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147 POST-ARREST FLUIDS IMPROVE SURVIVAL WITH BETTER METABOLIC PROFILE USING PLASMA-LYTE A OVER 0.9% NACL
148 THE IMPACT OF DIASTOLIC BLOOD PRESSURE ON OUTCOME OF CARDIAC ARREST SURVIVORS
149 RANDOMIZED TRIAL OF APNEIC OXYGENATION DURING ENDOTRACHEAL INTUBATION OF THE CRITICALLY ILL
150 CHARACTERIZING INITIAL CARDIORESPIRATORY INSTABILITY PATTERNS IN MONITORED STEP-DOWN UNIT PATIENTS
151 SENSITIVITY AND SPECIFICITY OF A PEDIATRIC EARLY WARNING SYSTEM USING DATA-DRIVEN VITAL SIGNS
152 1557 MINUTES OF PEDIATRIC CPR: PERFORMANCE ANALYSIS FROM A LARGE QUALITY IMPROVEMENT INITIATIVE
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155 SURVIVAL AFTER INPATIENT CARDIAC ARREST IS NOT AFFECTED BY LEVEL OF TRAINING OF CODE LEADER
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170 TIME-COURSE OF LACTATE LEVELS AFTER IN- VS. OUT-OF-HOSPITAL CARDIAC ARREST
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THE CUFF PUFF: A NOVEL METHOD TO CONFIRM ENDOTRACHEAL TUBE DEPTH USING COLOR DOPPLER ULTRASOUND

LONGER DURATION OF HYPOTENSION IS ASSOCIATED WITH WORSE OUTCOMES AFTER PEDIATRIC CARDIAC ARREST

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POST INTUBATION CARDIAC ARRESTS: AN INSTITUTIONAL REVIEW OF A POTENTIALLY PREVENTABLE CATASTROPHE

NEUROLOGIC INJURY IN PEDIATRIC ECMO PATIENTS: CHARACTERIZATION AND RISK ANALYSIS

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EFFECTIVENESS OF CARDIOPULMONARY RESUSCITATION IN ESTABLISHED ICU PATIENTS

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THE VALUE OF DEBRIEFING AFTER RAPID RESPONSE TEAM ACTIVATIONS AT A TERTIARY-CARE CHILDREN'S HOSPITAL

ADVANCED LIFE SUPPORT KNOWLEDGE AMONG AMBULANCE OFFICER (PARAMEDIC) STUDENTS IN HUNGARY

ESTIMATION OF THE INCIDENCE RATE AND CUMULATIVE INCIDENCE OF ROSC DURING RESUSCITATION IN ER

DOES CODE BLUE SIMULATION TRAINING DURING INTERN ORIENTATION IMPROVE COMFORT LEVEL AND ANXIETY?

NEUROMUSCULAR BLOCKERS FOR SHIVERING PREVENTION DURING THERAPEUTIC HYPOTHERMIA POST CARDIAC ARREST
CARDIAC ARREST IN SKILLED NURSING FACILITIES: NO SURVIVORS QUESTIONS UTILITY OF ATTEMPTS

INTERN SIMULATION TRAINING IN CODE BLUE EXECUTION IMPROVES IDENTIFICATION OF CODE TEAM MEMBERS

UNDER-UTILIZATION OF THERAPEUTIC HYPOTHERMIA AT A LARGE COMMUNITY HOSPITAL—TO COOL OR NOT TO COOL

Research Snapshot Presentations: Education

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THE PECARN HEAD TRAUMA RULE: VALIDATING A CLINICAL DECISION TOOL
CENTRAL VENOUS LINE PLACEMENT ASSESSMENT TOOL VALIDATION IN PEDIATRIC CRITICAL CARE MEDICINE
CLINICAL REASONING OF PEDIATRIC TRANSPORT TEAM DISPATCH—ANALYSIS USING SCRIPT CONCORDANCE TESTING
INCORPORATING AN INNOVATIVE, MULTIDISCIPLINARY ICU COURSE INTO AN INTEGRATED MEDICAL SCHOOL CURRICULUM
THE DOLLAR $IGN PROJECT: AN INNOVATIVE DRUG COST-AWARENESS TOOL FOR MEDICAL PROVIDERS
END-OF-LIFE EDUCATION: RESIDENT REFLECTIONS FROM THE 3 WISHES PROJECT
CRITICAL CARE PHARMACY RESIDENT RESEARCH PUBLICATION: RESIDENCY DIRECTORS PERCEPTIONS AND PRACTICES
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AN EVALUATION OF SITUATION AWARENESS DURING IN-HOSPITAL CARDIAC ARREST AND RAPID RESPONSES
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CRITICAL CARE PHARMACY RESIDENT RESEARCH PROJECT PUBLICATION: PRACTICES AND PERCEPTIONS OF GRADUATES
IMPLEMENTATION OF VIRTUAL RADIOLOGY ROUNDS IN A PEDIATRIC ICU: A PILOT STUDY
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ESTABLISHING PROCEDURAL COMPETENCE FOR TRAINEES IN THE BURN ICU USING A NOVEL TOOL
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REMOTE SIMULATION TRAINING WITH CERTAIN CHECKLIST IN 11 COUNTRIES
ACADEMIC PRODUCTIVITY OF ACGME-ACCREDITED CRITICAL CARE FELLOWSHIP PROGRAM DIRECTORS
A DEGREE COURSE IN CRITICAL CARE FOR UNDERGRADUATE MEDICAL STUDENTS: THE STUDENT VIEW
CAN THE SPIKES TOOL ASSESS FAMILY MEETINGS IN EOL DONATION AFTER CARDIAC DEATH (DCD) SIMULATIONS?
CONCEPTUALIZATION AND EXPLORATION OF VOLUNTEER PHYSICIAN ENGAGEMENT IN A NATIONAL SIMULATION PROGRAM
CURRICULUM CONTENT IN CRITICAL CARE: DEVELOPING A PROPOSAL BASED ON CONSENSUS OF EXPERTS
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DENY THE UTI: TARGETING CATHETER PREVENTION FOR ZERO INFECTION
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A BRIEF INTERVENTION FOR PROVIDERS TO DETECT PNEUMOTHORAX IN THE ICU USING ULTRASOUND
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SURVEY OF PEDIATRIC CRITICAL CARE TRAINING NEEDS FOR THE GENERAL PEDIATRICIAN
COMPARISON OF OBJECTIVE AND SUBJECTIVE MEASUREMENTS OF SITUATION AWARENESS IN SIMULATED EMERGENCIES
FIRST AID TRAINING FOR KINDERGARTEN AND PRIMARY SCHOOL CHILDREN
THE PICU PASSPORT: AN INNOVATIVE APPROACH TO STREAMLINING PEDIATRIC RESIDENT LEARNING IN THE PICU
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IMPACT OF FCCS TRAINED ADVANCED PRACTICE PROVIDER ICU NIGHT COVERAGE IN A LONG TERM CARE FACILITY
EVALUATION OF PHARMACY-NURSING COLLABORATIVE EDUCATION ON THE CRITICAL CARE PAIN OBSERVATIONAL TOOL
IMPLEMENTING IN-SITU SIMULATION TO ENHANCE TEAM PERFORMANCE IN POST CARDIAC SURGERY RESUSCITATION

Research Snapshot Presentations: Endocrine

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VITAMIN D STATUS IS ASSOCIATED WITH DISCHARGE DISPOSITION IN CRITICALLY ILL SURGICAL PATIENTS
EFFECT OF NUTRITIONAL STATUS OF CHILDREN WITH CONGENITAL HEART DISEASE ON POST-OPERATIVE OUTCOME
LONGITUDINAL CHANGES IN VITAMIN D STATUS OF CRITICALLY ILL SURGICAL ICU PATIENTS
CURRENT NUTRITION PRACTICES IN THE ICU: RESULTS OF AN INTERNATIONAL QUALITY IMPROVEMENT INITIATIVE
HYPOCHOLESTEROLEMIA IS ASSOCIATED WITH MORTALITY IN CRITICALLY ILL SURGICAL PATIENTS
CORTISOL CORRELATES WITH ILLNESS SEVERITY AND POORLY REFLECTS ADRENAL FUNCTION IN PEDIATRIC ARDS
EARLY PARENTERAL NUTRITION IMPROVES INTESTINAL BARRIER FUNCTION: RESULTS FROM A PILOT RCT
THE IMPACT OF OBESITY ON THE RELATIONSHIP BETWEEN TIMING OF ENTERAL NUTRITION AND OUTCOMES IN ARDS
INDIRECT CALORIMETRY VS PENN STATE EQUATION IN TRAUMATIC BRAIN INJURY, PRELIMINARY RESULTS
ENTERAL NUTRITION AND ANTACIDS IN THE PICU – IMPACT ON THE RISK OF VENTILATOR-ASSOCIATED PNEUMONIA
MANAGEMENT OF DIABETIC KETOACIDOSIS/HYPERGLYCEMIC HYPEROSMOLAR STATE IN PATIENTS ON HEMODIALYSIS
TIME IN BG RANGE 70–140 MG/DL IS ASSOCIATED WITH SURVIVAL IN NON-DIABETIC MEDICAL ICU PATIENTS
STRESS DOSE HYDROCORTISONE USE IN PEDIATRIC SEPTIC SHOCK VARIES AND IS ASSOCIATED WITH POOR OUTCOMES
COMPARISON OF WEIGHT-BASED CALORIC FORMULA WITH INDIRECT CALORIMETRY IN CARDIOTHORACIC ICU PATIENTS
THE RELATIONSHIP OF THE SEVERITY OF SEPSIS TO INSULIN RESISTANCE AND DYSGLYCEMIA
THE BENEFIT OF PARTIAL VERSUS FULL ENTERAL NUTRITION IN PEDIATRIC ICU PATIENTS

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BIOMARKERS OF NUTRITION DO NOT CORRELATE WITH NUTRIENT DELIVERY OR OUTCOMES IN SURGICAL ICU PATIENTS

SODIUM BICARBONATE ADMINISTRATION AND REOPENING OF ANION GAP IN DIABETIC KETOACIDOISIS

INCREASED FEEDING INTOXERANCE IN PICU PATIENTS IS SEEN WITH DELAYED INITIATION OF ENTERAL NUTRITION

CORRELATION OF ULTRASOUND ASSESSED GASTRIC ANTRUM AREA WITH ASPIRATED TUBE FEED VOLUME

IMBALANCES IN ENERGY DELIVERY AND OUTCOMES IN CRITICALLY ILL CHILDREN WITH BLOODSTREAM INFECTIONS

HYPOGLYCEMIC EVENT RATES WITH TWO DIFFERENT INSULIN PROTOCOLS IN ADULT ICU PATIENTS

SYSTEMATIC REVIEW OF OPPORTUNISTIC RADIOLOGIC SCREENING FOR FRAILTY IN HOSPITALIZED OLDER ADULTS

IMPROVED GLYCEMIC CONTROL WITH COLLABORATIVE TARGETED INTERVENTIONS IN A MEDICAL ICU

THE STUDY OF ENDOTHELIAL DYSFUNCTION AND POSSIBLE MECHANISMS INDUCED BY ACUTE GLUCOSE FLUCTUATIONS

IMPLEMENTING ELECTROMAGNETIC FEEDING TUBE PLACEMENT: A COMMUNITY HOSPITAL'S EXPERIENCE

CAN WE TRUST THEM? ACCURACY OF ICU NURSES IN ASSESSING ELECTROMAGNETIC FEEDING TUBE PLACEMENT

IMPACT OF INJECTABLE PHOSPHATE NATIONAL SHORTAGE ON MECHANICAL VENTILATION

SIGNIFICANCE OF LACTIC ACIDOSIS AND GLUCOSE LEVELS IN DIABETIC KETOACIDOISIS

EARLY NUTRITIONAL INADEQUACY IS ASSOCIATED WITH WORSE OUTCOMES IN CHRONIC CRITICAL ILLNESS

DESCRIBING PARENTERAL NUTRITION PRESCRIBING PATTERNS IN THE SURGICAL ICU OF A LEVEL 1 TRAUMA CENTER

FACTORS IMPEDING ENTERAL NUTRITION DELIVERY IN CRITICALLY ILL TRAUMA PATIENTS: A PROSPECTIVE STUDY

HYPOGLYCEMIA IS COMMON AMONG YOUNG CHILDREN PRESENTING WITH METABOLIC ACIDOSIS

DIABETES IS ASSOCIATED WITH INCREASED DYSGLYCEMIA AND MORTALITY IN PATIENTS WITH SEPSIS

THE OTHER ROLE OF HBA1C ON ICU ADMISSION IN CRITICALLY ILLNESS PATIENTS

A RANDOMIZED TRIAL OF ENTERAL GLUTAMINE IN BURN PATIENTS: RESULTS OF A MULTICENTER PILOT STUDY

COMPARISON OF 70/30 BIPHASIC INSULIN VERSUS INSULIN DETEMIR DURING CONTINUOUS ENTERAL NUTRITION

INITIATION OF ENTERAL NUTRITION IN A LEVEL 1 TRAUMA CENTER SURGICAL ICU: PRACTICES AND BARRIERS

MULTIDISCIPLINARY PERSPECTIVE ON USE OF INDIRECT CALORIMETRY FOR NUTRITIONAL ASSESSMENT IN THE PICU

THE IMPACT OF THE CUMULATIVE CALORIC DEFICIT IN CRITICALLY ILL PATIENTS

CLINICAL USEFULNESS OF CAPNOGRAPHIC MONITORING FOR FEEDING TUBE INSERTION IN CRITICALLY ILL PATIENTS
# Research Snapshot Presentations: Epidemiology

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VENTRICULAR CSF PROTEOMICS IN PATIENTS WITH ACUTE BRAIN INJURY

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DOPPLER ULTRASONOGRAPHY OF THE RETINAL VESSELS AND OPTIC NERVE SHEATH IN CHILDREN WITH BRAIN DEATH

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EVALUATION OF OUTCOMES ASSOCIATED WITH VASOPRESSIN USE IN ANEURYSMAL SUBARACHNOID HEMORRHAGE

Research Snapshot Presentations: Patient and Family Support

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PATIENTS RECALL OF BEING AWAKE DURING MECHANICAL VENTILATION IN THE ICU
DECISIONAL CONFLICT, REGRET AND QUALITY OF LIFE IN PARENTS OF CHILDREN OFFERED A TRACHEOSTOMY
PROVIDER AND FAMILY PERCEPTIONS OF FAMILY INVOLVEMENT IN DELIRIUM PREVENTION IN AN ICU
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PROSPECTIVE ASSESSMENT OF PEDIATRIC DELIRIUM: RISK FACTORS AND OUTCOMES IN PEDIATRIC CARDIAC SURGERY

Anita Patel, Katherine Biagas, Eunice Clark, Linda Gerber, Elizabeth Mauer, Chani Traube

Learning Objectives: Delirium is acute brain dysfunction associated with serious illness. Emerging data indicates that delirium occurs in 21% of children in Pediatric Intensive Care Units (PICU). Risk factors include developmental delay, severity of illness, and increased PICU length of stay (LOS). Cardiac surgery is a known risk factor for ICU delirium in adults (incidence 32–72%), but has never been systematically studied in pediatrics. Delirium may be a common but under-diagnosed problem in the Pediatric Cardiothoracic Intensive Care Unit (PICICU). We evaluated the prevalence of delirium over 6 mo in a PICICU (600 admissions/y) and assessed for associated risk factors.

Methods: A prospective chart review was performed of all patients undergoing cardiopulmonary bypass (CPB) over 6 mo. Children were screened for delirium with the Cornell Assessment of Pediatric Delirium (CAPD) once per 12-hour shift. Data abstracted from the electronic health record included demographics, severity of illness (Pediatric Index of Mortality-PIM2), and complexity of surgery (Risk Adjustment for Congenital Heart Surgery Score-RACHS). Univariate and multivariate analyses were performed. Results: 104 patients were studied. Delirium prevalence was 57.7%. Younger age, PIM2 score, and increased LOS positively correlated with the development of delirium (p<0.05) similar to the PICU data. In contrast, developmental delay did not confer an increased risk of delirium (p=0.4). Higher RACHS score, longer CPB time and cyanotic heart disease were associated with an increased risk of delirium (p<0.05). In a multivariate model age was still a risk factor for delirium development adjusting for PIM2, gender, and CPB time.

Conclusions: Our study reveals that delirium in PICICUs is common. While PICICU and PICU patients share similar characteristics, our study suggests that cardiac surgery significantly increases patients’ susceptibility for delirium. This study highlights the need for heightened, targeted delirium screening in all PICICUs to potentially improve outcomes in this vulnerable patient population. I Traube et al. PCCM. 2014. 42(3): 656.

2

PEDIATRIC REMOTE ISCHEMIC PRE-CONDITIONING PRIOR TO COMPLEX CARDIAC SURGERY: THE PREP PILOT TRIAL

Gonzalo Garcia Guerra, Robert Seal, Ari Joffe, Jonathan Duff, David Ross, Ivan Rebeyka, Irina Dina, Charlene Robertson

Learning Objectives: Remote Ischemic Pre-Conditioning (RIPC) refers to the finding that a brief ischemia-reperfusion event to a tissue results in subsequent protection from a more severe ischemia-reperfusion event to a different tissue/organ. There are only a few pediatric RIPC studies that show conflicting results. Hence, we conducted a randomized controlled trial (RCT) to determine the effect of early and late RIPC on the acute outcomes of infants after surgery for congenital heart disease (CHD).

Methods: Pilot double blind RCT of RIPC vs. control (sham-RIPC) infants (+6 weeks old) going for surgery for CHD. Patients were randomly assigned in a 1:1 ratio to receive an RIPC stimulus or control. RIPC was performed at 24–48 hr pre-operatively, and again before CPB. RIPC was done sequentially on each lower limb for 2 cycles. In the control group the cuff was placed underneath the legs. Blinding was achieved by covering the patients’ legs during the intervention. Forty-five infants were enrolled in the study (23 in the RIPC group and 22 in the control group), patients were analyzed on an intention to treat basis.

Results: Baseline characteristics were similar across both groups. There were no significant differences between the RIPC group and the control group in the highest blood lactate level day 1 post-operative (5.6±3.3 vs. 4.4±3.8 mmol/L; P=0.103), time of blood lactate <2 mmol/L (18.9±17.8 vs. 15.5±12.5 hr; P=0.461) or inotrope scores day 1 post-operative (20.3±23.8 vs. 11.2±6.5 hr; P=0.094). Between groups, there was no significant difference in troponin levels (at 3, 6, 12 and 24 hr), or creatinine levels (day 1 to 5) after surgery. Days on mechanical ventilation (4.6±3.4 vs. 12.8±29.1 days; P=0.193), intensive care length of stay (PICICU LOS) (5.1±2.8 vs. 14.3±32.2 days; P=0.190) and hospital LOS (5.1±2.8 vs. 14.3±32.2 days; P=0.052) were shorter in the RIPC; but these differences were not statistically significant. Conclusions: In infants who underwent surgery for CHD, our RCT on early and late RIPC did not find any significant difference in acute outcomes. A larger trial may be necessary.

3

INTERACTION EFFECTS OF MULTIPLE COMPLICATIONS ON POSTOPERATIVE MORTALITY IN GENERAL SURGERY

Minjae Kim, Guohua Li

Learning Objectives: Perioperative complications increase the risk of short-term mortality in critically ill surgical patients. There may be relationships between these complications to synergistically increase the risk of mortality but these effects are not well established. Methods: Multicenter, retrospective cohort study of patients undergoing intradialominal general surgery in the American College of Surgeons National Surgical Quality Improvement Program (2005–2011). Eight major postoperative complications were evaluated: 1) acute respiratory failure (ARF), 2) acute kidney injury (AKI), 3) sepsis/septic shock, 4) stroke, 5) cardiac arrest, 6) myocardial infarction (MI), 7) deep vein thrombosis/pulmonary embolus, and 8) transfusion. We separately modeled each combination of two complications (28 total) in a Cox model of 30-day mortality, adjusting for comorbidities and other risk factors. Additive interaction was assessed with the relative excess risk due to interaction (REI). A positive REI indicates that the mortality risk with both complications is greater than the sum of the individual mortality risks. A Bonferroni correction was applied for multiple comparisons (6×0.05/28=0.0018). Results: We analyzed 422,827 records. Seven combinations of complications demonstrated positive additive interactions: ARF/AKI (REI 55.2; p<0.0001), ARF/MI (REI 40.4; p=0.0001), ARF/stroke (REI 30.3; p<0.0001), AKI/sepsis (REI 28.6; p=0.0001), MI/sepsis (REI 28.6; p=0.0002), and sepsis/cardiac arrest (REI 76.5; p<0.0001). In addition, one combination demonstrated negative additive interaction: ARF/cardiac arrest (REI -81.6; p=0.0002). The remaining 20 combinations did not demonstrate additive interactions. Conclusions: Interaction effects exist between certain complications to increase the risk of short-term mortality. ARF, AKI, sepsis, and stroke were most likely to be involved in positive interactions. Further research into the mechanisms for these effects will be necessary to develop strategies to minimize the compound effects of multiple complications in the perioperative period.

4

FOUR-FACTOR PROTHROMBIN COMPLEX CONCENTRATE FOR LIFE-THREATENING BLEEDS OR EMERGENT SURGERY

Jonathan Sin, Karen Berger, Christine Lesch

Learning Objectives: Four-factor prothrombin complex concentrate (4F-PCC) is recommended for anticoagulant reversal in patients with life-threatening bleeds or requiring emergent surgery, however, it has been associated with a risk of thromboembolism. Randomized trials excluding patients with high risk for thrombosis have reported a 6.8–7.8% incidence. This study evaluated safety and effectiveness of 4F-PCC based on an institutional guideline that does not exclude patients with an elevated baseline thrombotic risk.

Methods: All adult patients who received 4F-PCC between March 2014 and December 2014 were included in this retrospective study. Outcomes data were analyzed for 14 days after administration, until discharge, or until death, depending on whichever came first. The primary outcome was a confirmed thromboembolism within 14 days after 4F-PCC administration. Secondary outcomes included INR correction to <1.5 at the first post-administration
draw and incidence of INR rebound within 24 hr post-warfarin reversal. **Results:** Ninety-three patients received 4F-PCC. Sixty-three (67.7%) were reversed for bleeding including 11 patients on novel oral anticoagulants. Thirty (32.3%) were reversed for surgery including 9 patients undergoing a left ventricular assist device explant to heart transplant. Eleven patients (11.8%) developed a thromboembolism within 14 days after 4F-PCC administration. The median (IQR) time to event was 5 (2–7) days. Based on a univariate analysis, other significant risk factors for thromboembolism were heparin-induced thrombocytopenia (p<0.001) and major bleeding including 11 patients on novel oral anticoagulants. Thirty (32.3%) were achieved an INR < 1.5 at the first post-administration draw and 14/63 (22.2%) experienced an INR rebound. Of these 14 patients, 8 (57.1%) did not receive concomitant vitamin K. **Conclusions:** 4F-PCC was associated with a significant risk of thromboembolism. All patient-specific thrombotic risk factors require consideration prior to administration. 4F-PCC remains useful as a warfarin reversal agent. Lack of vitamin K administration likely contributes to INR rebound.

5 IMPACT OF RIB FIXATION ON OUTCOMES IN MECHANICALLY VENTILATED BLUNT TRAUMA PATIENTS Obi Okoye, Christopher Horn, Matthew Pieper, Bradley Putty, Daniel Naughton, Carl Freeman

**Learning Objectives:** Rib fractures following trauma can be a source of significant morbidity, and rarely mortality. In patients requiring mechanical ventilation, pulmonary contusions associated with fractured ribs can increase work of breathing, and negatively impact weaning. While there is some evidence supporting use of fixation in patients with flail chest, there are no large studies or guidelines to direct rib fixation in multiple rib fractures without flail segments. **Methods:** The 2011 dataset of the National Trauma Data Bank was queried, and patients requiring mechanical ventilation following blunt trauma with associated rib fractures were identified. Patients with flail segments were excluded. Demographics, injury characteristics, operative intervention and outcomes were abstracted. Multivariate analysis was performed to identify impact of rib fixation on outcomes. **Results:** During the study period, a total of 93,475 patients sustained rib fractures. Of this number, 13,853 with blunt trauma required mechanical ventilation, with 1,339 (9.7%) of patients undergoing rib fixation. The mean age was 48.1 +/- 20.3 yr, with a male preponderance at 72.7%, and majority of patients involved in motor vehicle accidents (73.1%). Patients undergoing rib fixation had more fractured ribs, more pulmonary contusions, a higher chest abbreviated injury score, but overall injury severity score was similar. After adjusting for differences in the populations, there was no significant difference in pneumonia rates (AOR = 1.1 [0.9, 1.3], p=0.053). Adjusted mortality was significantly lower in the rib fixation group (AOR = 0.1 [0.1, 0.2], p<0.001). Ventilator days (Beta = -2.0, p<0.001), and ICU length of stay (Beta = -1.1, p<0.001) were also significantly reduced. **Conclusions:** In this retrospective study of patients with rib fractures without flail segments, rib fixation was associated with significantly improved mortality and a shorter duration of mechanical ventilation. Prospective study is warranted to validate these results.

6 DELAYED HYPOXEMIA FOLLOWING TRAUMATIC BRAIN INJURY EXACERBATES AXONAL INJURY Umang Parikh, Melissa Williams, Jodi Lapidus, Jose Pineda, David Brody, Stuart Fries

**Learning Objectives:** Hypoxia immediately following traumatic brain injury (TBI) has been observed to exacerbate injury. It remains unclear whether hypoxia beyond the immediate post injury period influences axonal injury. **Methods:** Forty 5 week old male mice (C57BL/6J) underwent controlled cortical impact (CCI) (N=24) or sham surgery (SHAM) (N=16). One day after awake animals were randomized to 30 min of low inspired oxygen (8% FiO2 and 4% CO2) or room air. Arterial blood gas sampling was performed at the end of 30 min of low inspired oxygen. White matter axonal injury was quantified 48 hr and 7 days post injury utilizing blinded stereological methods on beta amyloid precursor protein (B-APP) and neurofilament-200 (NF-200) stained sections. Quantification of tissue hypoxia was performed with Hypoxye probe kit and the Visiopharm Integrator System. **Results:** Twenty-four hr after CCI, 30 min of 8% FiO2 with 4% CO2 in awake spontaneously breathing mice revealed hypoxemia with normocarbia (paO2 50.1 + 1.9 mm Hg and paCO2 40.7 ± 2.0 mm Hg). Hypoxye probe immunohistochemistry demonstrated increased pericontusional white matter hypoxia in CCI + hypoxemia compared with CCI only (7.3% vs. 4.9% of the region of interest, P < 0.001) and minimal white matter hypoxia in sham and sham + hypoxemia (0.15% and 0.4% of the region of interest respectively). In the pericontusional corpus callosum and external capsule there were increased axonal swellings in CCI + hypoxemia compared with CCI animals for both B-APP at 48 hr (57 ± 6 vs. 21 ± 6.1 axons/mm3, P < 0.001) and 7 days (11 ± ± 5 vs. 5 ± 1 103 axons/mm3, P < 0.001) as well as NF-200 at 48 hr (34 ± 4 vs. 24 ± 3 103 axons /mm3, P < 0.001) and 7 days (26 ± 4 vs. 13 ± 2 103 axons/mm3, P < 0.001). Minimal B-APP and NF-200 staining was observed in SHAM and SHAM + hypoxenia mice. **Conclusions:** A clinically relevant model of delayed hypoxemia following TBI resulted in increased pericontusional axonal injury and white matter hypoxia. Therapeutic interventions that ameliorate post injury hypoxia may influence white matter injury severity.

7 PREOPERATIVE RISK INFLUENCES OUTCOMES WHEN A RESTRICTIVE FLUID REGIME IS USED AFTER CARDIAC SURGERY. Rachael Parke, Shay McGuinness, Keri-Anne Cowdrey, Eileen Gilder, Lianne McCarthy

**Learning Objectives:** IV fluid therapy is a ubiquitous component of post-operative Intensive Care Unit (ICU) care for cardiac surgical patients. We have previously reported a study to investigate the safety and efficacy of a restrictive fluid regime in patients after cardiac surgery. Further analysis sought to quantify the association between surgical risk and observed outcomes to inform future study design. **Methods:** Single-center randomized controlled trial of a restrictive fluid regime versus usual care in patients after cardiac surgery. Outcomes included the amount of fluid administered and ICU length of stay. This analysis stratified patients enrolled into the study as EUROSCORE II ≥0.9 (higher risk) or <0.9 (low risk). **Results:** 144 participants were included. Low risk group included 59 participants (30 usual care vs. 29 intervention) while the higher risk group included 85 participants (44 usual care vs. 41 intervention). In higher risk patients significant reductions in ICU length of stay (ICULOS) (median [IQR] 23.1 [20.2–49.2] vs. 43.7 [23.4–84.4] p=0.012) and total fluid bolus administered (1740mls [375–3437] vs. 3125 [1575–5873] p=0.005) were seen in the intervention group when compared to usual care. The differences in the low risk group were not significant for ICULOS (22.6 [20.6–35.5] vs. 22.2 [18.7–32.8] p=0.33) and total fluid bolus administered (1250mls [800–3250] vs. 2250 [1438–3625] p=0.09). **Conclusions:** These results demonstrate that cardiac surgical patients with a higher preoperative risk score may have a better response to a restrictive fluid regime and this may be associated with a reduction in ICU length of stay. These results suggest that a planned multicenter study of this strategy targeting higher risk patients is both justified and feasible and that enrolling this group of patients is more likely to see a result in the primary outcome of reduced length of ICU stay.

8 PROLONGED C-REACTIVE PROTEIN ELEVATION FOLLOWING SEVERE INJURY CAN BE REDUCED WITH PROPRANOLOL Ines Alamo, Kolenkede Kannan, Tyler Loftus, Harry Ramos, Philip Efron, Alicia Mohr

**Learning Objectives:** C-reactive protein (CRP) is an acute phase protein that rapidly rises in response to acute tissue injury, trauma, and infection. Trends in CRP have been used to monitor ongoing inflammatory activity. Severe injury leads to a prolonged hypercatabolism state in ICU patients. In a comparative rodent model of lung contusion (LC), hemorrhagic shock (HS) and chronic stress (CS) this ICU state has been replicated. The effects of propranolol on CRP levels following trauma are unknown. We hypothesize that daily propranolol (BB) reduces CRP levels in humans and rodents following severe injury. **Methods:** 44 severely injured trauma patients were studied prospectively. 24 patients received BB and 20 served as untreated controls. In addition, male Sprague-Dawley rats (n=5/group) were subjected to LCHS, and LCHS/CS, and daily propranolol (10mg/kg). Animals underwent two hr of daily restraint stress until sacrifice (day 7). Plasma CRP was tested on days 1 and 7 for rodents and from multiple times up to day 14 in patients. *p < 0.05 with Student t-test. **Results:** On the day of admission,
patients randomized to BB and untreated patients had a similar, markedly elevated CRP, compared to healthy volunteers (107 ± 38* and 77.2 ± 35 mg/L vs. 0.01 mg/L). From Day 1 to 14, BB treatment significantly reduced CRP levels by 37% (D1), 32% (D5), 45% (D10), and 33% (D14) compared to untreated patients. In rodent models, 7 days following CS, LCHS, and LCHS/CS, CRP levels increased by 50%, 63%, and 56% as compared to naive. After 7 days of daily BB, CRP levels were significantly reduced by 45%, 71%, and 69% in CS, LCHS, and LCHS/CS, as compared to the untreated counterparts. Conclusions: Following severe traumatic injury CRP levels are markedly elevated for up to 14 days. A rodent model of chronic stress added to LCHS validated a similar prolonged acute phase response. Daily propranolol use reduced CRP levels, a marker of persistent inflammation, both in humans and in rodents. Further study of the benefits of suppressing CRP levels with propranolol following severe trauma and daily stress are necessary.

9 RENAL INJURY ASSOCIATED WITH FREE HEMOGLOBIN IN RAT CARDIOPULMONARY BYPASS IS ATTENUATED BY NITRITE
Nahtah Kim-Campbell, Nicholas Krehe, Tomas Drabek, Mark Gladwin, Clifton Callaway, Cameron Derzulian, Hulya Bayir, Patrick Kochanek

Learning Objectives: Renal dysfunction in cardiopulmonary bypass (CPB) is reported in up to 50% and is associated with free hemoglobin (fHb) release. fHb may mediate several mechanisms of injury including decreased nitric oxide (NO) bioavailability. Nitrite is a source of NO in vivo and protects against organ injury in animal models of ischemic injury. We hypothesized that nitrite therapy will prevent renal injury associated with generation of fHb in rat CPB. Methods: Adult Sprague Dawley rats (Sham, n=5; CPB only [Control], n=6; CPB with nitrite [CN], n=5) underwent intubation, anesthesia, and placement of CPB cannulae and venous and arterial catheters. CPB was provided for 1hr at 60mL/min (Control and CN). In CN, 7μmol/kg of sodium nitrite was infused over the last 30min of CPB. Plasma was collected at Baseline, End CPB (END), 2hr and 24hr after reperfusion (REP) and was assayed for fHb (Hemocue), serum creatinine (Cr, colorimetry), and nitrite (chemiluminescence). Data are shown as median (IQR). Results: fHb (mg/dL) increased on CPB and returned to baseline by 24hrREP (Control) and 2hrREP (CN). Levels at baseline, END were: Control 10[10–20], 195[140–220]; CN 10[0–10], 230[210–290]. Nitrite (μmol) reached therapeutic levels after infusion (CN: END 11.85[11.03–13.71], Cr increased after CPB for 24hrREP in the control group but only until END in the CN group (Control: Baseline: 52[48–53], END 66[55–83], 2hrREP 59.58–67, 24hrREP 63[55–69]; CN: Baseline 51[37–64], END 69[67–88]). Fold-change in Cr was associated with change in fHb in all groups except CN (Sham: R2:91, Control: R2:86; p<0.05). All reported changes are significant (p<0.05). Conclusions: fHb increases after CPB and correlates with changes in Cr, indicating renal injury. Nitrite alters this relationship: fHb returns to baseline faster, Cr rise is ameliorated, and fold-change in Cr loss its association with change in fHb. This is likely due to replenishment of circulating NO, further suggesting the role of reduced NO bioavailability in CPB associated kidney dysfunction. Nitrite thus represents a promising therapy for CPB related renal injury.

10 USING EXPERT REVIEW TO CALIBRATE SEMI-AUTOMATED ADJUDICATION OF VITAL SIGN ALERTS IN STEP-DOWN UNITS
Madalina Fiterau, Donghan Wang, Artur Dubrawski, Gilles Clermont, Marilyn Hrvnak, Michael Pinskey

Learning Objectives: Machine Learning (ML) has shown predictive utility in analyzing vital sign (VS) data collected from physiologically unstable monitored patients. Training ML classifiers requires labeled ground truth data obtained via laborious annotation of events or manual chart reviews by expert clinicians. We aim to reduce the annotation effort through semi-automated adjudication. Methods: Noninvasive monitoring data including ECG-derived heart rate (HR), respiratory rate (RR), systolic and diastolic blood pressure (BP), and pulse oximetry (SpO2) were sampled at 1/2Hz and alerts were issued whenever VS exceed any of preset stability thresholds (40-chrerr85%). Statistical features were extracted from each raw VS stream independently during the alert window. ML models using Informational Projections (IP) were trained separately on 91 RR and 194 SpO2 events. 80 of remaining events (40 RR and 40 SpO2) were then automatically selected by the system and annotated by 2 expert clinicians. Then the experts adjudicated the same alerts using the available chart time series. We have determined annotation confidence categories based on the confidence and agreement of the experts. Results: Out of the 80 events, 36 are labeled with the same confidence (and label) irrespective of the manner of annotation, 3 events that could not be annotated based on the VS trace were annotated by analyzing the IPs. 10 of the events were annotated with more confidence based on the VS, while the remaining 31 (39% of total) could not be annotated based on the IPs, but could be adjudicated using VS. Informative-projection-assisted annotation was useful in labeling of 35 events, 53.03% of the non-ambiguous cases, reducing the need for chart-based adjudication to 31 events, 46.97% of the non-ambiguous cases. Conclusions: Effective training of ML-based automatic alert adjudication systems, calibrated on selective human annotation, can improve accuracy of automated adjudication while reducing human effort to prepare training data for ML.

11 CLINICAL PRACTICE GUIDELINE LOWERING THRESHOLD HEMOGLOBIN IN CYANOTIC NEONATES POSTOPERATIVELY
Michael Wolf, Michelle Glanville, William Mahle, Kevin Maher, Nikhil Chhanni, Shipra Das Dhuphane

Learning Objectives: Blood transfusions are often used in neonates with cyanotic congenital heart disease to increase hemoglobin and theoretically improve oxygen carrying capacity. Historically, a hemoglobin level >13 g/dL was targeted postoperatively. PRBC transfusions carry well known risks. Methods: We developed a clinical practice guideline (CPG) to limit reflexive transfusions in cyanotic neonates. Using a threshold hemoglobin level of 11 g/dL, we set physiologic triggers including oxygen saturation, lactic acidosis, tachycardia, and decreased cerebral NIRS for transfusion even with a hemoglobin level >11 g/dL. One year following CPG implementation we reviewed outcomes of neonates under the protocol compared with historical matched controls. Results: Excluding patients who required ECMO, there were 50 neonates who were eligible for the CPG over the initial 12 mo (22 Norwood procedures, 21 modified BT shunts, and 7 pulmonary artery bands). CPG compliance was >80% (41/50). Study patients had a lower mean 12 hour hemoglobin level (15.7 g/dL vs. 16.8 g/dL; p=0.03) and lower minimum hemoglobin level over the course of their ICU stay (11.2 g/dL vs. 12.9 g/dL; p=0.01). These numbers remained similar when CPG non-compliant patients were removed from the analysis as well as when each individual surgical group was analyzed against historical controls. Although the mean age of the study group was higher (9.5 days vs. 6.5 days; p=0.02), study patients and historical control did not differ in weight, arrival hemoglobin level, total PRBC received, postoperative bleeding volume, ICU length of stay, duration of mechanical ventilation, or overall survival (49/50 study patients vs. 46/50 historical controls). Conclusions: We successfully implemented a clinical practice guideline to lower threshold hemoglobin level in neonates with cyanotic congenital heart disease. Despite a significantly lower minimum hemoglobin level, clinical outcomes did not differ. Our initial data indicate that it may be safe to allow lower hemoglobin levels in cyanotic neonates absent other physiologic indications for PRBC transfusion.

12 POLY-NITROXYLATED-PEGYLATED HEMOGLOBIN AS AN ULTRA-SMALL VOLUME RESUSCITATION THERAPY
Catherine Byrd, Jessica Wallisch, Ruchira Jha, Vincent Vagni, Stephen Wisniewski, Li Ma, Carelton Hsia, Patrick Kochanek

Learning Objectives: Hemorrhagic shock (HS) complicating traumatic brain injury (TBI) worsens outcomes. Resuscitation with large volumes of fluids exacerbates brain edema. We showed that 20 mL/kg of the novel ultra-small volume resuscitation therapy Polynitroxylated-Pegylated Hemoglobin (PNPH) improved mean...
arterial pressure (MAP), prevented brain edema, and limited intracranial pressure (ICP) during combined TBI+HS resuscitation vs lacted Ringers (LR). Definitive studies to define the optimal dose of PNPH are needed for clinical trial design. Hypothesis: Volumes of PNPH as small as 5 mL/kg are equally effective as 20 mL/kg in TBI resuscitation. Methods: Mice (n=10/group) underwent controlled cortical impact followed by a 35-min severe HS. Mice then were randomized to 3 resuscitation groups (initial dose of PNPH 5 mL/kg, PNPH 20 mL/kg, or LR 20 mL/kg) followed by LR boluses every 5min for MAP<70 during a 90min “prehospital” phase. Lastly, resuscitated mice received 15min of reoxygenation (n=15/group) during a 2nd CPR cycle. ICP and MAP were monitored and % brain water (%BW) in injured and contralateral hemispheres determined at 24h (wet-dry weight). Results: The amount of fluid needed differed between the 5, 20 and LR groups (56 ± 3, 24 ± 3, and 184 ± 6 mL/kg, all comparisons p<0.05). Repeated measures [RM]ANOVA for MAP showed a treatment effect vs LR at both doses (p<0.01) and 20 >5 (p<0.05). At the end of pre-hospital phase MAP was 66 ± 2.4, 68.6 ± 2.6 vs 57.2 ± 2.2 mmHg, in 5, 20 and LR. RMANOVA for ICP did not differ between groups (p=0.2); there was a trend for reduced ICP in both PNPH groups vs LR (9.5 ± 0.9, 10.2 ± 1.0 vs 14.3 ± 2.0 mmHg, at end of pre-hospital phase). Mice resuscitated with PNPH 5 or 20 mL/kg of PNPH 20 mL/kg showed reduced %BW vs LR in both ipsilateral (79.91 ± 0.20 and 79.96 ± 0.27 vs 80.85 ± 0.30, p=0.03) and contralateral (78.19 ± 0.11 and 78.08 ± 0.13 vs 78.79 ± 0.15, p<0.01) hemispheres. Conclusions: PNPH equally attenuated brain edema at 5 or 20 mL/kg doses. Both doses also improved MAP and greatly reduced fluid requirements. Doses of PNPH as low as 5 mL/kg may be useful in TBI resuscitation. Support:U44NS070523, CEDER ICRC.

13 THE EFFECT OF DEVIATIONS FROM ACLS GUIDELINES ON OUTCOMES OF IN-HOSPITAL CARDIAC ARREST Kimia Horanard, Chantal Mepham, Craig Ainsworth, Zahira Khalid

Learning Objectives: In-hospital cardiac arrest is associated with poor outcomes. The latest Advanced Cardiac Life Support (ACLS) algorithms published by the AHA provide guidelines for the management of patients with cardiac arrest. The purpose of this study was to determine the effect of adherence to ACLS guidelines on outcomes of in-hospital cardiac arrest. Methods: We conducted a retrospective review of all cardiac arrests in hospital wards at three tertiary care centers in Ontario Canada (between January 2010 and June 2014 at St. Joseph’s Healthcare, and between those that January 2013 and June 2014 at the Hamilton General Hospital and Juravinski Hospital). Deviations from ACLS guidelines, such as administration of therapy not indicated for the algorithm, omission of required actions, and excess administration of appropriate medications, were recorded. Independent samples Student’s t-test was used to determine differences in ACLS guideline adherence and duration of code among those with ROSC and those who survived to hospital discharge or transfer. Results: One hundred and sixty-six in-hospital cardiac arrests were analyzed. There were 2.3 deviations from ACLS guidelines (SD=3.2) for events that led to ROSC and 5.9 deviations (SD=3.4) for events that did not lead to ROSC (p<0.0001). There were also fewer deviations during cardiac arrests among patients who survived to hospital discharge or transfer (2.1, SD 1.7) compared to those who did not survive (3.5, SD 3.1, p=0.016). Duration of code was not associated with ROSC (30.1min, SD 23.8 for those with ROSC vs. 28.6 min for those with no ROSC, SD 17.1, p=0.643) or survival to hospital discharge or transfer (26.7min for those who survived, SD 15.7 vs. 29.6 min for those who did not survive, SD 21.1, p=0.552). Conclusions: We found that lower adherence to ACLS guidelines was associated with less likelihood of ROSC and survival to hospital discharge or transfer following in-hospital cardiac arrest. Despite the paucity in evidence for the specific components of the ACLS guidelines, this study suggests that adherence to the guidelines in their entirety may improve patient outcomes.

14 A PERSONALIZED-MEDICINE APPROACH TO PEDIATRIC CARDIOPULMONARY RESUSCITATION IMPROVES SURVIVAL Ryan Morgan, Todd Kilbaugh, Wesley Shoup, George Bratinnov, Ting-Chang Hsieh, Vinay Nadkarni, Robert Berg, Robert Sutton

Learning Objectives: Most pediatric in-hospital cardiac arrests (IHCA) occur in ICU patients with invasive hemodynamic monitoring. Titrating cardiopulmonary resuscitation (CPR) to patient blood pressure (BP) rather than a standard chest compression (CC) depth improves survival in models of adult IHCA. The objective of this study was to determine if BP-targeted personalized CPR would improve survival compared to optimal American Heart Association (AHA) CPR in a piglet model of pediatric asphyxia-associated ventricular fibrillation (VF) IHCA. Methods: After 7 min of asphyxia followed by induction of VF, 18 female 4-week-old swine randomly received either 1) BP-targeted personalized CPR with titration of CC depth to systolic BP of 90mmHg and vasopressors (epinephrine × vasopressin) to maintain coronary perfusion pressure (CPP) ≥ 20mmHg (Pedi-BP Care) or 2) pediatric AHA Guideline care with CC depth ≥ 1/3 of the anterior-posterior diameter of the chest and standard AHA epinephrine dosing (Guideline Care). The first defibrillation attempt was after 10 min of manual CPR. Survivors in both groups received standardized post-resuscitation ICU care. The primary outcome was 4-hour ICU survival. Analyses were performed with Student’s t-test, one-sided Fisher’s exact test, and generalized estimating equation regression models. Results: 4-hour ICU survival was higher with Pedi-BP Care (9/9) vs Guideline Care (5/9); p=0.05. CPP during CPR was higher with Pedi-BP Care vs. Guideline Care (+9.2 mmHg, CI95: 0.3–18.1; p=0.05); and in survivors vs. non-survivors (+14.4 mmHg, CI95: 5.0–23.9; p=0.01). CC depth was greater with Guideline Care than Pedi-BP Care (44 ± 4mm vs. 32.6 ± 6mm; p=0.001). Prior to the first defibrillation attempt, more vasopressor doses were administered with Pedi-BP Care vs. Guideline Care (median 5 [3–6] vs. 2 [2–2]; p<0.01). One animal in each group required post-resuscitation vasopressor support (peak dopamine dose 10mcg/kg/min). Conclusions: BP-targeted personalized CPR improves 4-hour ICU survival compared to optimal AHA CPR in a piglet model of pediatric asphyxia-associated VF IHCA.

15 EEG SUPPRESSION RATIO 6 HOURS AFTER CARDIAC ARREST - ACCURATE BIOMARKER OF SEVERITY OF BRAIN INJURY Richard Riker, Nicholas Fox, Philip Stone, Sarah Holmes, Lauren Connolly, Barbara McCrum, David Seder

Learning Objectives: Predicting severity of brain injury in the first hr after cardiac arrest (CA) is known to be difficult. Standard and processed EEG have been shown to be accurate predictors, and recently, extended EEG monitoring during therapeutic temperature management (TTM) has shown better accuracy. Methods: Comatose adult survivors of CA were cooled to 33°C with moderate analgesodisation using propofol, fentanyl, and intermittent vecuronium (NMB) for shivering and monitored until warmed to 36.5°C. Bispectral index (BIS) and Suppression Ratio (SR) were calculated at first NMB dose (initial value) and 6-12-24 hr post-ROSC, blinded to outcomes. Receiver-operator characteristic (ROC) curves compared association with Good Outcome (GO) defined as Cerebral Performance Score of 1 or 2 at discharge. Results: Patients not given an opportunity to waken (death from cardiac causes or withdrawal of support <48 hr post-CA) were excluded. 267 patients were included: 203 men (76%), mean age 57.5 yr, 201 out-of-hospital arrests (75%), initial rhythm VT/VF in 131 (49%), and mean time to ROSC of 22 min. 119 (44%) patients were discharged from hospital phase MAP was 66.7 ± 2.4, 68.6 ± 2.6 vs 57.2 ± 2.2 mmHg, in 5, 20 and LR. RMANOVA for ICP did not differ between groups (p=0.2); there was a trend for reduced ICP in both PNPH groups vs LR (9.5 ± 0.9, 10.2 ± 1.0 vs 14.3 ± 2.0 mmHg, at end of pre-hospital phase). Mice resuscitated with PNPH 5 or 20 mL/kg of PNPH 20 mL/kg showed reduced %BW vs LR in both ipsilateral (79.91 ± 0.20 and 79.96 ± 0.27 vs 80.85 ± 0.30, p=0.03) and contralateral (78.19 ± 0.11 and 78.08 ± 0.13 vs 78.79 ± 0.15, p<0.01) hemispheres. Conclusions: PNPH equally attenuated brain edema at 5 or 20 mL/kg doses. Both doses also improved MAP and greatly reduced fluid requirements. Doses of PNPH as low as 5 mL/kg may be useful in TBI resuscitation. Support:U44NS070523, CEDER ICRC.

16 ACUTE LEFT VENTRICULAR FAILURE AFTER LIVER TRANSPLANTATION: PREDICTORS AND OUTCOME Abraham Sonny, Srinivasa Govindarajan, Jacke Czywinski

Learning Objectives: As orthotopic liver transplantation (OLT) puts enormous stress on the heart, cirrhotic patients with a decreased ejection fraction (EF) are generally not listed for OLT. However, despite having a normal ejection fraction (EF), certain patients experience significant decline in cardiac function after OLT. The primary objective of our study was to determine the
predictors of postoperative decline in EF to <45%. Our secondary objective was to evaluate subsequent recovery. Methods: Adult patients who underwent OLT at our institution from 01/2006 to 02/2015 were included. Data was obtained from prospectively collected institutional registries. Patients with an echocardiographically documented decline in EF to <45% within 6 mo after OLT were identified. Four controls were chosen per case; matched for age, gender, transplant year and Model for End-stage Liver Disease score. Conditional multivariable logistic regression was used to determine predictors of decline in EF. Results: In a cohort of 1,234 patients, 45 patients (3.6%) had post-OLT decline in EF to <45%. 180 matched controls were chosen. Lower EF (OR: 1.11, 95% CI 1.04–1.20, P < 0.01) and diastolic dysfunction (OR: 5.99, 95% CI 1.25–28.57, P = 0.02) on pre OLT echo were associated with post-OLT decline in EF. Diastolic dysfunction was found to be an independent predictor (p=0.04) in multivariable analysis. Post-OLT decline in EF was associated with a higher likelihood of 1 year mortality (OR: 2.30, 95% CI 1.19–4.42, P = 0.01). Left ventricular function recovered in 21 (out of the 45) patients, after a median duration of 112 days. Patients with pre-OLT diastolic dysfunction were less likely to recover (Fischer Exact test, P = 0.05).

Conclusions: Preoperative diastolic dysfunction was an independent predictor of post-OLT decline in EF and was also associated with non-recovery of left ventricular function. Patients known to have diastolic dysfunction need to be followed up more closely following OLT for early detection of left ventricular failure, especially since decline in EF was associated with a higher likelihood of 1 year mortality.

**Star Research Presentations: Neuroscience**

### 17

**EARLY NUTRITIONAL SUPPORT IS ASSOCIATED WITH FAVORABLE OUTCOME IN PEDIATRIC TRAUMATIC BRAIN INJURY**

Elizabeth Meinert, Michael Bell, P. Adelson, Sandra Buttram, Patrick Kochanek, Goundappa Balasubramani, Stephen Wisniewski

**Learning Objectives:** The impact of nutritional support on outcome after severe traumatic brain injury (TBI) is well recognized and nutritional support is addressed in the pediatric guidelines. Early initiation of nutrition (≤48h) is associated with survival in adults with severe TBI. However, it has not been systematically evaluated in children. Hypothesis: Timing of nutritional support is associated with outcome in children with severe TBI. Methods: The Cool Kids Trial (NCT 0022742) tested the hypothesis that early (≤6h), therapeutic hypothermia (32-33°C, 48h) would reduce mortality in children with severe TBI. Data were also collected on the timing of initiation of nutritional support for up to 7d as well as other variables. We defined nutrition initiation as the start of enteral or parenteral support and stratified it based on time after injury (≤48h, 48-72h, >72h or never). Outcomes were also stratified (mortality and Glasgow Outcomes Scale-Extended for Pediatrics (GOS-E Peds; 1–4, 5–7, 8)) at 6 mo and mixed-effects models defined the relationship between nutrition and outcome. Results: Children (n=90, 77 randomized, 13 run-in) were enrolled (mean GCS=5.8); the mortality rate was 13.3%, 57.8% of subjects received hypothermia. Initiation of nutritional support varied widely (≤48h: 35.5%; 48-72h:40%; >72h:18.9%, never~5.6%). Nutrition initiation was associated with mortality (p=0.01) and 6 mo GOS-E Peds (p<0.05). Patients never receiving nutrition in the study period exhibited increased mortality (≤48h, p<0.05; 48-72h, p<0.05) and worse GOS-E Peds (≤48h, p<0.05; 48-72h, p<0.05) vs other groups. Conclusions: Initiation of nutritional support early after TBI was associated with decreased mortality and favorable outcome in this secondary analysis. While this provides a rationale to initiate nutritional support early after TBI, definitive studies that control for important covariates (severity of injury, clinical site, calories delivered, parenteral/ enteral routes and other factors) are needed to provide conclusive evidence on the optimization of the timing of nutritional support after severe TBI in children.

### 18

**IN VIVO METABOLIC AND STRUCTURAL IMAGING AT 7T AFTER MILD TRAUMATIC BRAIN INJURY IN IMMATURE RATS**

Emin Fidan, Lesley Faley, Lee New, Patrick Kochanek, T. Kevin Hitchens, Hulya Bayir

**Learning Objectives:** Mild traumatic brain injury (mTBI) in children is a common and serious public health problem. Conventional neuroimaging findings are often normal in children who sustain mTBI putting them at risk for repeated mTBI (rmTBI). There is a need for more sensitive imaging techniques capable of detecting subtle alterations in neurophysiology after injury. In a pre-clinical model, we examined neurochemical and white matter changes in immature brain resulting from mTBI and rmTBI using proton magnetic resonance spectroscopy (MRS) and diffusion tensor imaging (DTI). Methods: Eighteen day old male rats received Sham, mTBI, or rmTBI (three impacts 24h apart). MRS of the hippocampi and in vivo DTI of whole brain were examined at 7 Tesla 7 days after injury after which rats were sacrificed for immunohistochemical staining (Silver and APP). Results: After mTBI and rmTBI, N-acetylaspartate/creatinine ratio (NAA/Cr) was reduced (p<0.03, p<0.001, respectively), and the myo-inositol/creatinine ratio (Ins/Cr) increased (p<0.017, p<0.01, respectively) vs sham. rmTBI exacerbated the reduction in NAA/Cr (p<0.01 vs mTBI). The choline/creatinine (Cho/Cr) and lipid/creatinine (Lip/Cr) ratios were also decreased (p<0.04, p<0.02, respectively) after rmTBI vs sham. There were significant increases in axial diffusivity, radial diffusivity and significant decreases in fractional anisotropy primarily in ipsilateral corpus callosum, external capsule, hippocampus and cortex after rmTBI vs sham. Immunohistochemistry revealed argyrophilic axonal staining and APP positive axonal bulbs in external capsule at 7d post mTBI and rmTBI. Conclusions: NAA and Ins are altered after mTBI and rmTBI likely reflecting neuro-axonal cell damage and glial proliferation, respectively. The decrease in Cho and Lip after mTBI, DTI and histological findings may reflect damage to axonal membrane. These findings may be relevant to understanding the extent of disability following mTBI and rmTBI in the immature brain. Support: NS061817, NS076511.

### 19

**APOTOPIC PATHWAY MEDIATES THE NEUROPROTECTIVE EFFECT OF IRL-1620 IN FOCAL CEREBRAL ISCHEMIA**

Anil Gulati, Anupama Puppala, Luis Thanh, Seema Briyal

**Learning Objectives:** Previous study has shown that IRL-1620 enhances angiogenic and neurogenic remodeling following cerebral ischemia. It is possible that ETB receptor agonist, IRL-1620, provides protection to neurons and astrocytes by inhibiting the apoptotic pathway. Methods: Male Sprague-Dawley rats underwent permanent middle cerebral artery occlusion (MCAO). Following surgery, rats received three intravenous injections of vehicle or IRL-1620 (5 µg/kg) at 2, 4, and 6hr post-occlusion. Evaluation of behavioral parameters confirmed the induction of stroke. Animals were sacrificed at 7hr and 24hr following occlusion and brains processed to evaluate protein expression of Bcl-2, Bax, total Akt and APP. Results: Animals treated with IRL-1620 showed significant improvement in all neurologic and motor function tests when compared with vehicle-treated MCAO group. In addition, there was a significant decrease in infarct volume 24hr after occlusion in animals treated with IRL-1620 (24.47 ± 4.37mm3) versus the vehicle-treated group (153.23 ± 32.18mm3). Anti-apoptotic protein Bcl-2 expression was increased and pro-apoptotic protein Bax expression was decreased in vehicle-treated MCAO rats compared to sham (p<0.01). In vehicle, and IRL-1620 treated rats, however, there was an increase in the phosphorylation of Ser173 of Akt (p<0.05 vs sham). The decrease in infarct volume 24hr after occlusion in animals treated with IRL-1620 (24.47 ± 4.37mm3) versus the vehicle-treated group (153.23 ± 32.18mm3). Anti-apoptotic protein Bcl-2 expression was increased and pro-apoptotic protein Bax expression was increased in vehicle-treated MCAO rats compared to sham (p<0.0001). On the other hand IRL-1620 treatment showed significantly (p<0.01) increased expression of Bcl-2 and decreased expression of Bax in MCAO rats. There were no changes in total Akt expression levels in the brains of sham, vehicle, and IRL-1620 treated rats, however, there was an increase in the phosphorylation of Ser173 of Akt (p<0.05 vs sham) in IRL-1620 treated rats compared to sham (p<0.01) or vehicle group (p=0.05) 7hr post-occlusion. No difference in total Akt or pS173-Akt levels was observed 24hr post-occlusion in the brains of sham, vehicle, or IRL-1620 treated rats. Conclusions: The results demonstrate that IRL-1620 is a neuroprotective agent and attenuates the neuronal damage following cerebral ischemia in rats by preventing apoptosis.
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LEVETIRACETAM IS AS EFFECTIVE AS PHENYTOIN FOR STATUS EPILEPTICUS WITH LESS ADVERSE EVENTS IN THE ED
Jachyn O'Connor, Phillip Levy, Suprat Saely Wilson

Learning Objectives: Both phenytoin (PHE) and levetiracetam (LEV) are recommended for the treatment of status epilepticus (SE). Despite higher prevalence of adverse effects, PHE is still considered the primary agent for the treatment of SE. This study will evaluate clinical outcomes of patients receiving LEV compared to PHE for SE in the emergency department (ED).

Methods: We performed a retrospective, cohort review of patients diagnosed with SE in the ED from Jan 2008 to July 2014. Patients excluded required continuous infusions of antiepileptics, or if seizure was from a traumatic brain injury/tumor. Primary endpoint was time to seizure termination. Secondary endpoints include need for additional antiepileptics and incidence of adverse effects.

Results: A total of 2,529 patients were identified from ICD-9 codes (345.0–345.9) for epilepsy and 206 patients with SE were included (n=100 PHE; 106 LEV). Mean age was 55 ± 15 yr and 57.8% were males. The duration of seizure prior to treatment was similar between groups (median [IQR]) 25 (20, 35) PHE vs. 29 (15, 45) min LEV; p=0.51). All but 6 patients received an initial treatment with benzodiazepines (BZD) with the majority (80%) receiving lorazepam (mean dose of 4.1 mg). The median initial dose was 1000 mg for both PHE and LEV groups. To time to seizure cessation was similar [5 (2.5) PHE vs. 5 (3.8) min LEV; p=0.085]. Patients treated with LEV required less additional rescue BZD within 24 hr (32% vs. 52%; p=0.005). Breakthrough seizures also occurred less in LEV group (22% vs. 38%; p=0.014). Adverse effects were significantly higher in the PHE group, with arrhythmia (9% vs 2%), ataxia (7% vs 1%), dizziness (9% vs 0%), and nausea/vomiting (17% vs 7%); p<0.05 for all. There were no differences in ED (3.3, 1.9-5.7) vs. 3.1 (1.9, 5.8); hr; p=0.662) or hospital lengths of stay [4 (2.5, 9.4) vs 4.3 (2.4, 9.5) days; p=0.775].

Conclusions: Levetiracetam is as safe and effective as phenytoin for the treatment of SE in the ED, with a lower incidence of adverse effects and number of adjunct medications required to control seizures within the first 24 hr of therapy.

21
INJURY TO NODES OF RANVIER IN THE WHITE MATTER OF DEVELOPING RATS AFTER ASPHYXIAL CARDIAC ARREST
Ming Fu, Mish Shoykhet

Learning Objectives: Nodes of Ranvier (NoR) enable short latency, reliable transmission of action potentials along axons. Prior data, in a model of pediatric asphyxia, revealed NoR injury and recovery mechanisms may be site-specific and may represent novel therapeutic targets.

Results: Asphyxial cardiac arrest disrupts NoR in the corpus callosum, results in selective disappearance of the smallest NoR, both increase by 30% and 24%, respectively (W: 1.17 ± 0.35 vs 0.90 ± 0.18 µm, p<0.05; L: 1.24 ± 0.32 vs 1.52 ± 0.39 µm, p<0.05). In the corpus callosum, peak changes also occur 24 hr post-arrest, when NoR width and length decrease by 30% and length decreases by 18% compared to sham values (W: 1.38 ± 0.27 vs 1.05 ± 0.19 µm, p<0.05; L: 1.24 ± 0.32 vs 1.52 ± 0.39 µm, p<0.05). In contrast to the optic nerve, injury in the corpus callosum results in selective disappearance of the smallest NoR. Both optic nerve and corpus callosum NoR values return to baseline by 10 days post-arrest.

Conclusions: Asphyxial cardiac arrest disrupts NoR in the CNS, which likely contributes to faulty transmission of sensory information after injury. NoR injury and recovery mechanisms may be site-specific and may represent novel therapeutic targets.

22
BRAZILIAN VERSION OF CRITICAL-CARE PAIN OBSERVATION TOOL: CROSS-CULTURAL ADAPTATION AND VALIDATION
Cristini Klein, Wolnei Caumo, Celine Gelinas, Valéria Patines, Fabiane Backes, Alexandra Lopes, Debora Vieira, Silvia Regina Vieira

Learning Objectives: The use of behavioral pain scales such as the Critical-Care Pain Observation Tool (CPOT) is strongly recommended for the assessment of pain in critically ill patients unable to self-report. However, the CPOT has not yet been translated and validated for use in Brazilian ICUs. We aimed to translate, culturally adapt, and validate the Brazilian Portuguese version of the CPOT.

Methods: Adult patients unable to self-report were recruited in a medical-surgical ICU in Brazil. Patients were excluded if received neuromuscular blocking agents or analgesic IV infusion, had neurodegenerative disease, injury on the face or on both upper limbs, were quadruplegic, Glasgow Coma Scale Score <4 on the item motor response. The translation process included the following steps: initial translation, translation synthesis, back-translation, evaluation by an expert committee, and pilot study. From April to December 2014, ICU patients were assessed with the CPOT by 2 nurses at 3 moments: at rest (M1), M2 during pain pressure threshold (PPT), and 15 min after PPT (M3).

Results: A total of 1019 ICU patients were screened, and 168 of them were included. A majority of participants were males (54.2%), median of age 67 (18–93) yr. Most of them were admitted for a medical reason (e.g., 42% had sepsis), had a mean APACHE score of 23(SD ±8.3), 84.5% of them were mechanically ventilated. A total of 672 paired assessments were performed. Chronbach’s α coefficients of CPOT item scores at M2 were 0.686 in mechanically ventilated patients, and 0.755 in non-ventilated patients, showing acceptable internal consistency. Inter-rater reliability of CPOT scores was high with a weighted kappa of 0.81 between 2 nurse raters. Discriminant validation was supported with significant higher CPOT scores at M2 compared to pre and post-assessments: 0 (0–3) at M1, 5(1–8) at M2, and 0 (0–5) 15 at M3 (p<0.001).

Conclusions: The Brazilian version of the CPOT was found to be reliable and valid for use in ICU adult patients unable to self-report, and is now available for behavioral pain scale use for Brazilian ICU settings.

23
EFFECT OF THE NOVEL AQUAPORIN-4 ANTAGONIST AER-271 IN COMBINED TBI PLUS HEMORRHAGIC SHOCK IN MICE
Jessica Wallisch, Ruchira Jha, Vincent Vagni, Keri Feldman, C. Dixon, George Farr, Patrick Kochanek

Learning Objectives: Secondary insults early after traumatic brain injury (TBI) such as hemorrhagic shock (HS) increase the need for fluid resuscitation and exacerbate brain edema, morbidity and mortality. The aquaporin (AQPs) channel is a mediator of cerebral edema and a potential therapeutic target. Hypothetical use of a selective AQP-4 antagonist (AER-271) early in resuscitation will reduce brain edema and intracranial pressure (ICP) in a mouse model of TBI+HS.

Methods: We used a combined cortical impact + HS (mean arterial pressure [MAP] 25–27 mmHg for 35 min) model followed by a 90 min resuscitation with lactated ringer's solution targeting MAP of 70 mmHg as previously described by our lab. C57BL/6 mice (n=12) were randomized to receive study drug AER-271 (5 mg/kg Arometics) vs equal volume of vehicle via IP bolus at the beginning of resuscitation and again at 60 min. Monitoring included temperature, heart rate, MAP, ICP, and cerebral perfusion pressure (CPP). Mice were sacrificed immediately after resuscitation and percent brain water (%BW) determined via wet-dry weight.

Results: There was a trend toward reduction in ICP during resuscitation with AER-271 (15.68 ± 1.04 vs 11.95 ± 1.64 mmHg, vehicle vs AER, p=0.08); however, AER treated mice exhibited a reduction in MAP (63.00 ± 1.34 vs 50.67 ± 3.29 mmHg, p=0.05) without difference in CPP (42.00 ± 8.28 vs 34.62 ± 7.02 mmHg, p=0.24). There were no differences in amount of fluid required or %BW in injured (80.79 ± 0.11 vs 80.81 ± 0.13, p=0.90) or non-injured (79.38 ± 0.09 vs 79.41 ± 0.10, p=0.78) hemispheres between groups.

Conclusions: In our mouse model of TBI+HS, AER-271 treatment showed a trend toward reduced ICP; surprisingly this did not

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result from an acute reduction in brain edema during resuscitation. Since AQP4 has been shown to have differential effects on cytotoxic and vasogenic edema, further studies are underway assessing more sustained administration in TBI+HS and in TBI alone. Funding: US DoD, W81XWH-14-2-0018; KL2TR000146.

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HIGH INCIDENCE OF NEUROIMAGING ABNORMALITIES AFTER PEDIATRIC SEPSIS
Mary Sandquist, Mark Clee, Smruti Patel, Usha Nagaraj, Blaise Jones, Sudhakar Vadiraju, Hector Wong

Learning Objectives: While neuroimaging abnormalities have been described in adults with sepsis, similar findings have not yet been described in children. No studies have explored neuroimaging findings after sepsis recovery although long term cognitive impairment is common. This study was intended to describe neuroimaging findings in children after sepsis.

Methods: Patients admitted to Cincinnati Children’s Hospital with a discharge diagnosis of sepsis or septic shock between 2004 and 2013 were cross matched with patients who underwent neuroimaging (head CT or brain MRI) during the same time period. All neuroimaging studies performed during or subsequent to a septic event were reviewed and all new (not known to be chronic) imaging findings were recorded. As many patients experienced multiple septic events and/or had multiple neuroimaging studies after sepsis, we analyzed the most recent (“final”) imaging study available for each patient.

Results: Three hundred and eighty-nine children with sepsis and 1705 concurrent or subsequent neuroimaging studies were included. Median age at first septic event was 3.4 yr (IQR: 0.7−11.5). Median time from first sepsis to final neuroimaging was 155 days (10−1054). The most common indications for final imaging were altered mental status (41%), seizures (15%), and follow up (14%). Sixty-three percent (n=243) of final imaging studies demonstrated abnormalities, the most common being volume loss (39%), signal abnormality (20%), fluid collection/hemorrhage (13%), enlarged ventricles (8%), encephalomalacia (6%), and cerebral edema (6%). Thirty-four percent (n=133) of patients had underlying neurologic conditions. On multiple logistic regression, PRISM III score (OR 1.032, p=0.048) and number of septic events (OR 1.482, p=0.048) were independently associated with abnormal final imaging findings.

Conclusions: The majority of children with sepsis and concurrent or subsequent neuroimaging have abnormal neuroimaging findings. Increased illness severity and higher sepsis frequency increase the risk of abnormal findings. The implication for long term sequelae requires further exploration.

Star Research Presentations: Pediatrics

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ECMO SUPPORT IN PREMATURITY AND EXTREME PREMATURITY INFANTS: INDICATIONS, COMPLICATIONS AND OUTCOMES
Gangajal Kasniya, Joel Davis, Scott Wagoner, Kevin Maher, Shiriprasad Deshpande

Learning Objectives: Gestational age and weight are often considered important criteria in establishing ECMO candidacy in neonates and infants with significant center to center variability. There is very limited data regarding outcomes of ECMO for respiratory failure in infants less than 36 weeks of gestational age. However, there is no available data on outcomes in extreme prematurity or on outcomes for cardiac ECMO. The goal of this study is to review indications, complications and outcomes in premature infants supported with ECMO. Methods: Retrospective cohort study of premature infants supported on ECMO at an academic tertiary care center designated as ELSO Center of Excellence. Results: We identified 39 premature (<36 weeks) patients from our institutional ECMO database. Of these, 18 were premature (<28 weeks). Indications for ECMO were: respiratory failure (31/39, 79.5%), cardiac (8/39, 20.5%). 6 patients followed ECPR. Mean non-adjusted age at ECMO was 162 days (1-455 days); mean adjusted age was 99 days and mean weight was 4.6kg (1.8-10kg). There were 15 patients less than 3kg. At the time of cannulation. 29/39 (74%) needed HFOV prior to ECMO. Cardiac ECMO. The complications during the ECMO run were as follows: hemorrhage / bleeding (13/39 patients), infection (4/39), neurologic complications (5/39), 27 patients (69%) were supported with CVVH. Mean duration of ECMO run was 240.8 hr (5-509 hr). Overall, 25/39 (64%) survived ECMO. This is similar to the mean survival reported by the ELSO registry for all newborns and better than pediatric ECMO survival. Utilization of VA ECMO was significantly lower in the extreme premature group compared to the late premature group (28% vs 62%, p<0.05). However, there were no differences in the duration of ECMO, complications and survival between the two groups. Survival for extreme premature group was excellent at 12/18 (66%). Conclusions: Premature and extreme premature infants supported with ECMO demonstrate excellent outcomes. History of prematurity by itself, therefore should not be considered a contraindication for ECMO support based on our data.

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ASSOCIATION BETWEEN ECMO CENTER VOLUME AND MORTALITY AMONG CHILDREN WITH HEART DISEASE
Punkaj Gupta, Andrew Wilcox, Mallikarjuna Rao Rettiganti

Learning Objectives: There is limited literature evaluating the relationship of extracorporeal membrane oxygenation (ECMO) center volume and mortality in children with heart disease. To address this knowledge gap, we undertook this study to evaluate the complex relationship between ECMO center volume and mortality using a myriad of advanced statistical techniques.

Methods: We performed post hoc analysis of data from an existing national database, Pediatric Health Information System (PHIS). Patients aged ≤18 yr receiving ECMO before or after pediatric heart operation at a PHIS participating hospital (2004–2013) were included. Propensity score matching was performed to 1:1:1 match patients in low-volume (0–30 cases per year), medium volume (31–50 cases per year), and high-volume (>50 cases per year) categories. We tested the sensitivity of our findings by repeating the primary analyses using traditional statistical techniques (traditional regression based methods and covariate adjustment using propensity score). Results: 3,502 from 42 hospitals qualified for inclusion. Using propensity score matching, 1,962 patients were matched 1:1:1 to compare the three volume categories (654 patients in each category). Overall mortality was 1,493 patients (43%). Prior to matching and adjustment, low and medium volume centers associated with higher mortality (low versus high volume, unadjusted odds ratio (OR): 1.99 (95% confidence interval (CI): 1.68–2.36, p<0.001). After matching, there was no significant association between center volume and mortality in unadjusted and adjusted analysis (low versus high volume, unadjusted OR: 1.06 (95% CI: 0.85–1.32, p=0.62); adjusted OR: 0.97 (95% CI: 0.63–1.50, p=0.90). This relationship remained similar for analyses using traditional statistical techniques (regression adjustment, low versus high volume, adjusted OR: 1.23, 95% CI: 0.80–1.89, p=0.04; covariate adjustment using propensity score, low versus high volume, adjusted OR: 1.16, 95% CI: 0.77–1.74, p=0.49). Conclusions: We demonstrated no relationship between ECMO center volume and mortality.

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ARE FREESTANDING CHILDREN’S HOSPITALS ASSOCIATED WITH IMPROVED OUTCOMES IN CRITICALLY ILL CHILDREN?
Punkaj Gupta, Mallikarjuna Rao Rettiganti, Paige Fisher, Tom Rice, Randall Wetzel

Learning Objectives: Little is known about the relationship between freestanding children’s hospitals and outcomes in children with critical illness. The purpose of this study was to evaluate the association of freestanding children’s hospitals with outcomes in critically ill children.

Methods: Patients <18 yr of age in the Virtual PICU Systems (VPS, LLC) Database (2009–2014) were included. We used propensity score matching to adjust for potential confounding variables between patients cared for in with and without freestanding children’s hospitals.

Results: A total of 538,967 patients from 140 centers were included. Of these, 323,319 patients were treated in 60 freestanding children’s hospitals. In contrast, 215,648 patients were cared for in 80 non-freestanding children’s hospitals. By Crit Care Med 2015 • Volume 43 • Number 12 (Suppl.)
propensity matching, 134,656 patients were matched 1:1 in the two groups (67,328 in each group). Prior to matching, patients in the freestanding children’s hospitals were younger, had greater comorbidities, higher severity of illness scores, higher incidence of cardiopulmonary resuscitation, higher resource utilization, and higher proportion of patients undergoing complex procedures such as cardiac surgery. Before matching, the outcomes including mortality were worse among the patients cared for in the freestanding children’s hospitals (freestanding versus non-freestanding, 2.5% vs. 2.3%, p<0.0001). After matching, the majority of the study outcomes were better in freestanding children’s hospitals (freestanding versus non-freestanding, Mortality: 2.1% vs. 2.8%, p<0.0001; SMR: 0.77 (0.73–0.82) vs. 0.99 (0.87–0.96), p<0.0001; Reintubation: 3.4% vs. 3.8%, p<0.0001; Good Neurological Outcome: 97.7% vs. 97.1%, p=0.001). In the matched sample, there was no difference in the duration of ICU stay and duration of mechanical ventilation between the two groups. **Conclusions:** In this large observational study, we demonstrated that pediatric intensive care provided in freestanding children’s hospitals is associated with improved survival chances compared to non-freestanding children’s hospitals.

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**DISASSOCIATING LUNG MECHANICS AND OXYGENATION IN EARLY PEDIATRIC ACUTE RESPIRATORY DISTRESS SYNDROME**

Nadir Yehya, Neal Thomas

**Learning Objectives:** Acute respiratory distress syndrome (ARDS) management emphasizes low driving pressures and tidal volumes (VT). Lower mortality is also associated with changes in positive end-expiratory pressure (PEEP) which improve PaO2/FiO2. It is unclear if the effects of PEEP are mediated by reduced driving pressure or improved PaO2/FiO2, which are linked. There are no data in pediatric ARDS (PARDS) confirming an association between driving pressure or VT and mortality. **Methods:** In this prospective observational study of PARDS at the Children’s Hospital of Philadelphia, peak inflating pressure (PIP), (PEEP), ΔP (PIP minus PEEP), VT, and PaO2/FiO2 were recorded at PARDS onset and at 24 hr, and tested for association with mortality, ventilator-free days (VFD), and ventilator days in survivors. We hypothesized ΔPaO2/FiO2 (24 hour PaO2/FiO2 minus initial PaO2/FiO2) was the primary metric associated with outcome. **Results:** Of 357 children, 273 (12% mortality) were on conventional ventilation at PARDS onset and at 24 hr. At onset, none of the variables differed between survivors and non-survivors (all rank-sum p>0.5). At 24 hr, survivors had lower PIP, lower ΔP, and higher PaO2/FiO2 (p<0.05). Change in ΔP (ΔΔP) between 0 and 24 hr did not differ between survivors and non-survivors (p=519), whereas ΔPaO2/FiO2 was higher (p=0.003) in survivors. In multivariable regression, ΔPaO2/FiO2 was associated with lower mortality (adjusted OR 0.75 per increase in PaO2/FiO2 by 25, 95% CI 0.63–0.89) after controlling for severity of illness, organ failures, initial PaO2/FiO2, and ΔΔP. Similar results were obtained when testing association with VFD or ventilator days in survivors, and when substituting oxygen index for PaO2/FiO2. **Conclusions:** In PARDS, improved PaO2/FiO2 in the first 24 hr was associated with lower mortality, more VFD, and fewer ventilator days in survivors. Changes in lung mechanics (including ΔΔP) were not independently associated. Future PARDS trials should focus on oxygenation response rather than ventilator mechanics, as ΔPaO2/FiO2 appears to be the more relevant variable.

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**ASSESSING RESPIRATORY COMPLICATIONS IN CHILDREN UNDERGOING ADENOIDOTONSILLECTOMY**

Alyson Baker, Christopher Carroll, Kathleen Sala, Allison Cowl

**Learning Objectives:** It is common practice to admit children who are perceived to be at high risk for complications due to pre-operative medical comorbidities to the ICU following adenotonsillectomy. This study aims to determine the frequency of respiratory complications in children admitted after adenotonsillectomy and to identify factors associated with the risk of respiratory complications in this cohort. **Methods:** A retrospective study of children admitted to the ICU following adenotonsillectomy. Pre-operative risk factors and peri-operative events were compared to post-operative interventions. **Results:** Over 4.5 yr, 165 children were admitted to the ICU following adenotonsillectomy, 150 (91%) of whom received no respiratory support. Interventions included supplemental oxygen >2hr (n=77), nasopharyngeal airway (n=14), and positive pressure ventilation (n=1). When comparing characteristics of the children who required respiratory support to those who did not, those who received support were more likely to have had a perioperative event including intra-operative laryngospasm or need for Narcan post-operatively (OR 12.3; 9% CI 2.3–67.4; p<0.01), or to have chronic neurologic disease including autism, seizures, or cerebral palsy (OR 3.7; 95% CI 1.1–11.9; p=0.04). Medical comorbidities such as obesity, asthma, and cardiac disease were not related to a need for post-operative support. **Conclusions:** Preoperative factors such as obesity and abnormal sleep studies were not associated with post-operative respiratory support. Instead, factors such as need for Narcan, intra-operative laryngospasm, and chronic neurologic disease conferred a need for respiratory support.

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**PAIN ASSESSMENT IN CRITICALLY ILL PATIENTS WITH DELIRIUM: SELF-REPORTED PAIN VERSUS BEHAVIORAL PAIN**

Rima Bouajram, Christian Sebat, Michelle Wilson, Dawn Love, Erin Nagle, Jeremiah Duby

**Learning Objectives:** Pain assessment in the Intensive Care Unit (ICU) setting remains a challenge due to clinical limitations such as communication barriers and mechanical ventilation. In patients unable to self-report pain with intact motor functions, behavioral pain scales are considered to be the most valid and reliable tools for pain assessment. However, the correlation between self-reported and behavioral pain assessment is still unclear. The purpose of this study was to describe the correlation and relationship between self-reported and behavioral pain assessment in critically ill patients with delirium. **Methods:** Prospective, observational study. Delirium was assessed using the Confusion Assessment Method for the ICU (CAM-ICU) and Intensive Care Delirium Screening Checklist (ICDSC). Behavioral pain was assessed using the Critical Care Pain Observation Tool (CPOT) and Behavioral Pain Scale (BPS). Self-reported pain was assessed using the Numeric Rating Scale (NRS) and the Wong-Baker Faces (WBF) pain scales. At the end of each assessment, patient preference regarding pain assessment methods was obtained. Statistical Analysis was performed to assess correlation between self-reported and behavioral pain assessment tools during delirium and non-delirium. **Results:** 115 patients were included; 67 non-delirious and 48 delirious patients based on CAM-ICU. In non-delirious patients, a strong correlation was found between behavioral pain scales (0.94328, p<0.0001) and self-reported pain scales (0.7775, p<0.0001). Self-reported and behavioral pain scales were weakly correlated with each other (0.2845, p=0.0206). In delirious patients, there was a strong correlation between behavioral pain scales (0.86146, p<0.0001) and moderate correlation between self-reported pain scales (0.68558, p=0.0001). There was also correlation between self-reported and behavioral pain scales in delirious patients (0.22653, p=0.12616). Most subjects preferred self-report. **Conclusions:** Self-reported and behavioral pain assessments cannot be used interchangeably. More reliable tools are needed to better assess behavioral pain in critically ill patients.

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**FEEDING CHILDREN ON HIGH FLOW NASAL CANNULA WITH ACUTE VIRAL BRONCHIOLITIS IS SAFE**

Anthony Sochet, Jessica McGee, Tessie October

**Learning Objectives:** Children with respiratory failure on high flow nasal cannula (HFNC) are routinely not fed due to perceived risk of aspiration. There are limited safety data to guide clinicians in their nutritional practice. **Methods:** We performed a prospective, observational study of children aged 1 month to 6 yr admitted to the ICU between January and July of 2015 with acute bronchiolitis on HFNC receiving enteral nutrition. Exclusion criteria were prematurity, congenital heart disease, neuromuscular disease, concurrent bacterial pneumonia, gastroesophageal reflux, craniotalfacial anomalies or use of other non-invasive ventilatory support. The primary outcome was the development of emesis as

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national databases, Virtual PICU Systems (VPS, LLC) Database and Pediatric Health Information System (PHIS). Methods: Patients <18 yr of age receiving mechanical ventilation for ALI were included (2009–14). Patients in the two databases were linked using direct identifiers. Propensity score matching was used to adjust for potential confounding variables between patients who received at least 24 hr of iNO (iNO group) and those who did not receive iNO (no iNO group). The outcomes evaluated included ICU mortality, standardized mortality ratio (SMR), ventilator free days (VFD), duration of mechanical ventilation, duration of ICU and hospital stay, and hospital costs. Results: 20,106 patients from nine centers were included. Of these, 859 (4.3%) patients received iNO. Prior to matching, patients in the iNO group were younger, with more comorbidities, greater severity of illness scores, higher incidence of cardiopulmonary resuscitation, and greater resource utilization. Before matching, unadjusted outcomes, including mortality, were worse in the iNO group [iNO vs. No iNO, 25.7% vs. 7.9%, p<0.001; SMR: 2.6 (2.3–3.1) vs. 1.1 (1.0–1.2), p<0.001]. Propensity score matching of 521 patient pairs, revealed no difference in mortality in the two groups [22.3% vs. 20.2%, p=0.49; SMR: 2.5 (2.1–3.0) vs. 2.3 (1.9–2.8), p=0.53]. However, the other outcomes such as VFD (10.1 days vs. 13.6 days, p<0.001), duration of mechanical ventilation (13.8 days vs. 10.1 days, p<0.001), duration of ICU and hospital stay (15.5 days vs. 12.2 days, p<0.001 and 28.0 days vs. 24.1 days, p<0.001), and hospital costs ($150,569 vs. $102,823, p<0.001) were significantly worse in the iNO group. Conclusions: This large observational study demonstrated that iNO administration in children with ALI was not associated with improved mortality. It was rather associated with increased hospital utilization and hospital costs. Further study to investigate this association is warranted.

32 EFFECT OF INHALED NITRIC OXIDE ON OUTCOMES IN CHILDREN WITH ACUTE LUNG INJURY
Punkaj Gupta, Troy Richardson, Matt Hall, David Bertoeh, Randall Wetz

Learning Objectives: To determine the effect of nitric oxide (iNO) administration on outcomes in children with acute lung injury (ALI) by linking two intervention on procedures, tube dislodgement, and high gastric residuals. A volume-based feeding protocol (VP) is designed to adjust the infusion rate to compensate for interruptions. We hypothesize that implementation of a VP would increase delivery of EN over that given by the conventional hourly-rate method (CM).

Methods: This prospective study evaluated VP patients from June 2014 to April 2015. Exclusion criteria were hemodynamic instability, intra-abdominal injury requiring operation, intensive-care unit (ICU) length of stay <72 hr, non-invasive positive pressure ventilation, and surgical restriction head-of-bed elevation >30°. VP patients were compared to CM patients from September 2013 to April 2015. The primary outcome measured was percentage of goal EN delivered during the entire ICU stay. Statistical analysis for continuous and categorical variables was performed with t-tests and chi-square tests, respectively.

Results: We evaluated 227 patients over a 20-month period representing a total of 1298 patient days of EN. Seventy-nine (79) patients in the VP group were followed during 694 patient days of EN and compared with the control group of 148 patients for 1298 patient days of EN. Patients on VP received a significantly higher percentage of goal EN than those on CM (73.3% vs. 65%, p<0.002). No difference was found between the two groups with regard to incidence of diarrhea (CM 4.16% vs VP 5.19%; p = .29), gastric residual volume >500 mL (CM 0.92% vs VP 1.15%; p = .62), or tube dislodgement (CM 2.04% vs VP 1.61%; p = .51). The VP group had a significantly lower incidence of emesis (VP 0.14% vs CM 1.39%; p = .006), and less frequency of interruption for procedures (VP 3.46% vs CM 6.7%; p = .002). Conclusions: Implementation of a volume-based protocol significantly increased delivery of EN by 8.3% over that given by the conventional hourly-rate method in critically ill trauma patients with no difference in feeding-related complications.

33 MICROSCOPIC EXAMINATION OF INTRACELLULAR ORGANISMS IN BAL FLUID FOR DIAGNOSIS OF VAP
Chang Liu, Zhiyong Peng

Learning Objectives: The presence of intracellular organisms (ICOs) in polymorphonuclear leukocytes obtained from bronchoalveolar lavage fluid (BALF) is a possible method for rapid diagnosis of ventilator-associated pneumonia (VAP). However, the validity of this diagnostic method remains controversial and the diagnostic thresholds reported by investigators were different. This study is to evaluate the accuracy of microscopic quantification of ICOs in BALF for the diagnosis of VAP, and to detect the best cutoff percentage of PMNs containing ICOs (PIC). Methods: 181 patients suspected of first episode of VAP were enrolled. The BALF samples underwent quantitative culture, cytologic and bacteriologic analysis. Definite diagnosis of VAP was based on pre-set criteria. The receiver-operating characteristic (ROC) curve was used to detect the best cut-off point for PIC to diagnose VAP. The diagnostic accuracy from quantitative culture and Gram’s stain of BALF was evaluated as well. Results: 102 patients were diagnosed with VAP, while 60 patients were diagnosed without VAP. ICOs were present in 96.08% (98 out of 102) patients with VAP and 20.00% (12 out of 60) patients without VAP. The PIC were significantly higher (0.53 ± 0.65% vs. 0.22 ± 1.33%, p<0.01) in VAP group. The cutoff point for PIC to diagnose VAP was 1.5%, which had a sensitivity of 94.12% and a specificity of 88.33%. The area under ROC curve was 0.956 (0.95% confidence interval [CI], 0.925 to 0.986±0.01). The sensitivity and specificity of positive quantitative culture to diagnose VAP were 65.69% and 95.00%. The sensitivity and specificity of positive Gram’s stain to diagnose VAP were 70.59% and 76.67%. Conclusions: PIC>1.5% in BALF by the microscopic examination has better diagnostic performance compared to Gram’s stain for the diagnosis of VAP.

34 VOLUME-BASED PROTOCOL IMPROVES DELIVERY OF ENTERAL NUTRITION IN CRITICALLY ILL TRAUMA PATIENTS
Gaurav Sachdev, Kehaulani Clark, Andrea Sorvillo, Taylor Soloff, Peter Fischer, A. Christmas, Ronald Sing, Tuan Huynh

Learning Objectives: Critically ill patients on enteral nutrition (EN) often do not receive goal nutritional support. Factors impeding delivery of EN include interruption for procedures, tube dislodgement, and high gastric residuals. A volume-based feeding protocol (VP) is designed to adjust the infusion rate to compensate for interruptions. We hypothesize that implementation of a VP would increase delivery of EN over that given by the conventional hourly-rate method (CM).

Methods: This prospective study evaluated VP patients from June 2014 to April 2015. Exclusion criteria were hemodynamic instability, intra-abdominal injury requiring operation, intensive-care unit (ICU) length of stay <72 hr, non-invasive positive pressure ventilation, and surgical restriction head-of-bed elevation >30°. VP patients were compared to CM patients from September 2013 to April 2015. The primary outcome measured was percentage of goal EN delivered during the entire ICU stay. Statistical analysis for continuous and categorical variables was performed with t-tests and chi-square tests, respectively.

Results: We evaluated 227 patients over a 20-month period representing a total of 1298 patient days of EN. Seventy-nine (79) patients in the VP group were followed during 694 patient days of EN and compared with the control group of 148 patients for 1298 patient days of EN. Patients on VP received a significantly higher percentage of goal EN than those on CM (73.3% vs. 65%, p<0.002). No difference was found between the two groups with regard to incidence of diarrhea (CM 4.16% vs VP 5.19%; p = .29), gastric residual volume >500 mL (CM 0.92% vs VP 1.15%; p = .62), or tube dislodgement (CM 2.04% vs VP 1.61%; p = .51). The VP group had a significantly lower incidence of emesis (VP 0.14% vs CM 1.39%; p = .006), and less frequency of interruption for procedures (VP 3.46% vs CM 6.7%; p = .002). Conclusions: Implementation of a volume-based protocol significantly increased delivery of EN by 8.3% over that given by the conventional hourly-rate method in critically ill trauma patients with no difference in feeding-related complications.

35 PLASMA PRODUCTS SUPPRESS MONOCYTE FUNCTION IN VITRO
Sanjna Shah, Susana Beeceo, Josey Hensley, Lisa Hanson-Huber, Mark Hall, Jennifer Muszynski

Learning Objectives: Blood product transfusion may contribute to critical illness-associated innate immune suppression, which is characterized by reduced lipopolysaccharide (LPS)-induced tumor necrosis factor (TNF) secretion by monocytes. In our previous studies, stored red blood cells suppress monocyte function in vitro. Immunologic effects of plasma products are unclear. We used in vitro
models to test the hypotheses that plasma products will suppress monocytes and that PF24 (plasma separated and frozen within 24 hr of collection) will suppress monocyte function more than FFP (plasma separated and frozen within 8 hr of collection). Methods: FFP and PF24 were obtained from the blood bank. 1 x 10^6 isolated monocytes from healthy adult donors were co-cultured with plasma products at 37°C. TNFα production was then quantified in supernatants by chemiluminescence. For dose-response experiments, total plasma volume was kept at 40% but the ratio of FFP to autologous plasma was varied. Experiments were performed in at least 3 replicates, with each distinct monocyte donor and blood products. Data are mean ± SEM.

Results: Exposure to FFP and PF24 both resulted in decreased LPS-induced TNFα production compared to autologous plasma controls (3146 ± 265 and 2829 ± 299 vs 6139 ± 1099 pg/ml; p = 0.01, RM-ANOVA). Differences between FFP and PF24 were not significant. In dose-response experiments, FFP exposure suppressed monocyte function with a linear dose-response relationship (9% FFP: TNFα response (pg/ml): 0%: 8077 ± 1069, 10%: 5714 ± 515, 20%: 5068 ± 192, 30%: 3561 ± 59, 40%: 4135 ± 494; R²=0.65, p=0.0008, N=3). Conclusions: Plasma products suppress monocyte function in vitro. PF24 does not appear to be more immunosuppressive than FFP in our model. Further work is needed to identify mechanisms of plasma product-induced monocyte suppression, to evaluate other plasma products, and to translate these findings in clinical studies.

R-107 ATTENUATES SEVERITY OF ACUTE LUNG INJURY AFTER CHLORINE GAS INHALATION IN OVINE MODEL

Satoshi Fukuda, Koji Ihara, Ernesto Lopez, John Salisbury, Robert Cox, Hal Hawkins, Donald Prough, Perenlei Enkhbaatar

Learning Objectives: Chlorine gas (Cl2) exposure may cause mass casualties both in battlefield and civilian conditions. There is no effective treatment available. When inhaled, Cl2 causes lung epithelial and endothelial damage through oxidative and nitrosative stress, which leads to excess formation of pulmonary shunt. We hypothesized that R-107, a novel agent that contains nitric oxide donor, peroxynitrite modulator and superoxide scavenger can ameliorate Cl2-induced acute respiratory distress syndrome (ARDS) by reducing pulmonary shunt. Methods: In translational ICU, twelve previously instrumented (Swan-Ganz, femoral artery, left atrium and urinary catheters) female sheep were exposed to the Cl2 inhalation (25 breaths/min, 140 ppm) under propofol anesthesia via tracheostomy tube for 30 min. After the injury, sheep were awakened, placed on mechanical ventilator and continuously monitored in conscious state for hemodynamics, pulmonary mechanics and gas exchange for 48 hr. Sheep were randomly allocated into two groups: 1) Control; treated with saline (n=7); 2) Treatment; treated with R-107 (n=5). R-107 was injected (3 ml intramuscularly) at 1 hr after injury. Fluid resuscitation was maintained by infusion of lactated Ringer’s solution (2 ml/kg/hr). Analgesia was provided with long acting buprenorphine. Results: All sheep survived 48 hr. The control sheep developed moderate ARDS (PaO2/FiO2 was 140±52 at 12, 18 and 24 hr post injury. Whereas, the ratio stayed at around 400 mmHg at all time points (p<0.05) in R-107 treated sheep. The pulmonary shunt fraction was significantly lower in treated group (11.6 vs 29.0% and 15.8 vs 34.5% at 24 and 42 hr, with p=0.043 and 0.023, respectively). Lung wet-to-dry ratio was significantly lower in treatment group as well (p=0.0025). No adverse effects noted with the treatment. Conclusions: R-107 prevents onset of Cl2 inhalation-induced ARDS by inhibiting pulmonary shunt and edema formation. Intramuscular injection of R-107 may be considered as an emergency treatment at the site of Cl2 exposure.

VENO-VENOUS ECMO WITH BICAVAL DUAL-LUMEN CATHETER CANNULATION: A REVIEW OF THE ELSO REGISTRY

Gregory Bittle, Pablo Sanchez, Si Pham, Bartley Griffith, Michael Mazzeffi, Daniel Herr, Zachary Kon

Learning Objectives: Several small case series have described excellent outcomes with the use of bicaval dual-lumen catheters for patients undergoing veno-venous extracorporeal membrane oxygenation (VV-ECMO). However, the incidence of and outcomes associated with this cannulation strategy have yet to be described on a large, multi-institutional scale. Methods: The ELSO registry was reviewed for all adult VV-ECMO cases performed between 2007 and 2014. Patient demographics, pre-ECMO and ECMO variables, and outcomes were compared between bicaval dual-lumen catheter cannulation (DLVV) cases and the contemporaneous conventional peripheral cannulation (CVV) cases. Results: Of 5454 ECMO runs in 5554 patients, there were 1638 DLVV and 3261 CVV cases identified. Over the study period, the incidence and proportion of DLVV cases increased significantly, from no cases in 2007 to over 400 per year in 2013 and 2014. Mean duration of ECMO support was similar between DLVV and CVV cohorts. 5.9% of DLVV cases utilized additional cannulation sites, but conversion to veno-arterial ECMO was less common compared to CVV. Rates of cannula site bleeding and cardiac tamponade were similar between groups, and there was less hemolysis with DLVV. Survival to discharge was 63% with DLVV compared to 58% with CVV (p<0.001). Interval survival to discharge in DLVV cases did not significantly change during the study period. Multivariable analysis revealed DLVV to be independently associated with increased likelihood of survival. Conclusions: The incidence of DLVV has increased dramatically over this study time period, and both in-hospital morbidity and survival to discharge appear to be quite favorable compared to contemporary CVV ECMO. These data from a large, multi-national database support previous single-center experiences in asserting that the use of DLVV cannulation is safe and efficacious for VV-ECMO.

PROPHYLACTIC CORTICOSTEROIDS TO PREVENT AIRWAY COMPLICATION AFTER EXTUBATION: A META-ANALYSIS

Keiko Kawai, Akira Kuriyama

Learning Objectives: Previous systematic reviews and meta-analyses suggested that prophylactic corticosteroids might prevent post-extubation stridor and reintubation in adults. However, there is no up to date systematic review regarding this theme since 2009, and some new trials examining this issue have been published. Herein, we updated a meta-analysis on the efficacy of prophylactic administration of corticosteroids to prevent post-extubation stridor and reintubation in adults. Methods: PubMed, the Cochrane Central Register of Controlled Trials, Web of Science, and China Academic Journal Network Publishing Database were searched without language restrictions. Placebo-controlled randomized trials evaluating the efficacy of prophylactic corticosteroids in mechanically ventilated adults were included. Our primary outcomes were the incidence of post-extubation stridor and reintubation. Data were pooled using the random effects model. Results: Nine trials with 2324 participants were included. Compared with placebo, prophylactic corticosteroid was associated with a reduced incidence of post-extubation stridor (RR 0.45; 95% CI 0.23 to 0.87), and of reintubation (RR 0.34; 95% CI 0.20 to 0.58). Subgroup analysis suggested that prophylactic corticosteroid was associated with a reduced incidence of post-extubation stridor (RR 0.37; 95% CI 0.24 to 0.57) and reintubation (RR 0.27; 95% CI 0.14 to 0.52) in patients who were cuff leak test positive one day prior to elective extubation. Conclusions: Our updated meta-analysis suggested that prophylactic administration of corticosteroids might prevent post-extubation stridor and reintubation. Especially, patients who were cuff leak test positive one day prior to elective extubation might get more benefited by the prophylactic corticosteroids.

THE PEDIATRIC PULMONARY RESCUE WITH EXTRACORPOREAL MEMBRANE OXYGENATION PREDICTION (P-PREP) TOOL

David Bailly, Ron Reeder, Luke Zabrocki, Anna Hubbard, Susan Bratton, Ravi Thiagarajan

Learning Objectives: Many factors are associated with mortality from respiratory failure supported with extracorporeal membrane oxygenation (ECMO) but currently no survival prediction tool is used in pediatrics. Our aim was to create and validate a scoring tool to predict risk of hospital mortality. Methods: Using the Extracorporeal Life Support Organization registry we identified 4352 children (>7 days <18 yr) with an initial ECMO run for respiratory failure between 2001–2013. The data consisted of pre-ECMO clinical and demographic variables. For analysis we presumed that renal and liver failure occurred prior to

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This large cohort study. Higher hospital survival and more days alive and free of delirium and coma in parallel with both total and partial bundle compliance (all P<0.001). Patients experienced more days alive and free of delirium and coma when patients had palliative care consults (7% higher survival, P<0.001), and for those on and off mechanical ventilation (all P<0.001). For patients with both total and partial bundle compliance (all P<0.001). Patients experienced more days alive and free of delirium and coma in this large cohort study.

Learning Objectives: The usefulness of N-terminal pro-B-type natriuretic peptide (NT-pro-BNP) acting as a prognostic factor in critically ill patients with severe pneumonia is controversial. The present study prospectively investigated whether NT-pro-BNP is predictive of 28-day mortality in a cohort of critically ill patients with severe pneumonia.

Methods: A total of 185 consecutive patients with severe pneumonia admitted to the Medical Intensive Care Unit (medical ICU), in a tertiary university hospital, during a 26-month period between May 2013 and June 2015, were assessed. Patients with recent acute coronary syndromes or major surgery in a month were excluded.

Results: The median age was 64 yr (range, 18–93 yr; IQR, 49–75), and 64.3% of the patients were male. There were 71 cases of severe community acquired pneumonia, 78 severe hospital acquired pneumonia and 36 severe healthcare-associated pneumonia. 32 required non-invasive ventilation, 98 required invasive ventilation, 39 required both non-invasive and invasive ventilation, and 16 required only oxygen therapy. The median level of NT-pro-BNP on ICU admission was 2291.0 pg/mL (range, 11.6–236,823.0 pg/mL; IQR, 617.0–476.5 pg/mL), and the median APACHE II score was 22 (range, 10–46). The 28-day mortality rate was 55.1%. The 28-day survivors did show significantly lower levels of NT-pro-BNP from non-survivors (1,341.0 pg/mL [range, 11.6–91,651.0 pg/mL] vs. 3,321.5 pg/mL [range, 64–236,823.0 pg/mL]; Z=−3.408, P=0.001). In prediction of 28-day mortality, the area under the curve (AUC) for NT-pro-BNP was 0.65 (95% confidence interval [CI], 0.57–0.73) and AUC for APACHE II score was 0.66 (95% CI, 0.59–0.74). AUC was 0.67 (95% CI, 0.60–0.75) when NT-pro-BNP was combined with APACHE II score.

Conclusions: The level of NT-pro-BNP was elevated in non-survivors compared with survivors in a cohort of critically ill patients with severe pneumonia in a medical ICU. Moreover, combining NT-pro-BNP with APACHE II score added little additional power in predicting 28-day mortality in this cohort of critically ill patients with severe pneumonia.

Learning Objectives: There is a driving unmet need in critical care to design and test methods of improving patient safety and reducing suffering for ICU patients. We studied an evidence-based bundled approach to implementation of SCCM’s Pain/Agitation/Delirium (PAD) guidelines in a real-world setting. The Awakening and Breathing coordination, Choice of drugs, Delirium monitoring and management, Early mobility, and Family engagement (ABCDEF) bundle was implemented by interprofessional teams in 7 community-based ICUs in California. The aim was to study the relationship between ABCDEF bundle compliance and both hospital survival and delirium.

Methods: This prospective, quality improvement study was conducted over 18 mo in 20 ICUs in California. The aim was to study the relationship between ABCDEF bundle compliance and both hospital survival and delirium.

Results: We enrolled 6,064 patients over 14,398 patient-days. Patients were 63±17 yr old (means±SD) with APACHE III of 90±26. Admissions were 65% emergent, 25% urgent/trauma, 10% elective with median ICU and hospital LOS of 4.0 and 8.5 days. For every 10% increase in complete bundle compliance, patients had a 19% higher odds of hospital survival (P=0.001). This relationship persisted even when patients had palliative care consults (7% higher survival, P<0.001), and for those on and off mechanical ventilation (all P<0.001). For patients who had partial bundle compliance, “dose” of compliance yielded significantly higher hospital survival (30% per unit increase in bundle compliance, p=0.001). Patients experienced more days alive and free of delirium and coma with both total and partial bundle compliance (all P<0.001).

Conclusions: Implementation of the PAD guidelines using the ABCDEF bundle predicted higher hospital survival and more days alive and free of delirium and coma in this large cohort study.

Learning Objectives: The usefulness of N-terminal pro-B-type natriuretic peptide (NT-pro-BNP) acting as a prognostic factor in critically ill patients with severe pneumonia is controversial. The present study prospectively investigated whether NT-pro-BNP is predictive of 28-day mortality in a cohort of critically ill patients with severe pneumonia.

Methods: A total of 185 consecutive patients with severe pneumonia admitted to the Medical Intensive Care Unit (medical ICU), in a tertiary university hospital, during a 26-month period between May 2013 and June 2015, were assessed. Patients with recent acute coronary syndromes or major surgery in a month were excluded. Results: The median age was 64 yr (range, 18–93 yr; IQR, 49–75), and 64.3% of the patients were male. There were 71 cases of severe community acquired pneumonia, 78 severe hospital acquired pneumonia and 36 severe healthcare-associated pneumonia. 32 required non-invasive ventilation, 98 required invasive ventilation, 39 required both non-invasive and invasive ventilation, and 16 required only oxygen therapy. The median level of NT-pro-BNP on ICU admission was 2291.0 pg/mL (range, 11.6–236,823.0 pg/mL; IQR, 617.0–476.5 pg/mL), and the median APACHE II score was 22 (range, 10–46). The 28-day mortality rate was 55.1%. The 28-day survivors did show significantly lower levels of NT-pro-BNP from non-survivors (1,341.0 pg/mL [range, 11.6–91,651.0 pg/mL] vs. 3,321.5 pg/mL [range, 64–236,823.0 pg/mL]; Z=−3.408, P=0.001). In prediction of 28-day mortality, the area under the curve (AUC) for NT-pro-BNP was 0.65 (95% confidence interval [CI], 0.57–0.73) and AUC for APACHE II score was 0.66 (95% CI, 0.59–0.74). AUC was 0.67 (95%CI, 0.60–0.75) when NT-pro-BNP was combined with APACHE II score.

Conclusions: The level of NT-pro-BNP was elevated in non-survivors compared with survivors in a cohort of critically ill patients with severe pneumonia in a medical ICU. Moreover, combining NT-pro-BNP with APACHE II score added little additional power in predicting 28-day mortality in this cohort of critically ill patients with severe pneumonia.
DESATURATION DURING TRACHEAL INTUBATIONS IN PICUS IS PERSERATIVE AND ASSOCIATED WITH ADVERSE OUTCOMES

Simon Lu, Ting-Chang Hsieh, Kyle Rehder, Sholeen Nett, Pradip Kamar, Natalie Napolitano, Vinay Nadkarni, Akira Nishisaki

Learning Objectives: The occurrence of desaturation during tracheal Intubations (TI) and the relation to indication and adverse TI associated events (TIAEs) across diverse Pediatric ICUs (PICUs) is unknown. Methods: Data from a multicenter TI database (NEAR4KIDS) across 31 PICUs from 1/2012-12/2014. All primary TIs with SpO2<90% after pre-oxygenation were included. TI indications were classified as: Respiratory (R), Hemodynamic (H), Respiratory+Hemodynamic (RH), or other (O). We defined moderate desaturation as SpO2 <80% and profound desaturation as SpO2 <70% during TI. We evaluated the association between moderate/profound desaturation with occurrence of any adverse TIAEs or severe TIAEs as well as number of attempts on the occurrence of moderate/profound desaturation. Analysis was by y2 and multivariate logistic regression.

Results: Of 5,754 TIs, moderate desaturation was associated with TI indications: R 22% (75/3357), H 12% (44/359), RH 28% (94/336), O 11% (185/1697), p<0.001. The association of profound desaturation with TI indication were R 16%, H 8%, RH 20%, O 7%, p<0.001. TIs with moderate desaturation (SpO2 <80%) compared to those without, were associated with TIAEs (32% vs. 13%, p<0.001) and severe TIAEs (11% vs. 5%, p<0.001). Profound desaturation (SpO2<70%) was associated with TIAEs (50% vs.13%, p<0.001) and severe TIAEs (12% vs.5%, p<0.001). All findings persisted after adjusting for TI indications (i.e. severe TIAEs OR: 1.9, 95%CI 1.5–2.4 for moderate desaturation, OR: 2.4, 95%CI 1.8–3.1, for profound desaturation). The number of attempts required for a given TI was associated with moderate and profound desaturation (p<0.001). After adjusting for indication, the associations with moderate desaturation were: 2 attempts OR 3.4 (95%CI 2.9–4.0) and 3+ attempts OR 6.7 (95%CI 5.6–8.0), compared with 1 attempt. For profound desaturation the associations were: 2 attempts OR 3.7, 95%CI 3.0–4.5, and 3+ attempts OR 6.9, 95%CI 5.6–8.5. Conclusions: Moderate (SpO2<80%) and profound (SpO2<70%) desaturation are associated with TIAEs. Number of TI attempts is also associated with desaturation during TI.

THE IMPACT OF VITAL SIGN MEASUREMENT FREQUENCY ON APACHE II AND IV SEVERITY SCORING

Marta Kokoszynska, Rob Greer, James Krinsley

Learning Objectives: The Acute Physiology and Chronic Health Evaluation (APACHE) scoring system estimates ICU inpatient mortality using the most abnormal vital sign (VS) and lab values from the first 24 hr of ICU admission, as well as age and comorbidities. Although the scoring methodology for APACHE II (APID) and IV (APIV) is explicitly described, there is currently no standardization of an appropriate frequency that VS should be measured and abstracted for scoring purposes. We hypothesized that decreasing frequency of VS abstraction would lead to lower severity scores. Methods: This is retrospective review of a convenience sample of 250 patients (185 medical, 65 surgical) admitted to the 16 bed ICU of a university affiliated teaching hospital between 7/11/14 and 5/2/15, with an ICU length of stay of > 24 hr. We compared APACHE II and IV scores (APID, APIV) using VS data abstracted at Q1, Q2 and Q4 hourly intervals. We calculated APACHE IV predictions of mortality (APIV PM) using these data and calculated Observed:Expected (OE) mortality ratios (OE MR), based on patient status at hospital discharge. We used the Wilcoxon rank-sum test to compare paired values. Results: The 250 patients had median age 69 and 13.6% mortality. Comparisons: Q1, Q2, Q4 hourly VS abstraction APID (median): 17; 16; 15 APIV (median) 59; 56; 54 APIV PM (mean %) 21.7; 19.8; 18.8 p=0.0001 for each pairwise comparison OE MR for Q1, Q2, Q4 VS abstraction were 0.65; 0.6; 0.72 For patients with APIV PM 0–10%, 10–25% and >25% the difference between OE MR obtained with Q1 vs Q4 VS abstraction was 0.06; 0.09; 0.10. Conclusions: APACHE II and IV scores decreased with less frequent abstraction of VS, yielding lower predicted mortality scores. These changes impacted the OE MR, especially with higher severity of illness. These data suggest that the frequency of VS abstraction for severity scoring should be standardized and reported explicitly in published manuscripts as well as in public reporting of outcomes data, in order to ensure valid comparisons.

INFLUENCE OF WITHHOLDING PHARMACOLOGIC PROPHYLAXIS DOSES ON VENOUS THROMBOEMBOLISM OCCURRENCE

Seth Bauer, Heather Blonsky, Karitina Zell, Anita Reddy

Learning Objectives: The influence of withholding pharmacologic venous thromboembolism (VTE) prophylaxis (Px) medications on VTE occurrence in medical intensive care unit (MICU) patients is unclear. This study was designed to evaluate the influence of missed VTE Px doses on incident VTE. Methods: Retrospective evaluation of all adult patients admitted to the MICU of a large academic medical center from January 2013 through August 2014. Only acute VTEs detected during clinical care, not present on admission to the hospital, and identified during or after MICU admission were regarded as incident VTEs. The proportion of ordered VTE Px doses not given was calculated; patients never receiving pharmacologic VTE Px were regarded as missing 100% of doses. Patients with a VTE were compared to those without a VTE to evaluate risk factors for VTE occurrence, with inferential statistics performed. Results: A total of 5183 patients were included. Most patients received heparin Px (61.0%), but 33.4% were never given pharmacologic VTE Px during their stay. Incidental VTE occurred in 145 patients (2.8%). Most VTE events occurred during the patients’ MICU stay (71.5%) and were detected a median (IQR) of 9 (5, 15) days after hospital admission. Overall, distribution of VTE by race differed (p = 0.015). In our sample, more African Americans had VTE than not (50.7% vs. 17.5%). Patients with VTE, compared with those without VTE had higher APACHE III scores (72 [57, 95] vs. 61 [45, 81], p<0.001) and higher number of days on mechanical ventilation (2 [0, 8] vs. 0 [0, 2], p<0.001). The VTE group had a significantly higher proportion of missed prophylaxis doses (8% [0, 33%] vs. 0% [0, 13%], p<0.001) and maximum number of consecutive missed ordered doses (1 [0, 0] vs 0 [0, 2], p<0.001). In a multivariable logistic regression model, the percent of missed VTE Px doses was independently associated with an increased risk of VTE occurrence (OR 8.4 [95% CI 3.8, 18.4], p<0.001). Conclusions: Withholding pharmacologic VTE Px in MICU patients had a strong influence on VTE occurrence. Methods to reduce missed doses should be evaluated.

THE “JULY EFFECT” IN THE ICU REVISITED

Kevin Blackney, Raghu Seethala, Haytham Kaafarani, Daniel Yeh, Edward Birtner, Ed George, Ali Raja, Jarone Lee

Learning Objectives: The ‘July Effect’ refers to the theoretical adverse impact on patients that results from the start of a new academic/traaining year. Previous studies in the ICU failed to confirm the presence of a July Effect in the ICU. In 2003, the ACGME implemented resident work-hour restrictions. These regulations resulted in extra resident sign-outs and reduced continuity of care. We sought to examine if a July Effect now exists after changes in staffing at a time when inexperienced providers are most vulnerable to error. Methods: We performed a multicenter retrospective cohort study of patients aged 18 or older who were admitted to any ICU over a 5-year period (2007 – 2012) at two academic, urban tertiary care centers. The primary outcomes were 30-day and 365-day mortality. The secondary outcome was ICU length of stay. We used multivariate logistic regression to assess for the presence of an association between admission to the ICU in July, compared to the rest of the year, and outcomes, adjusting for age, gender, race, type of ICU, and Elixhauser comorbidity index. Odds ratios (OR) and 95% confidence intervals (CI) are reported. Results: 57,335 patients were analyzed. 42.8% were female and the mean age was 64.2±16.1 yr. 30-day mortality was 10.8% in July compared to 11.6% for patients admitted in the remaining mo (p=0.09). 365-day mortality was 24.1% in July compared to 25.5% in the remaining mo (p=0.03). ICU length of stay was 5.4±9.1 days in July compared to 5.3±8.4 days in the rest of the year (p=0.24). The adjusted 30-day mortality OR for ICU admission in July was 0.92 (95% CI 0.84–1.02). The adjusted 365-day mortality OR for ICU admission in July was 0.92 (95% CI 0.85–0.99). Conclusions: We observed reduced long-term mortality after implementation of work-hour rules, and a trend towards decreased short-term mortality. We observed no difference
in ICU length of stay. Similar to previous studies, a July Effect was not observed in the ICUs; further studies are needed to assess the impact in July on specific process and clinical outcomes.

47 TEAMSTEPPS ROUNding IMPROvement PROJECT: AN INTEGRATED RONding STYLE
Jack He, Joseph Golob, Amanda Wojahn, Jonathan Savakus, Brenda Zosa, Jeffrey Clairidge

Learning Objectives: TeamSTEPPS was developed to improve teamwork and patient safety. TeamSTEPPS Rounding Improvement Project (TRIP) was designed to further involve all members of the critical care team (CCT) on daily rounds. This study evaluated if TRIP has achieved this goal. Methods: There were two trauma/surgical critical care units at our institution. From September through December, 2014, trained observers prospectively collected data on rounds in Unit 1 post-TRIP implementation, and Unit 2 pre- and post-TRIP implementation. Unit personnel were blinded to the data collection process, and were surveyed pre- and post-TRIP to grade patient safety and team communication (A, B=good grade; C, D, F=bad grade). Results: A total of 599 patient encounters were observed. Of those, 268 encounters were made in Unit 1; 233 and 98 encounters were observed in Unit 2 pre- and post-TRIP, respectively. Post-TRIP, all CCT members, including attending/fellow, resident, and nurse, were present on rounds 96% of the time vs. 71% prior (p=0.001). They were also more involved. Nurse presented vital signs and labs more often in the post-TRIP units (93% vs. 17% and 91% vs. 8%, respectively; all p<0.001). Resident development of daily care plans increased from 64% to 95%, and nurses were able to summarize these plans significantly more (71% vs 3%, all p<0.001). Post-TRIP, the amount of education sessions during rounds did not differ significantly. Rounding time per patient and total rounding time on average increased by 3 and 21 min, respectively (p=0.001 and p=0.02). However, review of invasive line/ tube, antibiotics course and indication increased 17–27% (all p=0.05). Antibiotic cessation errors were reduced in Unit 2 from 14% to 11% (p=0.58). Staff survey data also showed that a good grade for patient safety increased from 73% to 91% (p=0.07) and team communication increased from 70% to 81% (p=0.30). Conclusions: TRIP was associated with significant increase in presence and participation of CCT members at a cost of 3 additional min per patient. However, it may improve safety of the critically ill patients.

48 REDUCTION OF EARLY VAP AFTER BUNDLE DEPLOYMENT FOR PATIENTS INTUBATED IN THE EMERGENCY DEPARTMENT
Lawrence DeLuca, Paul Walsh, Tyler Durns, Ryan Miller, Ashley Pickering, Dylan Sabb, James Yeaton, Kurt Denninghoff

Learning Objectives: Ventilator-Associated Pneumonia (VAP) leads to high morbidity and mortality in ventilated patients. Eckert (2006) and Carr (2007) have linked VAP in trauma patients to Emergency Department (ED) intubation and ED length of stay (LOS). As early-onset VAP is linked to oropharyngeal colonization, we hypothesize that early VAP rates may be reduced by an ED-based VAP prevention program. Methods: A pre/post design was used with a historical control. PRE patients were retrospectively identified using an existing airway database. Staff was trained in VAP prevention and the VAP bundle was deployed in the ED. POST patients were prospectively identified. Kaplan-Meier curves were constructed showing time till acquisition of VAP. Log rank test for equality was performed, and Cox regression using the Breslow method for ties was used for proportional hazards analysis. Results: The PRE and POST groups comprised 192 and 153 patients, respectively, with VAP rates of 11 (5.7%) and 6 (3.9%). Log Rank test showed a significant difference in VAP (X^2 = 4.19, p = 0.0407). Cox regression identified a Hazard Ratio of 1.38 for baseline Clinical Pulmonary Infection Score (CPIS) (p = 0.001) and a Hazard Ratio of 0.19 for the VAP prevention bundle (p = 0.006). Kaplan-Meier curves demonstrate both a reduction in overall VAP rates and a reduction in early-onset VAP. Conclusions: An ED-based VAP prevention bundle is associated with lower overall and early VAP rates in patients intubated in the ED.

50 CONTEMPORARY TRENDS OF END-OF-LIFE HOSPITALIZATIONS AMONG HIV-INFECTED PATIENTS ADMITTED TO ICU
Lavi Oud

Learning Objectives: There has been reported improvement in hospital mortality following critical illness among HIV-infected patients. However, there are no longitudinal population-level studies on trends of end-of-life (EOL) hospitalizations among HIV-infected patients admitted to ICU. Methods: We used the Texas Inpatient Public Use Data File to identify hospitalizations with reported HIV infection for the yr 2004–2013, using ICD-9-CM codes 092 and V08. Hospitalizations with ICU admission were identified by presence of unit-specific charges. EOL hospitalizations were defined as hospital mortality or discharge to hospice. We examined the use of ICU among all EOL hospitalizations, and the annual rates of EOL hospitalizations among ICU admissions for the whole cohort (all) and among those aged <45 yr, ≥45 yr, and ≥65 yr Descriptive statistics, regression analyses, and chi-square tests were used. Results: There were 156,866 hospitalizations with HIV infection, with 48,043 (30.6%) ICU admissions during study period. There were 7,999 EOL hospitalizations, of which 5,583 (70%) were admitted to ICU. ICU use among all EOL hospitalizations increased from 61.3% to 71.7% (2.7%/year; p = 0.0006). The volume of hospice discharge increased by 121% and by 2013 accounted for 32% of EOL hospitalizations among those admitted to ICU. The following changes were observed between 2004 and 2013 in the rates of EOL hospitalizations among ICU admissions: all – decrease by 49% (~4.7%/year; p<0.0001); <45 yr – decrease by 57%
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PREDICTING PERFORMANCE STATUS ONE YEAR AFTER CRITICAL ILLNESS AMONG PATIENTS AGED 80 YEARS OR OLDER
Daren Heyland, Henry Stelfox, Allan Garland, Deborah Cook, Peter Dodek, Demetrios Koutsogiannis, Xuran Jiang, Andrew Day

Learning Objectives: The aging of society, increasing use of life-sustaining technologies, and shifting attitudes towards death have created numerous challenges for critical care clinicians, particularly in older populations. To inform clinical decisions and societal discussions about use of advanced life support at the end of life (EOL), we require more data about important patient-centered outcomes. The ABC+Lactate classification system may be a useful adjunct for identifying critically ill cirrhotic patients with very high long-term mortality.

Results: 84 patients were included. The ABC+Lactate classification system may be helpful in decision-making about the utility of life support for very elderly patients admitted to ICU.

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LONG-TERM OUTCOME OF PATIENTS WITH LIVER CIRRHOSIS ADMITTED TO A GENERAL INTENSIVE CARE UNIT
Alex Warren, Charlotte Souldby, Alex Paxty, Campbell Joseph, Martin Shaw, Tara Quasim, John Kinella, Joanne McPake

Learning Objectives: Few studies have reported the long-term prognosis of critically ill cirrhotic patients and no prognostic scoring system has been validated for long-term outcome. This study aims to report the outcome at 12 mo of patients with cirrhosis admitted to a general ICU, identify associations and compare the ability of scoring systems to predict long-term outcome. As little is known about this population, this was a hypothesis-generating study.

Results: This was an 18-month observational cohort study of ICU admissions to the Royal Infirmary meeting diagnostic criteria for cirrhosis followed up at 12 mo - rise by 0.8% (p = 0.1298). Conclusions: Our findings corroborate prior reports on the ongoing improvement of short-term outcomes of HIV-infected adult hospital survivors of critical illness. However, the observed trends were restricted to non-elderly patients. ICU was used increasingly and in the majority of EOL hospitalizations. Discharge to hospice has become a major part of EOL hospitalizations with ICU admission. Further studies are warranted to examine the sources of the observed differential trends.

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SAFETY and EFFECTIVENESS OF WEIGHT-BASED ACTIVATED PCC FOR WARFARIN-INDUCED LIFE-THREATENING BLEEDING
Elizabeth Messmana, Suprat Saely Wilson

Learning Objectives: Previous studies suggest that a fixed dose regimen (500 units for INR <5; 1,000 units for INR >5) of activated prothrombin complex concentrate factor VIII inhibitor bypassing activity (FEIBA) is effective for reversal of a warfarin-induced life-threatening bleeding. Little to no data is available on the use of weight-based dosing of FEIBA for this indication. The objective of our study was to evaluate the effectiveness and safety of weight-based FEIBA (50 units/kg) vs fresh frozen plasma (FFP) alone. Methods: We performed a matched case-control, multi-center retrospective analysis of patients with warfarin-induced life-threatening bleeding from Jan 2009 to Jun 2015. Patients that received FEIBA were matched (1:1) based on age, sex, and bleed location with those that received FFP alone. The primary endpoint was time to International Normalized Ratio (INR) < 1.5 after administration of FEIBA or FFP. Secondary endpoints included rates of thromboembolic events. Results: A total of 58 patients were included (FEIBA n=27; FFP n=27). Demographics were similar with respect to age, sex, history of liver disease, and location of bleed. Median baseline INR was 3.7 (IQR 2.7, 7.30) and 2.8 (2.3, 5.9) in the FEIBA and FFP groups (p=0.13). Vitamin K was given to 81% of FEIBA and 93% of FFP patients (p=0.42). Mean FEIBA dose was 4310 ± 873 units with a weight-based dose of 54 ± 9.7 units/kg and median FFP amount was 3 (2, 5) units with a volume of 790 (506, 1333) ml in the FFP group. Following FEIBA or FFP administration, 89% and 85% of patients had INR ≤ 1.5 (p=1.0). Use of FEIBA resulted in faster time to INR ≤ 1.5 with median of 2.4 (1.2, 4) vs 12 (5.4, 27) hr; [p<0.0001]. Thromboembolic events occurred in 9 (16.7%) of patients (FEIBA n=5; FFP n=4); p=1.0. Mortality was similar in both groups (FEIBA 33% vs FFP 15%; p=0.2). Conclusions: The use of a weight-based FEIBA regimen results in faster times of reversing warfarin-induced coagulopathy compared to the use of FFP alone. In addition, the use of FEIBA did not appear to have an increased risk of thrombotic events compared to FFP alone.

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DAILY VANCOMYCIN DOSE REQUIREMENTS AS A CONTINUOUS INFUSION IN OBESE VS. NON-OBSE SICU PATIENTS
Hsin Lin, Alexander Levine

Learning Objectives: Limited data is available assessing vancomycin concentrations in obese critically ill patients. Currently, there are no studies evaluating dosing requirements in this population who receive vancomycin administered as a continuous infusion (CI). The aim of this study was to assess whether there was a difference in the weight-based maintenance dose required to reach a therapeutic vancomycin concentration at 24 hr when given as continuous infusion in obese versus non-obese critically ill patients.

Methods: A retrospective cohort study of adult obese patients admitted to the SICU between 2013 and 2015 receiving a vancomycin CI with 24 hour serum level were included. Obese patients (Body Mass Index, BMI ≥ 35 kg/m2) were matched with non-obese (BMI < 35 kg/m2) based on renal function, age and APACHE-II score at admission. All patients in this study received a loading dose of 25 mg/kg then a maintenance dose based on renal function according to the protocol. The study was approved by the Institutional Review Board. The primary outcome was weight-based total daily maintenance dose required to achieve vancomycin level of 20 mcg/ml. Secondary endpoint included the achievement of a therapeutic level at
24 hr. Results: Twenty six matched pairs met the inclusion criteria. Of these, 17 pairs had preserved renal function and nine pairs required continuous veno-
ous hemofiltration. The weight-based daily maintenance dose in obese patients was 25.57 mg/kg versus 43.84 mg/kg in non-obese patients (p<0.01). Therapeu-
tic 24 hour levels were achieved in 24/26 versus 23/26 in obese and non-obese, respectfully (p=0.63). Mean 24 hour vancomycin level was 20.33 ± 3.81 mcg/ 
m/l for obese compared to 20.03 ± 3.79 mcg/ml for non-obese (p=0.77). Mean BMI was 40.9 kg/m² in obese versus 24.8 kg/m² in the non-obese. Conclusions: 
The results of our study suggest that critically ill obese patients treated with CI required a significantly lower maintenance dose per body weight than non-obese 
patients to achieve the same target level.

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DETERMINING BEST PRACTICES FOR FAMILY PARTICIPA-
TION IN ICU ROUNDS
Selena Au, Amanda Roze Des Ordons, Andrea Soo, Henry Stelfox

Learning Objectives: Family participation in ICU bedside rounds represents an opportunity to enhance patient and family centered care, but there is insufficient 
literature to guide clinical practice, particularly around family member perspec-
tives. Methods: We surveyed healthcare providers (HCPs) and family members in four medical-surgical ICUs September 2014 to March 2015 to elicit perspec-
tives on current experiences and determine needs, facilitators and barriers to fam-
ily participation in ICU rounds. Surveys were comprised of closed-ended and 
open-ended questions. Results: Surveys were completed by 60 family members and 
258 HCPs (61% and 43% response rate, respectively). HCP respondents included 
physicians (9%), nurses (56%), respiratory therapists (24%) and other 
multidisciplinary ICU team members (11%). While 38% of HCPs estimated that 
less than half of family members would be interested in participating in rounds, 97% of family members expressed high interest (p<0.01). Family mem-
bers and HCPs similarly recognized listening (94%, 96%, p=0.53) and shar-
ing information about the patient (83%, 82%, p=0.88) as family roles. Family 
members were less likely than HCPs to consider decision-making (35%, 59%, 
p=0.01) and asking questions (73%, 86%, p=0.03) as family member roles. Both 
groups considered discussing diagnoses (51%, 58%, p=0.39) and plans (86%, 
99%, p=0.01) as appropriate topics for rounds and perceived goals of care (59%, 
85%, p=0.01), prognosis (66%, 85%, p=0.01) and emotional support (80%, 
87%, p=0.19) as best undertaken in separate family meetings. Compared to fam-
ily members, HCPs perceived increased family stress (7%, 22%, p=0.01) and 
confusion (0%, 28%, p<0.01) as potential consequences of family participation 
in ICU rounds. Conclusions: While family members and HCPs had many simi-
lar perspectives on family participation in ICU rounds, there are notable differ-
ences including HCPs’ increased concern for negative consequences and families’ 
lower self-recognition of a decision-making role. This data can be used to inform 
strategies to effectively engage family participation in ICU rounds.

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MORTALITY, GLYCEMIC CONTROL AND HEMOGLOBIN 
A1C (A1C) IN THE ICU
David Carpenter, Sara Gregg, Kejun Xu, Craig Cooperstith

Learning Objectives: Glycemic control remains a significant contributor to mortality in the ICU. Controversy exists over how to best maintain euglycemia 
in the ICU. The purpose of this study was to examine the interplay between 
mortality and glycemic control as well as stratify mortality by A1C. Methods: A 
retrospective observational study in nine ICUs in two hospitals over 2 ½ yr 
with A1C ordered on all admissions. All patients with an A1C and 3 or more 

glucose measurements were included in the study. A logistic regression model was 
developed to measure glycemic control using mean glucose, glycemic variability, 
glucose results > 180 mg/dl (HI), results <70 mg/dl and results <40 mg/dl (LOW) 
comparatively to mortality and adjusted for SOFA. Using the ADA definition for 
diabetes, the patient population was then divided by A1C ≤6.5 and >6.5. The 
two groups were also compared with chi-square test for binary data and Mann-
Whitney for numerical data. Results: 13,092 patients were analyzed. 10,216 had 
A1C ≤6.5 and 2876 >6.5. For the total population, glycemic control accounted 
for 5.8% of patient mortality after SOFA control. For A1C ≤6.5 it accounted 
for 6.7% and for A1C>6.5 it was 4.8%. For the population, the mortality estimate 
for LOW had a 4.8 times larger impact than HI. For A1C ≤6.5, LOW had a 
mortality impact value of 5.2 times larger than HI. For A1C>6.5, LOW had a 
mortality estimate impact 1.9 times larger than HI. Glycemic variability and 
mean glucose had a negligible contribution to the model. Comparing groups 
A1C≤6.5 had a lesser percentage of LOW and HI vs. A1C>6.5 (1.59% vs 1.74% 
p=0.0007 and 2.49% vs 6.63% p<0.0001, respectively). Conclusions: In our 
study glycemic control accounted for 40% more mortality in the A1C≤6.5 than 
>6.5. Despite a smaller rate of LOW and HI in A1C≤6.5 there was a much larger 
impact in difference in LOW vs HI mortality estimate. This suggests these groups 
should be treated differently when managing glycemic control with particular 
attention paid to extremes in the ≤6.5 group.

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Reducing time to antibiotic administration in 
septic sicu patients: pre and post intervention 
Ohoud Almalki, Alexander Levine, Elizabeth Turner, Kelly Newman, Marc de 
Moya, Jarone Lee, Edward Binner, Hsin Lin

Learning Objectives: Timely administration of antibiotics to septic patients has 
been shown to improve survival. However, specific barriers to timely antibiotic 
administration in the ICU have been minimally described. Our aim was to inves-
tigate barriers to timely antibiotic administration in septic ICU patients. 

Methods: Adult SICU patients who received empiric broad spectrum antibiotics for septic shock were included in this study. This was a pre-post intervention 
study that consisted of three phases: 1) pre-intervention phase, retrospective evaluation of data; 2) intervention implementation, and 3) a 
post-intervention phase. A nurse survey was conducted to identify barriers for 
rapid antibiotic administration. Multidisciplinary interventions included adding 
antibiotics to the automatic dispensing cabinet; monthly staff education, and pro-
viding an antibiotic dosing table to all prescribers and attached to the computer 
workstations. Our multidisciplinary team consisted of the ICU medical directors, 
ICU nurse managers, bedside nurses, a critical care fellow and ICU pharmacists. 

The team frequently engaged groups of residents and nurses to understand the 

prescribing process, and the importance of timely antibiotic administration for 
septic patients. Results: The percentage of antibiotics that were received within 
60 min was 26.3% in the pre-group versus 84.0% in the post-group, p<0.001. 
The mean total prescriber to patient time was 110 ± 68.2 min in the pre-group 
versus 58.4 ± 8.2 min in the post-group, p<0.001. Conclusions: We achieved a 
higher rate of timely antibiotic administration among septic SICU patients by 
implementing process changes based on barriers identified by the nurses. The spe-
cific intervention included educational efforts in combination with dosing tables 
to prescribers and increased antibiotic availability.

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A feasibility trial to detect sepsis in the ed based 
upon blood monocyte volume variability 
Elliott Crouser, Joseph Parrillo, Derek Angus, Christopher Seymour, Kezi Bicking, 
Robert Magari, Liliana Tejidor, Fernando Chaves

Learning Objectives: Early detection of sepsis in the emergency department (ED) leads to rapid interventions and greatly improved clinical outcomes. The 
clinical similarity of sepsis to systemic inflammatory response syndrome (SIRS) 
not caused by infection often leads to delayed sepsis identification and treatment 
in the ED. Based upon preliminary studies, we hypothesized that changes in 
circulating immune cell volume parameters would facilitate early detection of 
sepsis in the ED population. Methods: An IRB approved, blinded, observational, 
prospective cohort study was conducted between August and December 2014 
engrolling 1320 representative patients presenting to two different EDs at The
Ohio State University. The study enrolled adult patients, ages 18 - 90 yr, who had a complete blood count (CBC) performed upon presentation to the ED. All blood samples were analyzed on a Beckman Coulter DxH 800 (version 2.0). **Results:** ED patients were categorized as controls (n=879), SIRS (n=205), infection without SIRS (n=140), or sepsis (including sepsis, severe sepsis, septic shock) (n=98). Compared to other volumetric cell parameters, including mean neutrophil volume (MVN), neutrophil distribution width (MDW) and routine CBC parameters (e.g., WBC or neutrophil %), monocyte distribution width (MDW) was better able to differentiate sepsis from all other conditions (AUC 0.79 (95% CI: 0.74–0.84)); sensitivity 77%, specificity 73%). Furthermore, MDW best distinguished sepsis from SIRS (AUC 0.74 (95% CI: 0.67–0.84)), and performed optimally for distinguishing severe sepsis or septic shock from non-infected ED patients (AUC 0.88 (95% CI: 0.75–0.99); NPV 99%). The negative predictive value of a normal MDW for sepsis was 98%. **Conclusions:** This study demonstrated the feasibility of automated immune cell volume parameters as biomarkers of early sepsis in an ED population. Elevated MDW performed best as a biomarker of sepsis in this study, and requires validation in larger, multi-site study.

Using multivariable regression adjusted for patient and hospital characteristics, we examined relationships between quintiles of annual hospital volume of severe sepsis for the receiving hospital and in-hospital mortality. Secondary outcomes were hospital length of stay and total charges (cost per admission). **Results:** A total of 141,707 patients with severe sepsis, representing 13.2% of all hospitalized severe sepsis cases were transferred. Patients with greater acute organ dysfunction and higher mortality risks were more likely to be transferred (p<0.001). Overall in-hospital mortality was 33.2%. Highest volume hospitals had significantly lower adjusted in-hospital mortality compared to the lowest volume hospitals (odds ratio 0.89%, 95% confidence interval, 0.67–0.99). In stratified analysis, mortality benefit associated with case volume was limited to patients with 1 organ dysfunction. Highest volume hospitals also had significantly shorter length of stay and total costs per admission compared to lowest volume hospitals. **Conclusions:** Transferred patients with severe sepsis had improved adjusted mortality at high sepsis case-volume centers. Similar to previous studies that excluded transferred patients, the benefit is limited to subjects with less acute organ dysfunction.

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**CASE VOLUME AND MORTALITY AMONG PATIENTS WITH SEVERE SEPSIS WHO UNDERWENT INTERHOSPITAL TRANSFER**

Uchenna Oloma, John Duhadh, Daniel Maeng, Allan Walkay

**Learning Objectives:** Multiple studies have shown improved outcomes for patients with severe sepsis treated at higher case volume centers. Implicit in studies of case volume-outcome relationships is the possibility that timely transfer of patients to high volume centers will result in improved patient outcomes. However, prior studies of case volume-outcome associations in severe sepsis have systematically excluded patients transferred from other hospitals. We therefore sought to characterize and explore case volume associations among patients with severe sepsis who have been transferred from another hospital. **Methods:** We performed a population-based study using the Nationwide Inpatient Samples of the Agency for Healthcare Research and Quality and identified adults with severe sepsis who were transferred from another hospital between 2002 and 2012. Transferred patients with severe sepsis who were transferred from another hospital between 2002 and 2012.
was initiated 1 h after LPS injection. Controls were administered an equivalent volume of saline. Survival rates and serum cytokine levels were evaluated. Histological examination of hematoxylin and eosin stained liver tissues along with immunohistochemistry (IHC) were performed. NETosis was identified by IHC based on staining for extracellular DNA, histones, and myeloperoxidase. Results: In mice subjected to LPS-induced septic shock, both lethality and levels of cytokines, such as TNF-α, IL-6, MCP-1, and IL-10, were lower in rTM-treated mice than in control mice. Liver tissue histology revealed that rTM reduced LPS-induced neutrophil infiltration and NETosis. Conclusions: Our findings suggest that rTM may play a key role in NETosis and be effective in treating septic shock in this mouse model by suppressing NETosis in the liver and the systemic dissemination of immunogenic cytokines through the blood, resulting in the amelioration of lethality.

63 VAGAL FIBER STIMULATION AMELIORATES LPS-INDUCED INTESTINAL EPITHELIAL BARRIER BREAKDOWN IN RATS
Ying Zhang, Zhiyou Peng

Learning Objectives: Sepsis is one of the main problems related to the patient mortality in ICUs. Studies demonstrated that protection of the gut barrier is critical during sepsis and vagus nerve stimulation improved intestinal barrier integrity after severe burn. Therefore, we hypothesized that vagus nerve stimulation ameliorates lipopolysaccharide (LPS)-induced intestinal epithelial barrier breakdown. Methods: Male SD rats were divided randomly into control, LPS, vagotomy(VGX), electrical stimulation(STM), and α-bungarotoxin(α-BGT) groups, with eight rats in each group. The samples were collected at 3 h after LPS treatment. Histopathological alterations, the intestinal wall permeability and the ultrastructure of intestinal epithelial tight-junction were observed. The localization and expression of zonula occuldiva(ZO-1) and claudin-2 proteins, the activation of nuclear factor-kappa beta (NF-κB) and myosin light-chain kinase (MLCK) proteins, and the apoptotic index (AI) of enterocytes were detected. Results: LPS challenge significantly increased ileal mucosal permeability. It also induced ultrastructural disruption of tight junctions, redistribution of ZO-1 and claudin-2 proteins, overexpression of NF-κB and MLCK, and enteroocyte apoptosis. Bilateral cervical vagotomy after LPS induction aggravated these responses. Application of constant voltage pulses to the left vagus trunk significantly alleviated all the alterations. Pretreatment with α-BGT blocked the protective action of vagal stimulation. Conclusions: Effective vagal nerve stimulation could protect LPS-induced intestinal barrier dysfunction and the protective effects were associated with the downregulation of the NF-κB and MLCK pathways and the inhibition of enteroocyte apoptosis in an α7 nicotinic receptor-dependent manner.

64 OBESITY ALTERS ADIPOSE TISSUE RESPONSE TO SEPSIS THROUGH WHITE TO BROWN TRANSDIFFERENTIATION
Ilay Ayalon, Shiva Kumar Shamshukhapp, Hui Shen, Lauren Williamson, Basila Zingarelli, Jennifer Kaplan

Learning Objectives: Animal studies suggest that obesity predisposes to worse outcomes following sepsis. White to brown transdifferentiation is a process in which the white adipose tissue (WAT) acquires properties characteristic of brown adipose tissue (BAT) in response to adrenergic stimuli. The uncoupling protein 1 (UCP1) is a mitochondrial protein exclusively found in BAT and is a marker for transdifferentiation. We hypothesized that sepsis induces browning of WAT and that this deviation from this pathway occurs in obesity. Methods: Six-week-old C57BL/6 mice (n=24) were randomized to a high fat diet (HFD) (60% kcal fat) or control diet(CD)(16% kcal fat). After 6 weeks of feeding, polymicrobial sepsis was induced by cecal ligation and puncture (CLP). Mice were sacrificed at 0, 18 h after CLP. Epidydimal WAT were processed for Electron Microscopy (EM) analysis. All EM slides were screened for changes in the tissue architecture characteristic of transdifferentiation. Mitochondrial number was counted and adjusted for total measured surface area. UCP1 protein expression was measured by Western blot. p<0.05 was considered significant. Results: During sepsis, 2/3 of CD mice showed major changes in the WAT architecture, characteristic of transdifferentiation, compared to none in the HFD mice(p<0.03). These changes included a breakdown of the unilocular lipid droplet, an increase in mitochondrial number (0.83±0.58 mtr per micrometer square vs. 0.07±0.07, p=0.002) and an increase in the cytoplasm content. No significant changes were seen in the HFD mice during sepsis. Mitochondrial number was significantly higher in the CD septic than in the HFD septic mice (0.83±0.58 mtr per micrometer square vs. 0.07±0.07, p=0.006). UCP1 protein expression was significantly higher in the CD septic compared to the HFD septic mice(1.0±0.6 vs. 0.2±0.1 relative units, p=0.004). UCP1 protein expression increased in the CD mice after sepsis compared to prior to sepsis but did not reach significance (p=0.14). Conclusions: Sepsis induces transdifferentiation of WAT in mice. This process does not occur in obese mice and may partially explain their worse outcomes.

Research Snapshot Presentations: Administration can be found after the Case Reports (Publishing Numbers 1292-1318).

65 USE OF TEG TO DIRECT HEPARIN MANAGEMENT IN NEO-NATAL AND PEDIATRIC ECMO PATIENTS
Natalie Henderson, John Berkenbosch, Janice Sullivan, Aaron Calhoun, Terri Wells, John Myers, Olivia Mitrel, Deanna Todd-Tianetos

Learning Objectives: Thromboelastography (TEG) is increasingly used to monitor unfractionated heparin (UFH) dosing in extracorporeal membranous oxygenation (ECMO). Few studies have evaluated this practice. Heparinase TEG (TEGH) can be used to evaluate the underlying coagulation irrespective of heparin dosing. Citrated kaolin TEG (TEGCK), specifically the reaction time (RCK), can be used clinically to direct heparin dosing. Higher values of RCK correlated with a lower probability of having a significant thrombotic or bleeding event. Results: RCK had a statistically significant correlation with Anti-Xa (r=0.571 p<0.01), ACT (r=0.338 p=0.011), and aPTT (r=0.302 p=0.019). Also, ACT had a strong correlation with aPTT (r=0.532 p<0.01). An RCK value of >17 strongly correlated with a therapeutic Anti-Xa level (r=0.76 p<0.01). RCK is an independent predictor for a thrombotic event (OR=0.78 95% CI 0.65–0.97 p=0.001). There were no independent predictors for bleeding events. Conclusions: RCK may be used clinically to direct heparin dosing. Higher values of RCK correlated with a lower probability of having a thrombotic event. Larger studies are warranted to investigate if TEG can be useful in predicting bleeding in pediatric ECMO patients and to evaluate clinical targets for RCK.

66 FLUID RESUSCITATION AND LOSSES ARE ASSOCIATED WITH PEDIATRIC CARDIAC SURGICAL SITE INFECTIONS
Anthony Sochet, Michael Spadero, Xiaoyan Song, Darren Klugman, Anna Brown

Learning Objectives: Surgical site infections (SSIs) account for 31% of all in-hospital healthcare acquired infections including 0.25–6% of pediatric cardiorrhachic surgery (CTS) cases. We hypothesize that patients with large post-operative fluid resuscitation or losses are at increased SSI risk. Methods: We performed a retrospective, nested case-control study of children aged 0 to 18 yr.
who underwent CTS at Children's National Health System from January 2010 to December 2013. Via CardioAccess®, deep SSI cases meeting the CDC's definition were identified. Controls without SSI were matched 2:1 by age, gender, Risk Adjustment for Congenital Heart Surgery score (RACHS-1) and Society of Thoracic Surgeons risk category (STS-EACTS). Primary variables were 6, 24 and 48 hour post-operative fluid resuscitation and thoracostomy output. Conditional logistic regression, Wilcoxon matched pairs sign rank test and McNemar's exact test were used in statistical analysis. Results: 2,021 children underwent CTS during the study period. Twelve deep SSI cases were matched to 24 controls and did not differ in age, gender, weight, RACHS-1, STS-EACTS category, bypass time or antibiotic prophylaxis. Deep SSIs received more fluid resuscitation at six (22.5 vs. 17.5 ml/kg), 24 (27.7 vs. 18ml/kg) and 48 (35.2 vs. 18ml/kg) hr (all p<0.01). Deep SSIs had larger thoracostomy output at six (20.8 vs. 16.5ml/kg), 24 (44.8 vs. 33.6ml/kg) and 48 (77.5 vs. 43.1 ml/kg) hr (all p<0.01). Conditional logistic regression of 48 hour post-operative fluid resuscitation on deep SSIs yielded odds of 1.013 (p=0.04, CI: 1.01–1.03). Conditional logistic regression of six hour thoracostomy output on deep SSIs yielded odds of 1.266 (p=0.04, CI: 1.01–1.26). Conclusions: Analysis of our results suggests that volume of fluid resuscitation and thoracostomy output are risk factors for deep SSI following CTS. Future research will analyze pharmacokinetics to determine if redosing of prophylactic antibiotics may reduce SSI risk by maintaining therapeutic drug concentrations.

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**POINT OF CARE ULTRASOUND IN THE MANAGEMENT OF HEART FAILURE**

Rachel Spevack, Mohamed Shuleieri, Dev Jayaraman, Gerrald Dankoff, Lawrence Rudski, Jed Lipes

**Learning Objectives:** Inpatient management of acute heart failure is dependent on clinical assessments of volume status, which is subjective with poor inter-rater reliability. Vascular and lung point-of-care ultrasound is useful in the diagnosis of heart failure, and may be useful the management of acute heart failure. The objective of this study is to determine if findings in clinical exam over time correlates with the inferior vena cava (IVC) size and lung ultrasound (LUS) in patients with acute heart failure. **Methods:** Patients admitted with a clinical diagnosis of left sided congestive heart failure were recruited in a prospective observational study. Investigators performed serial clinical and ultrasound assessments within 24 hr of admission (T1), day 1 in hospital (T2) and within 24 hr of discharge (T3). Clinical assessments included the jugular venous pressure (JVP), hepatojugular reflux (HJR), crackles (score 1 [none] to 3 [50% lung]), and a clinical congestion score (CCS) based on orthopnea, JVP, pedal edema and an S3. IVC size and collapsibility index was measured, and a 4-point LUS was performed bilaterally and the maximum number of B lines calculated. Spearman correlations were assessed between JVP and HJR versus IVC indices and the number was compared with B-lines. The CCS was also compared with B-Lines and IVC indices. Results: 39 patients were recruited with an average age of 76.5 yr (SD 13.9), and 54% were male. The average Killip score was 2.4 (SD 0.94). The ultrasound indices were analyzed for 17 of the 39 recruited patients. At T1, 28.2% of patients had an elevated JVP and 55.8% had a positive HJR. The mean crackle score was 1.2 (SD 0.95) and median CCS was 5 (IQR: 3–6). The average IVC size on expiration was 13.5 mm (35.1). The average number of B lines was 4.0 (SD 5.9). There were no significant correlation between elevated JVP/HJR and IVC indices, or between the crackle scale and LUS, or between CCS and B-lines at T1, T2 or T3. Conclusions: Given the poor correlation between clinical exam and ultrasound, a randomized trial between clinical exam and an ultrasound-based approach may be warranted.

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**ALKALINE PHOSPHATASE ACTIVITY PREDICTS ORGAN INJURY AND DYSFUNCTION AFTER INFANT CARDIAC SURGERY**

Jesse Davidson, Tracy Urban, Subong Tong, Christine Baird, Ludmila Khailova, James Jaggers, Paul Wischmeyer

**Learning Objectives:** Alkaline Phosphatase (AP) may be protective against ischemia-reperfusion injury through dephosphorylation of extracellular adenine nucleotides and endotoxin. Low AP activity is common after infant cardiac surgery and may lead to decreased clearance of these molecules and increased tissue injury. This study sought to assess the association between AP activity and organ injury/dysfunction after infant cardiac surgery. **Methods:** We performed a prospective cohort study of 94 infants ≤120 days of age undergoing surgery with cardio-pulmonary bypass (CPB) at Children's Hospital Colorado between 9/2013 and 5/2015. Serum samples were obtained prior to surgery, during rewarming from CPB (post-op), and at 6/24hr post-ICU admission. AP activity was measured using a clinically available assay. Primary outcomes were markers of cardiac dysfunction (NT-pro-BNP), intestinal and kidney injury (iFABP and NGAL), and peak lactate and creatinine. Multivariable analysis assessed the independent association of early AP activity (post-op and 6hr) with the outcome measures while controlling for key confounders. **Results:** Early AP activity was independently associated with NT-pro-BNP with post-op AP best predicting 6hr NT-pro-BNP (11% increase per 10U/L decrease in AP; p<0.005) and 6hr AP best predicting 24hr NT-pro-BNP (12% increase per 10U/L decrease in AP; p<0.005). Early AP strongly predicted peak lactate (p<0.001). AP activity at 6hr was independently associated with iFABP and 6hr (p<0.05), but with modest model performance (R2=0.14). Post-op but not 6hr AP was independently associated with 6 and 24hr NGAL (p<0.05). Both post-op and 6hr AP activity were associated with peak creatinine, with the 6hr activity strongly predicting subsequent increased creatinine (12% increase per 10U/L decrease in AP; p<0.0001, R2=0.75). **Conclusions:** Decreased AP activity early after infant cardiac surgery strongly predicts later cardiac and renal dysfunction and poor tissue perfusion. Early AP activity is also associated with intestinal and kidney injury but accounted for only a modest portion of the variation in these biomarkers.

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**SURGICAL NOT ECMO VOLUME IS ASSOCIATED WITH IMPROVED SURVIVAL AMONG PEDIATRIC CARDIAC ECMO CENTERS**

Cindy Barret, Titus Chan, Jacob Wilkes, Susan Bratton, Ravi Thiagarajan

**Learning Objectives:** Surgical volume and ECMO center volume have been associated with improved survival following pediatric cardiac surgery and ECMO. We sought to examine the relationship between cardiac surgical volume, cardiac ECMO volume and survival among centers providing cardiac ECMO. We hypothesized that surgical, rather than ECMO, volume would be associated with improved survival for cardiac ECMO. **Methods:** Patients in the Pediatric Health Information System database who underwent cardiac surgery or heart transplant from 2003–2014 and ECMO support were included. Multivariate logistic regression models adjusting for demographic and ECMO variables associated with mortality and controlling for center clustering were used to explore the association between cardiac surgical and ECMO volume with survival. Likelihood ratios tests were used to determine model fit. **Results:** Of 111,177 patients in 43 centers (n=109,058 Risk Adjustment for Congenital Heart Surgery-1 (RACHS-1) 1–6 & n=2519 cardiac transplantation) identified, 2.8% (n=3115) underwent ECMO support. ECMO volume quartiles: <2 runs per year (n=62), 2–6 (n=700), 7–8 (n=754), >8 runs per year (n=2003) or greater ECMO runs per year (Odds Ratio [OR]=0.46, [95% Confidence Interval CI) 0.23–0.92]. Surgical volume quartiles: <158 surgeries per year (n=133), 159–226 (n=715), 227–305 (n=1040), >305 runs per year (n=1227). Survival increased in surgical volume centers who performed >158 surgeries (OR=0.46 CI 0.27–0.79). Both surgical and ECMO volumes appeared to have a threshold rather than linear relationship with odds of mortality. In a model adjusted for factors associated with mortality (including surgical volume), the addition of ECMO volume quartile did not improve model performance. **Conclusions:** Surgical volume and not ECMO volume is strongly associated with cardiac ECMO survival. Larger volume surgical programs may have better developed care processes for managing cardiac surgical ECMO resulting in improved survival.

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**THE ASSOCIATION OF STRAIN ECHOCARDIOGRAPHY AND SUCCESSFUL DECANNULATION IN PEDIATRIC ECMO PATIENTS**

Rene Willert, Reid Thompson, Bereketeab Haileselassie, Theodore Abraham, Erik Su

**Learning Objectives:** Survival to ECMO decannulation has been associated with 50% success at best in some PICU populations, and predictors of

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outcome during ECMO would be instrumental in managing these critically ill patients. Conventional quantitative echocardiographic measures performed during ECMO have not been predictive of successful decannulation. Strain echocardiography (SE) is capable of capturing subtle perturbations in function. To date, series describing use of SE in assessing ECMO patients and their potential outcomes in a general PICU population are nonexistent. Methods: Pediatric ECMO patients admitted to a tertiary medical/surgical PICU from 2014–2015 who received echocardiographic imaging (ECHO) were retrospectively analyzed. Initial and final ECHOs during the ECMO course were post-processed using SE analysis software. Strain and strain rate parameters were compared using t-test for patients successfully decannulated versus those who did not, and between patients receiving eCPR and nonemergent cannulation. Results: 24 patients with at least one ECHO while on ECMO were identified, with 17 surviving to decannulation. Half of the patients received eCPR. Diastolic circumferential strain (CSR) on initial ECHO was significantly greater in patients who were successfully decannulated from ECMO (p=0.033) compared to those who were not. Patients who received eCPR demonstrated significantly lower magnitude diastolic and systolic circumferential strain (CS) than patients cannulated nonemergently (p=0.046 and p=0.038, respectively). Systolic CSR magnitude was significantly less in those who underwent eCPR on initial ECHO (p=0.01). Lactate proximate to the time of ECHO was significantly correlated with both systolic CS and CSR (p=0.033 and p=0.043 respectively). Conclusions: Decreased CS parameters may indicate compromised cardiac function seen in shock and following eCPR in pediatric patients on ECMO. Higher magnitude diastolic CSR may also portend successful decannulation from ECMO. Further investigation could be instrumental in determining the utility of SE as an outcome assessment instrument in the PICU.

71 CARDIAC HEMODYNAMIC CHANGES DURING WEANING FROM MECHANICAL VENTILATION USING NICOM: PILOT STUDY
Antonio Saad, Mahlbubur Rahman, Nicole Ribeiro Marques, Joe Funston, Luis Pacheco, William Whitehead, George Kramer, Aristides Koutrouvelis

Learning Objectives: Failure of planned extubation occurs in about 20% of patients and is associated with increased risk of mortality. Cardiac dysfunction has been suggested as one of the leading causes of weaning failure. We believe that assessing the changes in cardiac hemodynamics during weaning trials from mechanical ventilation is an important adjunct for predicting weaning success. Our objective was to describe changes that occur during weaning from mechanical ventilation in cardiac hemodynamics using a non-invasive cardiac output monitor (NICOM). Methods: Intubated patients admitted to the ICU were included in this prospective cohort study. Linear regression, was used for comparison between the bioreactance NICOM and the thermodilution catheter. Using NICOM, hemodynamic measurements for cardiac output (CO), cardiac index (CI), stroke volume (SV), cardiac power (CP), systemic vascular resistance (SVR) and thoracic fluid content (TFC) were obtained before start of, during spontaneous breathing trial (SBT); Pressure support of 5cmH2O and after extubation. All models were adjusted by age, gender and BMI. Mixed effect regression models were used for statistical analysis. P < 0.05 was considered statistical significant. Results: No patients failed SBT or extubation. CO from the bioreactance device correlated well with CO values from the thermodilution catheter (CO PAC) (coefficient 0.7 p<0.05). No differences were noted in CO, CI, SV, SVI CP or SVR among all three periods. SV (-5.8 [95% CI -10.5 to -1.5, p=0.008] and SVI (-2.7 [95% CI -4.7 to -0.6, p=0.001]) were lower during SBT trial while TFC was higher during time period after extubation [1.1 [95% CI 0.23 to 2.9, p=0.015] compared to time period before SBT Trial. Conclusions: Patients with good cardiac reserve undergoing SBT have decreased SV followed by recovery to baseline in the extubation period. In addition, when positive pressure environment transitions to negative intrapleural pressures, TFC is increased without changes in CO or CP. We suggest that changes in TFC and SV recovery during and after SBT are potential predictors for weaning success during SBT.

72 MULTI-INSTITUTIONAL ANALYSIS OF EXUTURATION FAILURE AFTER NEONATAL CARDIAC SURGERY
Christopher Mastropietro, Brian Benneyworth, Eric Graham, Wenying Zhang, Darren Klughman, John Costello, Michael Gaies

Learning Objectives: Extubation failure occurs commonly in neonates with critical cardiac disease. In a multi-center cohort of neonates recovering from cardiac surgery in cardiac intensive care units (CICU), we describe the epidemiology of extubation failure, identify risk factors for its occurrence, and determine its impact on outcomes. Methods: We analyzed prospectively collected clinical registry data on all neonates undergoing cardiac surgery in the Pediatric Cardiac Critical Care Consortium (PC4) database from 10/2013–7/2015. Extubation failure was defined as re-intubation <72 hr after the first planned extubation. Risk factors for extubation failure were identified using multivariable logistic regression with generalized estimating equations to account for within center correlation. Results: The analytic cohort included 899 neonates from 14 PC4 centers: 14% premature, 21% with genetic abnormality, 18% with major extracardiac anomaly, and 75% surgery with cardiopulmonary bypass. Overall, 103 (11%) neonates had extubation failure: 61% failed within 24 hr, 23% between 24–48 hr, and 16% between 48–72 hr. Unadjusted rates of extubation failure ranged from 5.22% across hospitals. Univariate analysis suggested male gender, congenital airway abnormality, nitric oxide, and ECMO prior to extubation were associated with extubation failure (included in the multivariable model with p<0.1). After multivariable analysis only airway abnormality was independently associated with extubation failure (OR 3.1, p=0.01). Patients with extubation failure had greater postoperative CICU length of stay (median 16 vs. 8 days, p=0.001) and in-hospital mortality (8% vs. 2%, p=0.002). Conclusions: This multi-center study showed that neonates recovering from cardiac surgery fail initial postoperative extubation in 11% of cases, with associated longer CICU stay and higher mortality. Congenital airway anomaly was the only variable independently associated with extubation failure. We observed variation in extubation failure rates across hospitals, suggesting that collaborative quality improvement could reduce extubation failure.

73 NOVEL ASSESSMENT OF THE RIGHT VENTRICULAR FUNCTION WITH A MODIFIED SUBCOSTAL ECHOCARDIOGRAPHIC VIEW
Andres Borja Alvarez, Jonathan Danaraj, Katherine Duello, Jose Yataco, Michelle Freeman, Brian Shapiro, Jose Diaz-Gomez

Learning Objectives: The echocardiographic assessment of right ventricular function (RVF) in the Intensive Care Unit (ICU) has gained interest. The tricuspid annulus plane systolic excursion (TAPSE) is a validated measure of RVF; however, the apical echocardiographic window varies, limiting its utility. We propose an alternative, the subcostal echocardiographic assessment of tricuspid annulus kick (SEATAK). Methods: To measure the SEATAK, the following maneuvers are used: from the subcostal 4-chamber view, rotate the transducer 90 degrees counterclockwise to obtain the inferior vena cava view; then sweeping slightly to the left provides the visualization of the right chambers and tricuspid annulus. M-mode is used to measure its excursion (kick). The investigation was approved by the Institutional Review Board for evaluation of patients with right ventricular dysfunction (RVD). A Sparq Ultrasound System (Phillips Healthcare) use utilized to obtain images. Analysis was performed with JMP for Bland-Altman and Spearman correlation. Results: We evaluated 45 patients, 26 (57.8%) of whom were women and a mean age 60.8. Two groups with similar characteristics: one with diagnosis that leads to RVD (20) and a control group with no RVD; however, the apical echocardiographic window varies, limiting its utility. We propose an alternative, the subcostal echocardiographic assessment of tricuspid annulus kick (SEATAK). Methods: To measure the SEATAK, the following maneuvers are used: from the subcostal 4-chamber view, rotate the transducer 90 degrees counterclockwise to obtain the inferior vena cava view; then sweeping slightly to the left provides the visualization of the right chambers and tricuspid annulus. M-mode is used to measure its excursion (kick). The investigation was approved by the Institutional Review Board for evaluation of patients with right ventricular dysfunction (RVD). A Sparq Ultrasound System (Phillips Healthcare) use utilized to obtain images. Analysis was performed with JMP for Bland-Altman and Spearman correlation. Results: We evaluated 45 patients, 26 (57.8%) of whom were women and a mean age 60.8. Two groups with similar characteristics: one with diagnosis that leads to RVD (20) and a control group with no RVD (25). We were unable to obtain TAPSE in 16% of the patients. The mean for SEATAK was 1.62 and 1.93 for TAPSE, with a mean difference of 0.13. Correlation factor (r) was 0.86:1 with a Spearman p of 0.83. There was strong correlation, by Wilcoxon test, between TAPSE and SEATAK and the degree of RVD: severe decrease (1.35/0.83), a mild/moderate decrease in function (1.76/1.33), normal function (2.05/1.96) and hyperdynamic function (2.38/1.96). There were significant differences between the SEATAK values by RVF (hyperdynamic, normal, mild/moderate, severe) with Wilcoxon test for non-parametric variables (p<0.001).

Conclusions: This study suggests that SEATAK can be an alternative to TAPSE
and may be easier to obtain in the ICU setting, especially in patients with RVD. Further research is needed to validate SEATAK and evaluate sensitivity, specificity and cut-off values for RBF prognostication.

74 DEAD SPACE PREDICTS LENGTH OF MECHANICAL VENTILATION IN INFANTS WITH INTRACARDIAC SHUNT POST SURGERY

G Nicole Sinclair, Rami Bzieh, Evan Wu, Sabrina Heidemann

Learning Objectives: Children who require surgery for repair of cardiac lesions require prolonged mechanical ventilation primarily because of low cardiac output rather than lung disease. It is important to identify these children early since they are at risk of developing complications of mechanical ventilation including ventilator associate pneumonia. The objective of this study is to determine if dead space fraction measured within 4 hr of admission to the pediatric ICU would predict the need for prolonged mechanical ventilation in children after palliative correction of intracardiac defects which result in shunting. Methods: Children aged 0–18 yr, who had congenital heart surgery associated with intracardiac shunting were prospectively studied. Approximate dead space fraction was measured by arterial blood gases and real time measurement of end tidal CO2 (PECO2) using the equation (PaCO2-PECO2/PaCO2). Intracardiac shunting was determined by transesophageal ECHO and knowledge of the repair. Length of intubation and hospital days were recorded. Results: 36 children whose median age was 6 mo (0.2–70.5) mo were studied. Dead space fraction was increased in those children who required intubation for >4 days compared to ≤ 4 days (0.34±0.08 vs. 0.19±0.09 p=0.001). Likewise, those intubated >2 days had higher dead space fraction when compared to ≤ 2 days (0.30±0.09 vs. 0.19±0.09 p=0.007). The diagnoses included Fontan completion (n=14), hemi-Fontan (n=6), HLHS (n=5), DORV (n=5), and other (n=6). Dead space fraction correlated with length of intubation (r=0.51, p=0.007) and with length of hospitalization (r=0.42, p=0.015). Conclusions: Children with intracardiac shunting after surgery for congenital heart disease who require prolonged mechanical ventilation have higher dead space fractions compared to those who were extubated earlier. Children with elevated dead space fraction immediately following surgery tend to be intubated longer and have greater length of hospitalization.

75 QUETIAPINE-ASSOCIATED QTc PROLONGATION IN CARDIAC SURGERY PATIENTS WITH ICU DELIRIUM

Amanda Kroll, William Calooso

Learning Objectives: The Society of Critical Care Medicine (SCCM) Clinical Practice Guidelines for the Management of Pain, Agitation, and Delirium in Adults Patients in the Intensive Care Unit indicate that atypical antipsychotics may be used to reduce the duration of ICU delirium. The SCCM discourages the use of antipsychotics for ICU delirium in patients at a significant risk for torsade de pointes, a known potentially fatal side effect of atypical antipsychotics. The purpose of this study is to further elucidate the QTc prolongation induced by quetiapine in cardiac surgery patients being treated for ICU delirium. Methods: This was a retrospective review of patients at least 18 yr of age who underwent cardiac surgery and received at least 2 doses of quetiapine for ICU delirium from July 1, 2012 through July 1, 2014. The primary outcome was mean QTc prolongation while on quetiapine. Results: 61 patients met inclusion criteria. The mean age was 60.8 yr (range 21–83 yr) and 65% of patients were male. Baseline arrhythmias were present in 44.3% of patients. Of patients included, 41 (67.2%) patients experienced QTc prolongation, defined as any QTc longer than baseline. Mean QTc prolongation was 22.1 ± 48.7 msec. Of patients who had QTc prolongation, 16.4% had QTc prolongation ≥ 60 msec. The only factor associated with QTc prolongation was CVP:13 mmHg (95%CI:0.95–1.00) was the best predictor of a FWLS≥-21%. Conclusions: Studies have shown an increased risk of torsade de pointes when there is an increase in QTc > 60 msec from baseline. Further research is needed to elucidate the safety of quetiapine in the cardiac surgery population.

76 IMPACT OF HEART SCORING ON IMPROVEMENT OF EMERGENCY DEPARTMENT PERFORMANCE IN NSTEMI DETECTION

Dave Milzman, Eric keichel, Stephanie Poole, Christian Timpol, Matt Wilson, Jeff Dubin, Rahul Bhat, Sam Frenkel

Learning Objectives: Decision-making in ED chest pain patients requires risk stratification for potential major adverse cardiovascular events (MACE), including ACS. Objective determination of this using multivariable models the History, ECG, Age, Risk factors, and Troponin (HEART) have better clinical outcomes than approaches based strictly on clinical gestalt. These decision-support tools were derived from undifferentiated ED patients with suspected ACS, but there is insufficient evidence to suggest that any one tool is clearly superior to another. Methods: A retrospective review of 343 consecutive ED cases of chest pain admitted at urban teaching hospital, with 90,000 ED pts annually. Exclusion criteria included patients with a STEMI or another admission diagnosis beside chest pain. Attending physician experience and NSTEMI diagnosis were evaluated to determine if Experience is improved by HEART score use. Outcomes determined using final discharge diagnosis by cardiology team as recorded in the patients medical record and NSTEMIs were categorized as a peak cTnI elevation >1.0 mg/ml. Results: A cohort of 343 patients seen over 3 mo by ED attending with complaint of acute Chest pain in 2014. Pts had mean age of 58 with 52% female. Historically this ED determines that 2.5% of all Non-STEMI admitted chest pain patients are ruled in for N-STEMI. The addition of HEART score improved the performance of actually diagnosed NSTEMI to nearly 5%, a 100% improvement. The impact of experience on performance accuracy of ED attending found that > 20 yr experience had improved admission rate accuracy then Docs with 10 yr, and less than 5 year experience, respectively. No amount of experience out-performed HEART score diagnostic accuracy for N-STEMI on admit; p < 0.01. Conclusions: Objective decision Modeling (HEART) outperformed Emergency Attending Experience and usual practice in decision accuracy for N-STEMI in chest pain patients with 200% improvement. Future studies need to address ability of rapid decision scoring to improve patient outcomes, including intervention and survival.

77 OPTIMAL RIGHT HEART FILLING PRESSURE IN ARDS DETERMINED BY STRAIN ECHOCARDIOGRAPHY

Romel Garcia-Montilla, Faryal Imam, Mi Miao, Kathryn Stinson, Akram Khan, Stephen Heitner

Learning Objectives: Right ventricular (RV) systolic dysfunction (RVSD) in ARDS is a frequently observed condition associated with increased mortality. Preload optimization is crucial in its prevention and management, but the unreliability of dynamic fluid responsiveness indices and the lack of an accepted central venous pressure (CVP) reference in this clinical context, leaves the clinicians without a clear hemodynamic goal to achieve. We analyzed the utility of RV free wall longitudinal strain (FWLS), setting a FWLS range of -18% to -24%. FWLS:-24% corresponded to CVP:13 mmHg (95%CI:0.95–1.00) was the best predictor of a FWLS≥-21% (lower reference value). In regression models, CVP (95%CI) was plotted against FWLS, setting a FWLS range of -18% to -24%. FWLS:24% corresponded to
a CVP:11 mmHg and FWLS:-18% to a CVP:15 mmHg, and to the maximum RSV. Beyond these limits RSVV, TAPSE, Sr, RVEF, FWLS, LVEF rapidly declined and Cr, Lct, increased. Conclusions: Our study suggests that a CVP range of 11–15 mmHg should be considered the optimal level of RV filling pressure in moderate-severe ARDS. The adoption of these values may provide the clinicians with objective metrics for the management of these patients.

PEDIATRIC EXPERIENCE WITH NOVEL PERCUTANEOUS LEFT VENTRICULAR SUPPORT DEVICE IN CARDIOGENIC SHOCK.
Sebastian Tume, Paul Checchia, Dhaval Parekh, Aamir Jeewa, William Dreyer, Athar Qureshi, Iki Adachi, Henri Justino

Learning Objectives: Cardiogenic shock is a common diagnosis with high mortality and morbidity rate in children. Aggressive therapy with inotropes and intubation may be insufficient requiring use of mechanical support. Impella (Abiomed, Danvers, MA) catheters are novel percutaneous ventricular support devices that can be used to support children in cardiogenic shock. Experience with percutaneous mechanical support using Impella catheters in children is limited. We present our experience with Impella device in a pediatric cardiac critical care unit at a freestanding children’s hospital. Methods: Data was collected retrospectively on all patients treated with Impella device at a single tertiary center pediatric cardiac critical care unit between September 2014 and June 2015. Demographic, hemodynamic and laboratory data were reviewed and reported using descriptive statistics. Pre and post-intervention data were compared using Student’s t-test with significance level at p<0.05. Results: Total of 7 patients (2 female) were supported with 8 Impella devices: 2.5 (n=1), CP (n=4), and 5.0 (n=3). Median age was 17 yr (6.5-25), weight of 64 kg (22.87), and BSA of 1.71 m2 (0.91,2.09). Average length of support was 11±5 days (median 10 (5,21)). Impella was used in two patients (29%) for left ventricle decompression on VA-ECMO. Two patients (29%) required ECMO support within 24 hr of initiating Impella support. There was a significant improvement in creatinine levels at 5 days (p=0.005) and lactate at 24 hr (p=0.02). Median LDH level was 2133 U/L (80,80) after 5 days of support. Persistent insertion site bleeding occurred with 6 devices (75%). All patients survived at 30 days post device removal. Conclusions: Impella support for cardiogenic shock showed a safe profile with limited morbidity and no early mortality in pediatric cardiac critical care setting. This percutaneous ventricular assist device can be considered as part of the mechanical support armamentarium used in management of cardiogenic shock to achieve end organ recovery.

STANDARD VERSUS LOW DOSE ALTEPLASE INFUSION FOR TREATMENT OF ACUTE PULMONARY EMBOLISM
Lukas Martin, Jessica Winter, Kristen Carter, Madeline Foertsch, Sheila Takieddine, Nicole Harger

Learning Objectives: Thrombolytic therapy and anticoagulation is recommended for treatment of massive pulmonary embolism (PE) and submassive PE with right ventricular (RV) dysfunction. Newer data suggest lower doses of alteplase may be used instead of the traditional 100 mg dose to decrease risk of major bleeding while maintaining clinical efficacy. Methods: This multicenter, retrospective cohort study included 78 adult patients with confirmed PE who received treatment with alteplase through either systemic or catheter-directed administration between 2005 and 2015. The primary outcome of the study was major bleeding rates between <100 mg and 100 mg doses of alteplase. Secondary outcomes included rates of symptomatic resolution, morbidity, and mortality. A multivariate analysis was conducted to evaluate the association between pre-specified risk factors for bleeding and major bleeding. Results: One hundred and fifteen patients received alteplase for suspected PE, of which 78 patients were included for confirmed PE. Major bleeding occurred less in patients receiving <100 mg alteplase compared to 100 mg (25.0% vs 46.6%, p = 0.154). There were no significant differences in symptomatic resolution (50.0% vs 55.0%, p = 0.899) or morbidity endpoints including escalation of treatment (40.0% vs 25.9%, p =0.362) and persistent RV dysfunction at 60 days (16.7% vs 12.5%, p =1.000). Mortality rates by discharge where similar (15.5% vs 15.0%, p = 1.000).

There were no individual baseline risk factors significantly associated with major bleeding. Patients admitted after protocol implementation had higher rates of appropriate alteplase dose based on the institution-specific protocol. There were no differences in rates of recommended heparin initiation, starting dose, and reinitiation after alteplase therapy. Conclusions: Alteplase doses of ≤100 mg were associated with less incidence of major bleeding than traditional 100 mg doses, while maintaining similar rates of symptomatic resolution and mortality. These findings support a potential benefit in using reduced alteplase dosing in selected patients with PE.

A SURVEY ON THE CURRENT STATE OF ENDOTRACHEAL INTUBATIONS IN THE ICU AMONG THE CRITICALLY ILL
Venkatesh Gondhi, Mohamed Seia, David Barbara, Benjamin Sandefur, Daniel Diedrich, Rahul Kashyap, Nathan Smischney

Learning Objectives: Characterization of current ICU intubation practice is largely unknown and intubation carried out in ICU as compared to other settings can be associated with increased complications. We aim to study current intubation practice on both airway and hemodynamic management in adult critically ill patients. Methods: A nationwide representative group of clinicians performed a standardized 23-item survey among 25 participating sites. The survey was developed with the help of the survey research center at Mayo Clinic and functionality was tested on a select group of clinicians. All data are obtained by the intubating clinical provider at the participating sites. Respondents were asked about airway and hemodynamic management of intubations. Results: Thirteen sites responded: MN, WI, NE, OH, OK, AZ, FL, NC, PA (2), RI, MA and WA. The most common reason for intubation is acute respiratory failure (76%). Regarding airway management, 84% did not use an intubation checklist but 100% of respondents stated they pre-oxygenate prior to intubation. For airway device used, 69% primarily use laryngoscopy. When a difficult airway is encountered and the primary device has failed, 40% use video laryngoscopy followed by fiber-optic bronchoscopy (20%). Only 58% routinely practice coagulopathy. Regarding hemodynamic management, etomidate is used the most (100%) followed by propofol (90%) with fentanyl (88%) and midazolam (88%) as the most common adjuncts. However, most respondents desired to use ketamine (90%) followed by propofol (90%) with a similar proportion of respondents using the above adjuncts. Ninety percent of respondents listed hypotension as the most immediate complication with 55% using vasoactive agents. Conclusions: This survey illustrates video laryngoscopy is primarily chosen as the initial and back-up device for routine and difficult airway management. Although most centers use etomidate and propofol for induction, most providers would prefer to use ketamine and propofol. Finally, hypotension is the most common immediate complication.

NEW MARKERS FOR THE PREVENTION OF THROMBUS FORMATION AND SIGNIFICANT BLEEDING FOR ECMO PATIENTS
Natalie Henderson, John Berkenbosch, Janice Sullivan, Aaron Calhoun, John Myers, Terri Wells, Olivia Mittel, Deanna Todd-Tzanetos

Learning Objectives: Traditionally, activated clotting time (ACT) and activated partial thromboplastin time (APTT) have been utilized to direct heparin dosing and to monitor the degree of anticoagulation for patients requiring ECMO support. Recently, Anti factor Xa activity and thromboelastography (TEG), specifically Citrate Kaolin R value (RCK) have been used for measures of anticoagulation in ECLS patients. The current study aimed to test which measures independently predicts a significant thrombotic event and significant bleeding in ECLS patients. Methods: A single-center, retrospective review of 30 neonatal and pediatric ECMO patients from July 2013 to July 2015 was performed. UFH dosing was directed per institutional protocol to maintain Anti Xa of 0.2 – 0.7 u/mL. ACT were performed hourly. Anti Xa, and aPTT were drawn every 6hr and as needed to assess UFH dosing, TEG was performed daily and as needed. Lab values studied were collected within a 30-minute window of one another. Mean receiver operator characteristic area under the curve for the four diagnostic measures was calculated. Separate stepwise random-effects logistic regression
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MORTALITY AND INCIDENCE OF ACUTE ADVERSE NEUROLOGIC EVENTS IN THE CARDIAC INTENSIVE CARE UNIT

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Learning Objectives: Advancements in prenatals diagnosis, surgical technique, and pre- and post surgical care have greatly improved mortality for children with congenital heart disease. For the past several decades, focus has now shifted to improving neurologic morbidity. We sought to identify the incidence of neurologic-related mortality and morbidity of patients within our institution.

Methods: We reviewed all patients (medical and surgical) admitted to the pediatric cardiac ICU between January 2011 and January 2015. Our primary outcome is mortality from neurologic related causes with secondary outcomes evaluating the incidence of acute neurologic events (ANE). ANE was identified by ICD 9 codes and imaging studies recognizing stroke, intracranial hemorrhage, seizure, and/or the presence of hypoxic ischemic injury. Results: We identified 1,181 patients admitted to the CICU during our study interval. Of these patients, 20 children (1.7%) died during their CICU encounter and 13/20 (65%) of these deaths were associated with an ANE. A total of 81 patients (6.9%) had morbidity from an ANE, with 37 (3.1%) of these patients experiencing more than one ANE. The total number of ANE was 129 with 37 (27.8%) from stroke, 42 (32.6%) from intracranial hemorrhage, 15 (11.6%) seizures, and 35 (27%) white matter changes including necrosis, hypoxic ischemic changes, and cerebral edema. Conclusions: Although mortality is low in the ICU due to its restriction to patients with both sinus rhythm AND controlled ventilation. In patients at least temporarily with sinus rhythm (SR) AND controlled ventilation IOHT aims to optimize SVV and to document the corresponding GEDVI when a SVV-target of 10% has been achieved. This value is termed optimized GEDVI (GEDVI-opt) and used as a therapeutic target when SVV cannot be used. Methods: To evaluate IOHT we analyzed the inter- and intra-individual association of GEDVI to SVV using a prospectively maintained database including 10,938 measurements of SVV and GEDVI in 697 patients with PICCO-monitoring (Pulsion Medical Systems, Germany). For the final analysis only measurements with SR AND controlled mechanical ventilation AND jugular CVC were used. Statistics: Spearman correlation, partial correlation; coefficient of variance; IBM SPSS 23. Results: Inter-individual association: In the totality of measurements, the correlation of SVV and GEDVI was low: r = -0.107; p = 0.001. Individual means of GEDVI and SVV (“one point per patient”) were not correlated (r = 0.046; p = 0.550). In the relevant subgroup with SVV-values of 9–13% the association between GEDVI and SVV was slightly better for all measurements (r = 0.021; p = 0.002) as well as for the means (r = 0.294; p = 0.004). For all measurements with the target SVV of 10% and the mean GEDVI was 755 ± 135mL/m² (range 439–1064; coefficient of variation 17.9%). Intra-individual association: In all measurements GEDVI and SVV were not associated in partial correlation (r = 0.047; p = 0.152). For the subgroup with SVV of 9–13% there was a poor, but significant partial correlation (r = 0.180; p = 0.007). Single observations: In one patient with 6 measurements with SVV of 10% the GEDVI-values were 611, 781, 766, 729, 810 and 830mL/m² (mean of 755 ± 79 mL/m²; coefficient of variation of 10.4%). Conclusions: The poor intra-individual association of GEDVI and SVV contradicts the concept of IOHT in non-selected ICU patients.

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CHEMICAL TERRORISM-HALOGENS INDUCED CARDIAC INJURY, DEPRESSION AND FAILURE

Ahmed Zaky, Afral Ahmad, Shama Ahmad, Louis Dell’Italia, Sadis Matalon

Learning Objectives: Halogens such as chlorine (Cl₂) and bromine (Br₂) are significant industrial and chemical terroristic toxins incurred primarily via inhalation. Victims of halogens inhalation that succumb early demonstrate significant cardiac pathology. However, a gap exists in the understanding of halogens-induced cardiac dysfunction. We hypothesized that halogens inhalation at concentrations mimicking accidental human exposures (Cl₂ in the range of 500 or 600 ppm for 30 min, and Br₂ 600 PPM for 45 min) is associated with myocardial depression and failure independent of concomitant hypoxia. Methods: Male Sprague–Dawley rats were exposed to inhalation of 500 ppm Cl₂ for 30 min and Br₂ 600 PPM for 45 min and were then returned to room air for 20 hr and monitored by pulse oximetry. A group of rats were exposed to 40% oxygen to ameliorate hypoxia. Results: Inhalation of 500 ppm Cl₂ for 30 min and Br₂ 600 PPM for 45 min resulted in increased serum lactate, troponins, brain natural peptide, and heart-type fatty acid binding protein. After 20-hr of return to room air, there was a reduction in systolic and diastolic blood pressure, an increased left ventricular ejection fraction (LVEF), and global circumferential strain, a reduction in rate of rise and decline of LV pressure (dP/ dt), and an increase in early diastolic mitral flow velocity to early diastolic mitral annular velocity ratio (E/E’). There was an attenuation of myocardial contractile force in ex vivo preparation. Microscopic examination revealed disrupted myocardial contractile units. Cl₂ exposure at 600 ppm (30 min) was associated with biventricular failure (observed at 2 hr after exposure) and death. Cardiac mechanical dysfunction persisted despite increasing the inspired oxygen fraction concentration to ameliorate hypoxia. Similarly ex-vivo cardiac mechanical dys- function was reproduced by sole exposure to chlorine (a potential circulating Cl₂ reactant product). Conclusions: These results suggest an independent role of halogens (and their reactants) in inducing cardiac toxicity and potentially contributing to mortality.

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FEASIBILITY OF “INDIVIDUALLY OPTIMIZED HEMODYNAMIC THERAPY” (IOHT): A SYSTEMATIC DATABASE ANALYSIS

Wolfgang Huber, Anna Breitling, Andreas Leitstner, Christian von Kollhn, Lisa Weindl, Roland Schmid, Tobias Lahmer, Sebastian Mair

Learning Objectives: Stroke volume variation (SVV) and global end-diastolic volume index (GEDI) are used to optimize fluid load. However, the usefulness of SVV is limited in the ICU due to its restriction to patients with both sinus rhythm AND controlled ventilation. In patients at least temporarily with sinus rhythm (SR) AND controlled ventilation IOHT aims to optimize SVV and to document the corresponding GEDVI when a SVV-target of 10% has been achieved. This value is termed optimized GEDVI (GEDVI-opt) and used as a therapeutic target when SVV cannot be used. Methods: To evaluate IOHT we analyzed the inter- and intra-individual association of GEDVI to SVV using a prospectively maintained database including 10,938 measurements of SVV and GEDVI in 697 patients with PICCO-monitoring (Pulsion Medical Systems, Germany). For the final analysis only measurements with SR AND controlled mechanical ventilation AND jugular CVC were used. Statistics: Spearman correlation, partial correlation; coefficient of variance; IBM SPSS 23. Results: Inter-individual association: In the totality of measurements, the correlation of SVV and GEDVI was low: r = -0.107; p = 0.001. Individual means of GEDVI and SVV (“one point per patient”) were not correlated (r = 0.046; p = 0.550). In the relevant subgroup with SVV-values of 9–13% the association between GEDVI and SVV was slightly better for all measurements (r = 0.021; p = 0.002) as well as for the means (r = 0.294; p = 0.004). For all measurements with the target SVV of 10% and the mean GEDVI was 755 ± 135mL/m² (range 439–1064; coefficient of variation 17.9%). Intra-individual association: In all measurements GEDVI and SVV were not associated in partial correlation (r = 0.047; p = 0.152). For the subgroup with SVV of 9–13% there was a poor, but significant partial correlation (r = 0.180; p = 0.007). Single observations: In one patient with 6 measurements with SVV of 10% the GEDVI-values were 611, 781, 766, 729, 810 and 830mL/m² (mean of 755 ± 79 mL/m²; coefficient of variation of 10.4%). Conclusions: The poor intra-individual association of GEDVI and SVV contradicts the concept of IOHT in non-selected ICU patients.

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PREDICTORS OF GLUCOSE VARIABILITY DURING HYPOTHERMIA AFTER CARDIAC ARREST

Vito Fontana, Antonio Dell’Anna, J Geoffrey Chase, Thomas Desaiye, Jean-Louis Vincent, Jean-Charles Preiser, Mauro Oddo, Fabio Silvio Taccone

Learning Objectives: Targeted Temperature Management (TTM) is often used to treat comatose survivors from cardiac arrest (CA). In these patients, both high glucose levels on admission and large glucose variability (GV) during the cooling period have been associated with poor outcome. Yet, glucose control is difficult during TTM because of insulin resistance induced by hypothermia. Aim of the study is to explore the predictors of GV in patients treated with TTM after successful resuscitation of CA. Methods: Analysis of a prospectively collected database in two university hospital medical/surgical ICUs. Insulin therapy was given to maintain blood glucose (BG) target between 6 -8 mmol/L, according to a computer-based algorithm. We also recorded the total amount of glucose and the total amount of insulin administered. Blood GV was calculated as the
ratio between the standard deviation and the mean of all glucose measurements during the cooling period (32–34°C during 24 hr). Patient-specific clinically validated model-based insulin sensitivity (IS, L/mU-min) was identified from patient-specific clinical data and describes the overall whole-body effect of insulin, using concentration of BG (mmol/L), based on the total glucose and insulin doses, model-estimated plasma and interstitial insulin concentrations. Results: We studied 213 patients: male 81%, median age 61 [51–71] yr, diabetics patients 82 (38%). BG on admission was 10.3 [8.1–13.8] mmol/L and median blood glucose 7.8 [7.1–9.2] mmol/L. Median GV = 0.22 [0.14–0.35]. In a multivariable analysis, the only predictor of GV was BG on admission, although the correlation was poor (r2 = 0.19; p = 0.01). GV was similar in diabetic and non-diabetic patients. There was no correlation between GV and IS (r2 = 0.008; p = 0.98). Conclusions: GV is higher than 20% during TTM after CA, and its intensity can hardly be predicted (except for a high BG on admission). Insulin sensitivity plays no important role. Thus, frequent measurements and a more patient-specific management would be necessary for glucose management of CA survivors treated with TTM.

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INTER-RATER RELIABILITY OF PERIPHERAL PERFUSION ASSESSMENTS IN NEONATES AFTER CARDIAC SURGERY
Alicia DeMarco, Tuan Nguyen, Thomas Weiler, Irina Kukueva, Rambod Aminovin

Learning Objectives: A fall in cardiac output in children following cardiac surgery is well-described in the medical literature. Prior studies have proposed a definition of low cardiac output syndrome (LCOS) based upon physical, hemodynamic, and laboratory parameters. However, the definition includes subjective assessments of pulses and perfusion. The reliability of the subjective component of the LCOS tool has not been investigated. Our objective was to demonstrate inter-rater reliability between study investigators with regard to assessment of peripheral pulses and perfusion in neonates following cardiac surgery. Methods: To determine inter-rater reliability of clinical assessment of LCOS, the primary investigator and three co-investigators simultaneously palpated peripheral pulses and individually recorded their evaluations of a convenience sample of 20 neonates in the first 24 hr following cardiac surgery. Fleiss’ kappa was computed based on their assessments. In a subset of neonates, raters were additionally compared to the objective components of an LCOS tool to assess agreement between subjective exam findings and objective laboratory and clinical data. Results: 46 evaluations were completed on 22 neonates. Raters obtained 100% agreement on just 26/46 evaluations (56.5%, CI 41.11–71.1%). Fleiss’ kappa was K = 0.278, reflecting poor inter-rater reliability. 100% agreement was only achieved if patients had unequivocally good pulses and perfusion. Conclusions: Subjective assessment of peripheral pulses and perfusion varies widely among clinicians. Its inclusion as part of an LCOS tool precludes generalization of the diagnosis of LCOS. Future studies should define LCOS utilizing objective components, such as hemodynamic and biomarker parameters.

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ICU OUTCOMES OF CHILDREN REQUIRING TRACHEOSTOMY AFTER CARDIAC SURGERY: ANALYSIS OF VPS LLC DATABASE
Trent Sims, Linda Grummy, Charsiss Lachica, Ortmann Laura

Learning Objectives: There is controversy regarding indications and safety of tracheostomy in pediatric patients after cardiac surgery. Previous reports have been small single center studies which limit generalizability. This study was conducted to describe the demographics, comorbidities, and outcomes of children requiring tracheostomy after cardiac surgery using a national PICU database. Methods: Multicenter, retrospective study utilizing the Virtual Pediatric Systems, LLC database. Patients included were less than 18 yr of age who had undergone tracheostomy placement during the same admission as congenital heart surgery or transplantation from January 1, 2009 to April 30, 2014. Results: 232 patients from 44 PICUs were included. Patients requiring tracheostomy after cardiac surgery had a mean age of 16.5 mo and a mean weight of 7.7 kg. The most common biventricular surgeries were TOF repair (8.2%) and heart transplantation (6.9%) while the most common single ventricle repair was the Norwood procedure (7.3%). Median duration from surgery to tracheostomy was 43 days (range 0–308). ICU survival was 81%. Length of stay in the ICU was 86.6 days (range 3–996). Patients who received tracheostomy < 30 days following surgery had a mortality rate of 10.7%, while patients who received tracheostomy at 30 or more days had a mortality rate of 22.9%. Patients with the diagnosis of hypoplastic left heart syndrome had the highest mortality rate contributing 13 of 44 deaths (29.6%), while heart transplant was the surgery with the highest mortality rate contributing 5 of 44 deaths (11.4%). Average length of ventilation prior to tracheostomy was 45 days, while the average length of ventilation following tracheostomy was 16 days with 29.4% of patients being discharged without mechanical ventilation. Conclusions: Tracheostomy in pediatric patients following cardiac surgery is associated with significant mortality. Patients undergoing tracheostomy less than 30 days following cardiac surgery have better survival rates when compared to patients undergoing later placement of tracheostomy.

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CARDiORESPiRATORY INSTABILITY ALERT SUBTYPES IN MONITORED STEP-DOWN UNIT PATIENTS HAVE LOW ENtROPY
Marilyn Hravnak, Luie Chen, Artur Dubrawski, Eliezer Bose, Gilles Clermont, Michael Pinsky

Learning Objectives: bedside monitors alert for cardiorespiratory instability (CRI), but are agnostic to patterns due to patient baseline or specific pathophysiology. We hypothesize step-down unit (SDU) patient’s exhibit non-random CRI patterns due to signatures or pathophysiology, and sought to characterize their distributional patterns of CRI alert types and temporal transitional patterns. Methods: Continuous vital sign (VS) monitor data for 24 mo. SDU admissions (heart rate [HR], respiratory rate [RR], oscillometric blood pressure [BP], oximetry [SpO2]) were recorded at 1/20Hz. Alerts were VS across local stability thresholds. After eliminating artifact, 8 CRI alert subtypes were identified by which VS and how threshold was crossed (high or low HR, RR, systolic BP, low SpO2, high diastolic BP). For each admission we computed relative entropy (absolute entropy scaled by entropy under uniform distribution assumption) to quantify alert distribution by subtype (low values suggest low distribution uncertainty), and transitional probability among subtypes. Results: Data from 2616 SDU admissions (total 22.67 patient yr monitoring hr) yielded 10889 CRI alerts. 946 (36%) of admissions recorded ≥1 alerts. Of these, 505 (53%) incurred a single subtype repeatedly with 0 relative entropy of subtype distribution, while 387 (41%) had relative entropy ≥0 but <0.5 (mean 0.29±0.09). Temporal transitional patterns were: initial low HR followed by same subtype 99% of time, high HR followed by same in 79%, low RR and same in 93%, high RR and same in 92%, low SpO2 and same in 88%. With all 3 BP alert types aggregated, they self-transited into BP in 58% and low SpO2 subtype in 24% of time. Conclusions: CRI alerts for HR, RR and SpO2 usually remain in the same subtype per SDU patient and rarely transit into other subtypes. However, BP alerts sometimes transit to SpO2 suggesting combined CRI etiology. Potentially, if each subtype is associated with specific pathophysiology, treatment following first alert might attenuate disease progression.

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INCIvENCE AND PROGNOSIS OF NEw-ONSET ATRIAL FIBRILLATION IN A MIXED ICU: AN OBSERVATIONAL STUDY
Misuzu Nakanishi, Akira Kuriyama, Toshie Kaibara

Learning Objectives: New-onset atrial fibrillation (AF) develops in 5% to 15% of critically ill patients, and is associated with a longer length of stay (LOS) in ICUs and the hospital and a higher mortality. However, the number of studies reporting this association is limited, and the populations in such studies were restricted to surgical or septic patients. Little is known about the incidence and prognosis of new-onset AF in ICUs in general. The aim of our study was to identify the incidence and prognosis of new-onset AF in an emergency ICU at a Japanese tertiary care hospital. Methods: A one-year prospective observational study was performed. We included the patients who were admitted through the emergency room to our ICU, from July 2014 to June 2015. Patients younger than 18 yr and those with pre-existing AF were excluded. All patients were monitored for arrhythmia during the ICU stay and the incidence of new-onset AF was...
recorded. The number of in-hospital deaths and the LOS in the ICU and hospital were measured, respectively. Results: A total of 462 patients were included. Mean APACHE II score was 17.4, and median age was 71 (IQR, 48–80). The overall incidence of AF was 2.8% (n=13/462). Compared with patients without AF, those with new-onset AF had a longer LOS in the ICU (median, 8 days vs 2 days, p=0.01). The LOS in the hospital tended to be longer in patients with new-onset AF (median, 29 days vs 15 days), but there was scarcely statistical significance (p=0.052). There was no significant difference between patients with and without new-onset AF in the number of in-hospital deaths (7.4% vs 7.7%, p=0.91).

Conclusions: In our cohort, the incidence of new-onset AF was lower than previously reported. Compared with patients without AF, patients with new-onset AF tended to have a longer LOS in the ICU and in the hospital. No significant difference in the in-hospital mortality was found between patients with and without new-onset AF, unlike the previous reports.

90 PHARMACOLOGIC TREATMENT OF ICU DELIRIUM IS NOT ASSOCIATED WITH INCREASED DEVELOPMENT OF ARRHYTHMIAS
Anli McCoy, Daniel Eiferman, Mike Boyd, Gary Phillips, Claire Murphy

Learning Objectives: Medications used for the treatment of ICU delirium can cause QTc prolongation and possible development of Torsades de Pointes (TdP). Limited data is available to guide identification of patients at risk for QTc prolongation in the ICU, or the frequency of ECG monitoring needed when using these medications. This study aims to determine if medications used for the treatment of ICU delirium cause QTc prolongation with subsequent development of TdP.

Methods: A retrospective cohort study was conducted to evaluate risk factors for QTc prolongation amongst patients being treated for ICU delirium. Delirium treatment included at least one of the following: haloperidol, risperidone, quetiapine, or olanzapine. QTc prolongation was defined as QTc ≥500 milliseconds or ≥20% increase from baseline. The primary outcome was to determine prevalence of QTc prolongation, and to identify medication-related predictors of QTc prolongation in the ICU delirium population. Secondary outcomes included prevalence of TdP and ICU mortality. A multivariable logistic regression model was constructed for assessment of the primary outcome.

Results: Two hundred and nine patients were evaluated. Twenty seven (13%) patients had QTc prolongation. The majority received risperidone (14 (51.9%) with QTc prolongation, 86 (47.3%) without) or quetiapine (11 (40.7%) with QTc prolongation, 83 (45.6%) without) for delirium treatment. When adjusting for concomitant use of diuretics and QTc prolonging antibiotics, no difference was found in our sample in the risk of QTc prolongation amongst the selected antipsychotic agents and doses used. No episodes of TdP were identified, but a trend towards increased mortality was noted in patients with QTc prolongation. Conclusions: QTc prolongation in ICU delirium was not significantly impacted by choice of antipsychotic agent or doses administered. Furthermore, no malignant arrhythmias were caused by use of these medications, regardless of QTc prolongation. Less ECG monitoring may be required than initially believed when using medications to treat ICU delirium, but further investigations are warranted.

91 CHARACTERISTICS OF SLEEP AND SLEEP DISORDERS IN CHILDREN WITH CYANOTIC CONGENITAL HEART DISEASE
Kirankumar Bhosrekar, Nathan Thompson, Matthew Scanlon, Lynn D’Andrea

Learning Objectives: Our objective was to investigate sleep-disordered breathing and characteristics of sleep architecture in children with cyanotic congenital heart disease (CHD). Children with CHD may hypoxic for months to years before undergoing surgical palliation. Our objective was to investigate sleep-disordered breathing and differences in sleep architecture or are at increased risk for sleep-disordered breathing.

Methods: A retrospective chart review was performed for children with cyanotic CHD who underwent polysomnography (PSG) over a 5 year period at Children’s Hospital of Wisconsin. Variables collected including demographics, CHD diagnosis, surgical procedures and PSG results. Children were categorized into 3 age groups: < 1 year, 1 – 4 yr and > 5 yr in order to compare sleep architecture variables to normative data for age. Results were analyzed using SPSS software.

Results: 93 PSGs were included in this study. Median age at time of PSG was 36.2 mo (range: 1.6–257.6). Overall the sleep architecture of children with cyanotic CHD was comparable to normative values in all 3 age cohorts. Approximately 1/3 of the PSGs were performed on children who were still cyanotic. Children who remained cyanotic at the time of PSG despite having undergone surgical palliation had worse total sleep time (p-value <0.002). Overall, median AHI was 1.1 in children >1 year but the median AHI was 2.9 in children >5 yr who were still cyanotic. In children >5 yr, the PLM index was only 0.2, but length of initial cardiopulmonary bypass (CPB) time and aortic cross-clamp (ACC) time were associated with an increased PLM index (p-values 0.021 and 0.002 respectively).

Conclusions: Our study provides the first description of sleep disorders and sleep architecture in children with cyanotic CHD. Sleep architecture was not significantly altered in children with cyanotic CHD. Older children were at risk for obstructive sleep apnea, similar to children without CHD. Length of CPB time and ACC time were directly proportionate with an increased PLM index.

92 TRANEXAMIC ACID AND POST-OPERATIVE SEIZURES IN PATIENTS WHO UNDERWENT CARDIAC SURGERY
Chan Justin, Angela Jerath, Humara Poonawala, Marcin Wasowicz

Learning Objectives: Tranexamic acid (TXA) is an antifibrinolytic drug routinely given to patients undergoing cardiac surgery involving the use of cardiopulmonary bypass (CPB) in order to reduce perioperative bleeding. TXA is cleared predominantly by renal elimination. There is growing evidence demonstrating TXA causes post-operative seizures in a dose-dependent relationship. However, this hypothesis and the impact of renal dysfunction has never been addressed in a prospective study. This study aimed to prospectively detect the incidence of post-operative seizures in cardiac surgical patients with various levels of chronic renal dysfunction receiving TXA.

Methods: Following REB approval and informed consent, we recruited 48 patients. Twenty six received 50 mg/kg of TXA after informed consent, we recruited 48 patients. Twenty six received 50 mg/kg of TXA after induction of anesthesia (low-risk group). Two hundred were administered a bolus of 30 mg/kg of TXA after induction of anesthesia, followed by an infusion of 16 mg/kg/hr of TXA throughout the surgery until sternal closure with an additional 2 mg/kg bolus given in the CPB pump prime (high-risk group).

Results: Four patients (8.3%) within the high-risk group had post-operative seizures. Mean (SD) age was 67.5 (10.7) yr and 5 patients were male. Three patients seized on post-operative day (POD) 1 and 1 seized on POD 0. The 4 patients received a cumulative dose of 104.02 mg/kg, 57.94 mg/kg, 177.0 mg/kg, and 90.25 mg/kg. Mean (SD) total TXA dose was 8540 (4810) mg. Three patients had chronic kidney disease (CKD) stage 5 and 1 patient had CKD stage 5. Mean (SD) creatinine was 485.00 (291.92) µmol/L at baseline, 330.75 (165.63) on POD 0, and 380.75 (177.70) on POD 1. Subsequent CT and EEG results were only available for three patients. CT scans revealed no evidence of acute intracranial processes and EEGs demonstrated non-epileptiform encephalopathy. In-hospital mortality was seen in 2 (50%) patients. Conclusions: High TXA dose increases the risk of post-operative seizures in cardiac patients with renal impairment. Further research is required to determine optimal TXA dosing in patients with chronic renal dysfunction undergoing cardiac surgery.

93 RIVAROXABAN MAJOR BLEEDING IN PRACTICE: PATIENT CHARACTERISTICS, MANAGEMENT, AND OUTCOMES
Sarah Sienko, Karen Burgos, Janet Hoffman, John Koerber, Maureen Smythe

Learning Objectives: Rivaroxaban was the first oral direct factor Xa inhibitor approved for use in atrial fibrillation. Limited real-world data is available regarding major bleeding with this medication.

Methods: This single center, retrospective, observational study evaluated patients with a rivaroxaban bleeding event between July 2011 and June 2014. Identification occurred through health-system adverse events reporting or by cross-referencing rivaroxaban with ICD-9 codes for atrial fibrillation, hemorrhage, and transfusion. Charts were reviewed to confirm the presence of a major bleed (International Society on Thrombosis and Haemostasis criteria) and temporal relationship to rivaroxaban. Patient characteristics, bleed management, and outcomes were evaluated.

Results: Sixty patients were identified with a mean age of 80.3 yr. Median CHA2DS2VASC score was 5 and
HAS-BLED score was 3. Gastrointestinal and intracranial bleeds occurred in 63% and 27% of patients, respectively. Rivaroxaban doses were excessive based on renal function in 35% of patients. Concurrent antiplatelet medications were prescribed in 70% of patients, with 10% receiving dual antiplatelet therapy. Two patients had a perioperative medication reconciliation error prior to the bleeding event, 10% had an invasive procedure within 7 days of the bleed, and 5% of patients were given rivaroxaban with concerns of bleeding. Nearly 50% of patients spent time in the ICU post-bleed. Bleed management consisted of a procedure/surgery in 18%, PRBC in 73%, EFP in 20%, and hemostatic agent use in 35% of patients. Anticoagulation was held at discharge in 70% of patients. Ten percent of patients were made hospice or palliative care. In-hospital mortality was 10%. Conclusions: Patients experiencing a rivaroxaban major bleed in practice were elderly and often on antiplatelet therapy. More than 25% of all major bleeds were intracranial. Hemostatic agents were administered to over one-third of patients. In-hospital mortality was 10%. Anticoagulation therapy remained held at discharge in the majority of patients.

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PHASE OF CARE MORTALITY ANALYSIS FOR A PEDIATRIC CARDIOTHORACIC SURGICAL POPULATION

Learning Objectives: Pediatric cardiac surgical patients undergo multiple interventions with a wide variety of responses to treatment throughout their clinical course, all while being managed by a group of providers from multiple disciplines. A phase of care mortality analysis (POCMA) has been developed in adult cardiac surgical programs in Michigan, designed to include all identifiable dimensions of care or clinical events that could ultimately contribute to a patient’s mortality. We aimed to modify this concept in a pediatric cardiac surgical population. Methods: Providers from pediatric cardiac ICU, cardiology, CT surgery and safety experts met recurrently to systematically develop a pediatric POCMA form through an iterative process. This form was modified for use in pediatric cardiac surgical patients with an intent to enhance situational multidisciplinary awareness, identify avoidable events and promote system changes whenever necessary for this complex population. Results: The POCMA form consists of 5 phases of care for review: pre-operative, intraoperative, post-operative ICU, post-operative floor and discharge (to home or rehab). We systematically reviewed 26 pediatric cardiac mortalities from 2010–2014 to ensure utility of our POCMA form. We identified 14 categories of evaluation within the phases, such as judgement, bypass-related complications, equipment specifications and timely recognition of low cardiac output state. Potentially avoidable events were identified and mortality rates compared with national norms for the procedure. Completion of the form by a primary provider within 24 hr of occurrence is required and then reviewed at the multidisciplinary morbidity and mortality conference. Necessary system changes are reviewed and implemented. Conclusions: Use of phase of care analysis in this complex population with multidisciplinary care involvement provides significant opportunity for quality improvement initiatives in an effort to develop and refine morbidity and mortality reviews and provides a structured forum for discussion, education and follow-up, with an ultimate goal of improved outcomes.

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GLUCOCORTICOIDS PROTECT YOUNG MALE RAT HEARTS FROM ISCHEMIA AND REPERFUSION INJURY
Thant Lin, Lubo Zhang, Andrew Song, Willinka Medina

Learning Objectives: There is increasing use of steroids prior or during cardiopulmonary bypass in pediatric patients to decrease the inflammatory response. However there is little or no research regarding this practice in pediatric patients. Based on this, our research hypothesis: Steroids are cardioprotective in young male rats during ischemia reperfusion injury. Methods: Four weeks old male Sprague-Dawley rats were injected intraperitoneally with dexamethasone 1mg/kg or saline control. All animals undergoing surgical procedures were anesthetized with isoflurane. After baseline recording, hearts were subjected to global ischemia followed by reperfusion using a modified Langendorff apparatus. Left ventricular developed pressure (LVPD), heart rate (HR), dP/dTmax, dP/dTmin, and Left ventricular end-diastolic pressure (LVEDP) were continuously recorded. Coronary effluents were also collected for lactate dehydrogenase (LDH) assay. Left ventricles were collected, sliced, incubated and photographed. Infarct size was measured using computerized planimetry. Westernblot analysis was performed for antibodies to PKC Delta and PKC Epsilon. Results: Dexamethasone confers cardioprotection when given before ischemic reperfusion injury by decreasing the infarct size (Saline Mean 51 ± 4 SD vs Dex 38 ± 6 SD, p = 0.007), increased dP/dTmax (p < 0.0001 by two way ANOVA), increased dP/dTmin (p < 0.0005), increased LVPD (p < 0.0001), decreased LVEDP (p < 0.018). LDH levels did not show any significant differences between saline vs dexamethasone treatment groups. Finally, molecular analysis showed no significant difference in PKC delta protein expression, however, there was decreased expression of PKC epsilon protein expression in dexamethasone treated group. Conclusions: Dexamethasone confers cardioprotection in young rat hearts as evidenced by decrease in infarct size, increase in dP/dTmax, increase in dP/dTmin, increase in LVPD and decrease in LVEDP. PKC delta expression was unchanged. Further studies are needed to determine the possible molecular factors that mediate cardioprotection observed with dexamethasone pretreatment.

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PERIOPERATIVE EVENTS IN CHILDREN WITH PULMONARY HYPERTENSION UNDERGOING NON-CARDIAC PROCEDURES
Meghan Bernier, Ariel Jacob, Joseph Collaco, Lewis Romer, Chinwe Unebu

Learning Objectives: Adults with pulmonary hypertension (PH) undergoing non-cardiac surgery are at greater risk of perioperative complications and death. Data are more limited in pediatrics, but prior research indicates that children with idiopathic PH or PH related to congenital heart disease had a higher rate of adverse outcomes than predicted during both non-cardiac procedures and cardiac catheterizations. We examined pediatric outcomes after procedures in a PH patient population. Methods: We conducted a single center retrospective cohort study of children with active or pharmacologically controlled PH from 2006–2014 undergoing non-cardiac procedures or cardiac catheterizations who received anesthesia. The pre-operative baseline, severity of PH, intraoperative course, and post-operative care were examined. Logistic regression analysis will be performed to determine the association of variables with outcomes, and Kaplan-Meier curves will be used for time-to-event analyses. Results: We identified 77 patients with active or pharmacologically controlled PH who underwent 148 procedures at a median age of 6 mo. Etiologies of PH included bronchopulmonary dysplasia (47%), congenital heart disease (30%), congenital diaphragmatic hernia (14%), persistent pulmonary hypertension of the newborn (4%), idiopathic (1%), heart failure (1%), and others (3%). PH severity during procedures ranged from 43% resolved under pharmacologic control without echocardiographic or catheterization evidence of elevated pulmonary arterial pressure, to 55% mild, 19% moderate, and 14% severe. Inpatient mortality within one month of procedure was 7.7%. Record review to date of 67 procedures includes cardiac arrest in 2 patients on induction and 1 intra-op; 2 patients with intra-op PH crisis. Post-operatively within the first 96 hr, 6 patients required escalation of PH care, 7 had PH crisis requiring intensive care, and 3 had cardiac arrests. Conclusions: Children with active or pharmacologically controlled PH are at increased risk of perioperative complications, including escalation of PH management, PH crisis, cardiac arrest, and death.

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PEDIATRIC SYSTEMIC CAPILLARY LEAK SYNDROME ENDOTHELIAL CELLS ARE HYPERSENSITIVE TO TNF-A AND LPS
Richard Pierce, Mustafa Khokha, Martin Kluger, John Paul Lavik, Jordan Pober

Learning Objectives: Systemic capillary leak syndrome (SCLS) is a rare disorder characterized by episodes of edema, hypotension, hypoalbuminemia and hemoconcentration with no known triggers. Episode severity ranges from mild to fatal. Only 14 cases in children have been described. Inappropriate cytokine release or endothelial cell (EC) dysfunction has been postulated but the etiology and pathogenesis of the disease remain unknown. We present novel studies using dermal
microvascular endothelial cells (EC) cultured from one such patient. **Methods**: We cared for a SCLS patient who passed away from complications of a severe episode. We isolated human dermal microvascular EC (HDMEC) at necropsy by our published protocol. Cultures of SCLS HDMEC as well as normal control HDMEC were maintained at post-confluence for several days, allowing formation of tight junctions. Assessment of barrier function was then conducted using time-resolved noninvasive measurement of electrical resistance by electrical cell-substrate impedance sensing (ECIS). Electron microscopy of the SCLS HDMEC and normal HDMEC was conducted using our described protocol for tight junction analysis. **Results**: SCLS HDMEC monolayers developed a barrier of similar strength and over similar time course as normal HDMEC. Electron microscopy (EM) of SCLS HDMEC revealed normal cell tight junction patterns. SCLS HDMEC demonstrated an exaggerated decrease in barrier function in response to stimulation with TNF-α by 80% and to LPS by 75% compared to normal HDMEC, and SCLS HDMEC failed to recover their barrier through 24 h of monitoring. No differences in barrier responses were detected following stimulation by IL-1-alpha or thrombin. **Conclusions**: Pediatric SCLS is a rare disease of unknown etiology. HDMEC isolated form one such patient could establish normal barrier function and had normal junctional appearance on EM but demonstrated an exaggerated barrier decrease and a failure to recover in response to TNF-alpha and LPS but not to IL-1 alpha or thrombin. HDMEC hyper-responsiveness to select mediators may explain the patient’s clinical phenotype.

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DOES DDAVP INCREASE RENAL INSUFFICIENCY AND PROLONG MECHANICAL VENTILATION IN CARDIAC SURGERY?  
John Blackburn, Taylor Mueller, Vikas Kumar, Manuel Castresana  
**Learning Objectives**: As a synthetic analogue of vasopressin, desmopressin (DDAVP) retains its antidiuretic properties and ability to increase factor VIII and von Willebrand factor levels without the vasoconstrictive properties. DDAVP has historically been used to treat diabetes insipidus (DI) and to minimize bleeding during surgical procedures. Currently best evidence doesn’t support routine use of DDAVP but does suggest that subgroups with perioperative platelet dysfunction exhibit a modest decrease in postoperative bleeding. Considering the hemostatic dose of DDAVP is ten times the antidiuretic dose used in DI we assessed if patients who received DDAVP were more likely to have perioperative acute kidney injury (AKI) and more ventilator days due to fluid retention.  
**Methods**: We performed a retrospective analysis of 50 patients undergoing cardiac surgery. We excluded patients with end stage renal disease and those who died within 48 h postoperatively. Aside from demographic data we evaluated both groups for risk factors known to predispose patients to renal injury and pulmonary complications including: diabetes, lung disease, baseline renal function, anemia, CPB time and heart failure. The primary endpoint was incidence of AKI defined by the AKIN criteria while secondary endpoints were ventilator days, ICU length of stay (LOS) and hospital LOS. Continuous variables were compared using unpaired t-test while categorical variables were compared using McNemar’s tests. **Results**: Sixty percent of the DDAVP group (n=25) developed AKI compared to 24% of the control group (p-value 0.02). Despite the statistically significant increase in AKI we found no statistically significant difference between the two groups regarding secondary endpoints. **Conclusions**: Our data suggest that DDAVP at hemostatic doses increases perioperative AKI emphasizing the need to continually weigh risks and benefits. Further studies are needed to further evaluate the impact this may have on ventilator days and LOS.

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COMPLETE ASSESSMENT BY SONOGRAPHY IN INTRA-VASCULAR HYPOVOLEMIA (CASH) SCORE  
Keith Killu, Victor Coba, Darlene Derezcyk, Nina Kolbe, Stephanie Bakey, Dionne Bylden, Harriette Horst  
**Learning Objectives**: Intravascular hypovolemia (IH) assessment by bedside ultrasound (BU) usually focus on individual organs. Combining different organs and using a scoring system, to compare to the standard methods (SM), will aid in the diagnosis and standardize BU use. **Methods**: Prospective, observational study, in the surgical intensive care unit (SICU), of a single academic tertiary center. Patients with IH included. IH identified by the SM of heart rate (HR), mean arterial pressure (MAP), central venous pressure (CVP), serum lactate, Oxygen Saturation of central venous blood (SCVO2), and cardiac index (CI). BU studies included the heart, lungs, Inferior Vena Cava (IVC), and Internal Jugular Vein (IJV). CASH score developed to assess IH; A) Heart: Hyperkinetic=0, Normal or hypokinetic=1. B) Lungs: Absence of B-Lines=0, presence of B-Lines=1. CI: IVC <2.5 cm and >50% respiratory variation in diameter=0, 1.5–2.5 cm or more and <50% variation=1. D) IJV: >40% variation=0, <40% variation=1. CASH score range from 0–4. A score near zero indicates IH, a score near 4 indicates no need for fluids. Data for SM and BU compared to each other in a pre and post resuscitation phase. Comparisons were performed using Wilcoxon signed rank-sum tests, the nonparametric equivalent to a paired t-test and using McNemar’s tests of paired proportions. **Results**: 26 patients with IH included in the study. In the SM, the pre versus post-resuscitation data; HR 113.5 vs 94.5 bpm, MAP 74 vs 86 mmHg, CVP 7.4 vs 13.4 cmH2O, SCVO2 59.7 vs 74.9, lactate 3.5 vs 1.1, and CI 2.7 vs 3.9 respectively, P <0.001. In the BU, the pre versus post-resuscitation data; heart 92% hyperkinetic vs 100% normal, Lungs 100% no B-lines in both states, IVC 89% with <2.5 cm, >50% variation vs 1.5–2.5 cm or more, <50% variation, and the IJV 88% with >40% variation vs 88% <40% variation, respectively, P<0.05. The total BU pre vs post-resuscitation CASH scores were a mean of 0.5 (SD 1.2) vs 3.8 (SD 0.6) post-resuscitation, P<0.001. **Conclusions**: Applying a CASH score can standardize and aid in the diagnosis during BU. A CASH score of 0.5 or less can identify patients with IH.

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IMPACT OF INTRAOPERATIVE CONTINUOUS VS. INTERMITTENT CEFAZOLIN THERAPY ON THE INCIDENCE OF SSIS  
Bethany Shoulders, Kate Dzintars, Jessica Crow, Stephanie Davis, Glenn Whitman  
**Learning Objectives**: Cardiopulmonary bypass (CPB) increases the volume of distribution of cefazolin in cardiac surgery patients, resulting in decreased concentration at the incision site. The Infectious Diseases Society of America guidelines currently recommend standard dosing intervals for antibiotic prophylaxis due to limited data supporting alternative dosing strategies. In order to optimize pharmacokinetic and pharmacodynamic parameters, the use of continuous infusion cefazolin has been proposed in cardiac surgery patients undergoing CPB. This retrospective cohort study included adults undergoing CABG on CPB and received cefazolin intraoperatively from June 1, 2013 to December 31, 2014. The intermittent (INT) cohort included patients from June 2013 to February 2014 and the continuous infusion (CI) cohort included April to December 2014. The primary endpoint was incidence of SSIs, and safety endpoints of renal dysfunction and seizures were evaluated. Multivariable logistic regression analysis was utilized to determine the impact on SSIs when controlling for other risk factors. A subgroup analysis for this study included two groups within each time period to evaluate protocol adherence. **Results**: The overall incidence of SSIs was decreased in patients receiving CI cefazolin, although this did not reach statistical significance (4.58% INT vs. 1.72% CI, p=0.116). Superficial SSIs were significantly reduced in the CI cohort (2.8% vs. 0.4%, p=0.039). In the regression analysis CI cefazolin decreased the odds of SSI by 66%, although it did not reach statistical significance (p=0.077). Safety endpoints were not different between groups. **Conclusions**: Continuous infusion cefazolin significantly decreased the incidence of superficial SSIs in patients undergoing CABG on CPB without increasing the risk for adverse effects, but this study was underpowered to detect a difference in overall SSIs.

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PHASE 3 OF ANDEXANET ALFA FOR REVERSAL OF APTIXABAN AND RIVAROXABAN ANTICOAGULATION IN OLDER SUBJECTS  
Mark Crowther, Alex Gold, Gemmlin Lu, Janet Leeds, Brian Wiens, Pamela Conley, Stuart Connolly, John Curnette  
**Learning Objectives**: Although direct Xa inhibitors have demonstrated convincing anticoagulant efficacy, risk of bleeding is a concern with no specific antidotes available for reversal. Andexanet alfa (AndXa) is a recombinant modified Xa as a
Learning Objectives: Extubation failure (EF) is associated with increased ICU stay, complications and mortality. Young children after cardiac surgery has experienced high incidence of EF. This study was conducted to identify the prevalence, etiology and risk factors of EF in the neonates after cardiac surgery. Methods: We performed retrospective chart review of children ≤ 31 days old who underwent congenital heart surgery and admitted to cardiac ICU from January 2011 to December 2014 at our hospital. EF was defined as reintubation within 48hr. The etiology of EF was investigated. Demographic, preoperative and perioperative data were collected. Collected data were analyzed with chi-square test, Fisher’s exact test or t-test. In multivariate analysis, logistic regression models were constructed using bidirectional stepwise procedure. Results: Of 121 eligible cases (111 patients), EF occurred in 13% (16 of 121). Median age was 13 days (range: 0–31). The median duration of mechanical ventilation was 4 days (range: 0–58). The common risk factors for failed cases were airway disease (n=5), chromosomal abnormality (n=3), arrhythmia (n=3), diaphragm paralysis (n=2). The etiology of EF was respiratory impairment (n=9), hemodynamic instability (n=5), airway obstruction (n=1) and gastrointestinal bleeding (n=1). Eleven were successfully extubated at subsequent extubation. Eight needed subsequent surgery (heart surgery in 4, tracheostomy in 2 and diaphragmatic plication in 2). In-hospital mortality was 4%. Associated factors with EF were airway disease, intubation prior to surgery, young age, long duration of mechanical ventilation, delayed sternal closure, ECMO, high CVP and use of inotropic. In multivariate analysis, independent risk factors were airway disease (EOR, 14.2), intubation prior to surgery (EOR, 4.0). Conclusions: Extubation failed in 13% of neonates after cardiac surgery. The etiology of EF were diverse. Delinquent care by cardiac intensivists with multilateral viewpoints should be offered constantly. Airway disease and intubation prior to surgery were risk factors for EF and this population needs extreme care.

Learning Objectives: Recombinant activated factor VII (rFVIIa) has been shown to reduce intra-operative (IO) and post-operative (PO) intractable bleeding in cardiac surgery patients. Although effective, various dosing regimens of rFVIIa have been used in this setting. Our objective was to investigate the use of rFVIIa in cardiac surgery patients. Methods: Data was retrospectively collected on all patients who underwent cardiac surgery from May 2014 to April 2015 and received at least 1 dose of rFVIIa PO. Blood transfusions were given as needed by the anesthesiologist or the PO team without the use of a protocol. The decision to administer rFVIIa and surgical re-exploration was at the discretion of the cardiac surgeon. The rFVIIa dose was limited to 1.25 mg but could be repeated. Blood transfusions, chest tube output and rFVIIa doses were collected for 24hr PO while thrombosis events and mortality was assessed at 30 days. All data are presented as categorical or nonparametric (median [interquartile range]) with Mann–Whitney U used for any statistical analysis between groups. Results: A total of 36 patients received rFVIIa with 52 administered doses (79% PO). The first rFVIIa was administered in the IO phase in 31% of patients. A second dose was given to 36% with a median time of 2 [1–3] hr between doses. The median rFVIIa dose was 29 [21–40] mcg/kg. Total chest tube output prior to rFVIIa and at 12-hr PO was 1070 [630–1495] mL and 2110 [1273–3830] mL, respectively. Hourly chest tube output was significantly reduced after the first rFVIIa dose compared to before (44 [32–80] mL vs. 302 [225–438] mL, p<0.01). Transfused red blood cells, fresh-frozen plasma and platelets before and after rFVIIa were as follows: 3 [2–6] units vs. 4 [3–11] units (p=0.06); 3 [2–6] units vs. 2 [0–6] units (p=0.16); 3 [2–5] units vs. 2 [0–5] units (p=0.01). Surgical re-exploration occurred in 61% with 68% receiving rFVIIa before re-exploration. Thrombosis rate was 17% while the 30-day mortality rate was 14%. Conclusions: rFVIIa reduced hourly chest tube output PO but failed to spare allogeneic transfusions outside of platelets.

102 OUTCOME OF PATIENTS IN CARDIOGENIC SHOCK SUPPORTED WITH EXTRACORPOREAL MEMBRANE OXYGENATION Ana Hurtado, Diana Garcia-Saez, Donna Hall, Clara Hernandez-Caballero, Nicholas Lees, Aron Popov, Andre Simon, Clifford Morgan Learning Objectives: Veno-arterial extracorporeal membrane oxygenation (VA-ECMO) is an established treatment for refractory cardiogenic shock as temporary support (bridge to recovery), as a bridge to optimization prior to the implantation of ventricular assist device or cardiac transplantation. Methods: Retrospective observational study to assess indication and outcome of patients who were supported with VA-ECMO at our institution from June 2010 to December 2014. Results: 53 patients were supported with VA-ECMO. The mean age was 42 year old,75% being male. The etiology was acute ischemic heart disease 10 patients (18,8%),chronic ischemic heart disease with decompensated heart failure (DHF) 9 patients (17%),dilated cardiomyopathy with DHF 24 patients (45,28%), acute heart failure as myocarditis 7 patients (13,2%) or other 3 patients (5,6%). The approach to cannulation was peripheral in 50 patients (94,33%) with mean duration of support of 7,2 days.19 patients were supported with combined IABP (35,84%). ECMO weaning was possible in 29 patients (54,7%). We observed total recovery of heart function in 11 patients (20,75%).In 23 patients was necessary to upgrade support to LVAD +/- RVAD (5 patients).During the study period 4 patients received a heart transplant. The ITU mortality was 26,41% (14 patients) and the overall mortality at hospital discharge was 43,4% (23 patients). Refractory shock with multiorgan failure was the most common cause of death (16 patients, 30,2%), followed by complications related with ECMO, as uncontrolled hemorrhage (11,32%, 6 patients).Cardiogenic shock secondary to acute myocarditis represents the group with better overall survival. Conclusions: In-hospital survival rate of patients with VA-ECMO varies up to 50% according to the cause of the cardiac dysfunction. While it remains difficult to determine which patients will benefit from VA-ECMO. Patients who require ECMO as a result of reversible causes such as myocarditis appear to have the best prognosis with a high rate of recovery. There remains a poor outcome for patients with ischemic heart disease. 103 EXTUBATION FAILURE IN NEONATES UNDERGOING CARDIAC SURGERY: PREVALENCE, ETIOLOGY AND RISK FACTORS Shinya Miura, Nakano Satoshi, Masaki Osaki Learning Objectives: Extubation failure (EF) is associated with increased ICU stay, complications and mortality. Young children after cardiac surgery has experienced
surgery for congenital heart disease (CHD). We aimed to further validate the VVR in this patient population and determine the time point within the early recovery period at which it is most predictive of postoperative outcome. **Methods:** Over a 6 month period, we prospectively reviewed consecutive patients who recovered from surgery for CHD in the cardiovascular ICU at our center. VVR was calculated at 6, 12, 24, and 48 hr postoperatively as follows: VVR = ventilation index (RRIP*PIP+PEEP) + 25% of RRIP + 30% of PIP + 50% of PEEP. VVR was calculated in the early postoperative recovery period can be a strong predictor of prolonged hospital LOS. Further research in a larger, multi-centered cohort should be conducted to determine effectiveness of the VVR as a predictor of less frequent but important outcomes such as need for extracorporeal support and death.

**108 RELIABILITY OF THE INFERIOR VENA CAVA DISTENSIBILITY INDEX MEASUREMENT IN PEDIATRIC PATIENTS**

Yosef Levenbrown, Scott Penfil, Glenn Stryjewski

**Learning Objectives:** The inferior vena cava distensibility index (dIVC) has been shown to be a reproducible measurement to evaluate for fluid responsiveness in mechanically ventilated adult patients with hypovolemic or distributive shock. There have been no studies evaluating the reproducibility of this measurement in pediatric patients. The aim of this study is to evaluate the intra-rater reliability of this measurement in mechanically ventilated pediatric patients. **Methods:** Three pediatric intensive care physicians, with formal training in bedside ultrasound, measured the dIVC in the inferior vena cava in the subcostal view using 2D ultrasound (SonoSite M-Turbo, SonoSite Inc., Brothell, Washington, USA). The minimum and maximum diameter of the IVC were subsequently measured in M-mode, with the minimum diameter obtained during a ventilator delivered breath. dIVC was calculated using the formula: dIVC = (max diameter – min diameter)/min diameter. The 3 measurements were obtained at 5-minute intervals. **Results:** In order to analyze the correlation among measurements that are expected to be non-linear and non-parametric, Spearman’s rank correlation was used. Correlation of the first and second measurement was 0.76. Correlation of the third measurement with the first and second measurements were 0.87 and 0.83 respectively. A Spearman’s rho value greater than or equal to 0.7 was considered a strong correlation. **Conclusions:** dIVC is a reproducible measurement in mechanically ventilated pediatric patients, with good intra-rater reliability.

**109 REDUCING CLINICAL ALARM FATIGUE THROUGH HEART RATE ALARM ADJUSTMENT**

Jorge Arroyo Palacios, Michele Pelter, Yong Bai, Andrea Villaroman, Koa Gudehus, Xiao Hu, Richard Fidler

**Learning Objectives:** Alarm fatigue is recognized as a critical safety issue in clinical practice. Minimal research has been conducted on appropriate alarm parameters in critical care, and this study aims to describe how clinicians interact with heart rate (HR) alarm limits in ICUs. Understanding these interactions is important to reduce the number of alarms by changing some current practices. **Methods:** Retrospective analysis of HR parameter alarms was conducted using a 6 month period, we prospectively reviewed consecutive patients who recovered from surgery for CHD in the cardiovascular ICU at our center. VVR was calculated at 6, 12, 24, and 48 hr postoperatively as follows: VVR = ventilation index (RRIP*PIP+PEEP) + 25% of RRIP + 30% of PIP + 50% of PEEP. VVR was calculated in the early postoperative recovery period can be a strong predictor of prolonged hospital LOS. Further research in a larger, multi-centered cohort should be conducted to determine effectiveness of the VVR as a predictor of less frequent but important outcomes such as need for extracorporeal support and death.
Further studies mally correlated with LOS (\(\rho = 0.32, p = 0.07\)).

Conclusion: Tailoring HR alarms earlier and more frequently, decreases HR alarms and improves sensitivity to patient condition changes. This analysis describes that current practice does not routinely include HR alarm limit changes, and when changed, limits are modified by widely varied amounts hr into the patient hospitalization. Opportunities exist for further research to produce guidelines for parameter alarm tailoring to include other vital signs.

110 IS ARTERIAL BLOOD PRESSURE IMPACTED BY SHORT VENTRICULAR TACHYCARDIA DETECTED BY PATIENTS MONITORS?
Xiao Hu, Richard Fidler, Yngi Bai, Andrea Villaroman, Jon Aldrich, Mitchell Cohen, Michele Pelter

Learning Objectives: Patient monitor alarm fatigue reduces vigilance of bedside clinicians and compromises patient safety. Solutions to this problem need a fundamental examination of the current patient monitoring paradigm including detailed studies of critical alarms. A ventricular tachycardic alarm (VT) is typically defined as an episode of >5 consecutive ventricular beats at >100 beats per minute (BPM). VT episodes under such a definition can have different hemodynamic impact and hence could be prioritized differently in future design to avoid distracting clinicians unnecessarily. Methods: VT alarms from five adult ICUs at UCSF medical center in 3/2013 were annotated by ECG experts to identify true and false alarms. We focus on true VT alarms to identify each ventricular beat. Then systolic (sys), diastolic (dia), and mean arterial pressures (MAP) were calculated before and during VT episodes. Hemodynamic impact was assessed by comparing these metrics before and during VT. Correlation is studied between hospital outcome data and VT characteristics and hemodynamic impact. Results: We analyzed 36 true VT alarms from 23 patients (14 male, age 61 ± 14, length of stay (LOS) = 6.4 ± 7.2, 5 died), VT episodes had a rate from 103 to 259 BPM (mean±152) lasting from 2.2 to 23.1 secs (mean=6.0). The mean delay from VT onset to alarm annunciation was 9.0 ± 4.5 sec. Not every VT beat generated an ABP pulse (28 episodes lost at least one pulse) and one patient became pulseless at a rate of 259 BPM. This patient died in the hospital. For the remaining 22 episodes, the drop of ABP (sys, dia, and MAP) was 28 ± 18, 4 ± 9, and 16 ± 12 mmHg, respectively. A positive correlation (Spearman \(\rho = 0.50, p < 0.001\)) exists between the degree of systolic drop and the rate of VT. Among several metrics of VT and hemodynamic impact including rate of VT, the drop of dia was maximally correlated with LOS (\(p = 0.32, p = 0.07\)). Conclusion: Further studies are needed to establish how hemodynamic compromises from VT affect outcome to inform the design of smart VT alarm that includes its hemodynamic impact.

111 SURVEY OF ANALGESIA, SEDATION, AND SHIVERING PRACTICE DURING TARGETED TEMPERATURE MANAGEMENT
Julia Weiner, Robert Nietupski, Christina Candeloro, Barry Fuchs, Cassandra Bellamy

Learning Objectives: Targeted temperature management (TTM) is considered to be the standard of care in comatose patients resuscitated from out-of-hospital cardiac arrest. Although international and national resuscitation guidelines make recommendations for the general management of TTM, there are unclear recommendations regarding the use of analgesia, sedation, and shivering management during this process. This study aims to describe current practice regarding sedation, analgesia, and shivering control in these patients. Methods: Using RED-Cap, an electronic survey application, 4587 members of professional pharmacy organizations received this survey. Pharmacists practicing in institutions utilizing TTM post-cardiac arrest were targeted for inclusion. Questions describing choice of agent, frequency, and monitoring strategies for analgesia, sedation, and shivering management were asked. Prior to national distribution, the survey was piloted in a small group of hospitals in the Philadelphia area. The national survey was open for a 4-week period with two e-mail reminders sent to non-responders. Results: Four-hundred and sixteen (9%) participants responded to this survey. The majority of responders utilized analgesia (85%), sedation (91%), and shivering management (89%) during TTM post cardiac arrest. While multiple answers were allowed, the most commonly used analgesic agents were fentanyl continuous infusion (93%) and fentanyl intermittent boluses (44%). The most commonly used sedative agents were propofol (82%), midazolam continuous infusions (58%), midazolam intermittent boluses (30%), and dexmedetomidine (23%). The most commonly used agents for shivering management were neuromuscular blocking agents (86%), meperidine (44%), sedatives (44%), and buspirone (42%). There were significant variations in the specific monitoring strategies for each domain. Conclusion: Our study suggests that the majority of responders utilize medications for the management of analgesia, sedation, and shivering. However, the overall management of analgesia, sedation, and shivering during TTM after cardiac arrest varies significantly.

112 PREVALENCE AND IMPACT OF DIASTOLIC DYSFUNCTION IN INFANTS AFTER REPAIR OF AORTIC COARCTATION
Sujata Chakravarti, Reina Tan, Puneet Bhata

Learning Objectives: Diastolic dysfunction (DD) is common in patients with left heart obstruction. This dysfunction is known to be persistent despite surgical correction of the congenital defect. The prevalence of early DD in infants after repair coarctation of the aorta has not been described. Furthermore, the clinical impact and natural history are not known. The objective of the study was to determine if early DD is common in infants after the repair of coarctation of the aorta. Secondly, we sought to determine if the presence of DD impacts post-operative course. Methods: We conducted a retrospective review of pediatric patients who underwent congenital heart surgery at our institution from January 1, 2013 to September 30, 2014. All patients less than 3 mo of age who underwent repair of coarctation of the aorta were included. Patients with associated congenital heart defects other than atrial and ventricular septal defects were excluded. The primary outcome measure was the presence of DD as determined by echocardiographic parameters. Secondary outcomes included time to negative fluid balance, time to extubation, reintubation rate, and length of stay. Results: A total of 19 patients were included. The median age at surgery was 6 days (range 2–90 days). The median weight was 3.2 kg (range 1.6–3.8 kg). 8 patients had evidence of early DD based on echocardiographic criteria. The median time to negative fluid balance, time to extubation, reintubation rate, and length of stay were not significantly different between the two groups. Conclusion: Early DD is common in neonates after repair of coarctation of the aorta, but the presence of DD does not seem to significantly impact the post-operative course. Limitations of this study include small sample size.

113 ACUTE DECOMPENSATION NEEDING READMISSION TO PEDIATRIC CARDIAC ICU
Aarti Bavare, Kimia Rafie, Cody Cruz, Patricia Bastero-Minon, Paul Checchia

Learning Objectives: Readmissions to ICU shortly after discharge are important indicators for ICU and impact patient outcomes greatly. Acute decompensation and readmission causes a huge burden on resources and significant discontent for caregivers and family. There is paucity of data on readmission to pediatric cardiac ICU (PCICU) shortly after discharge. We investigated the characteristics of patients that had acute decompensation needing readmission to
INR prolongation caused by bivalirudin. Adult patients receiving bivalirudin as a bridge to warfarin in 2014 were retrospectively evaluated. Patients were excluded if they had a thrombophilia, or if the INR was not checked appropriately after stopping bivalirudin. Data recorded included patient demographics, indication for bivalirudin use, dose requirements of bivalirudin, and changes in the INR when starting and stopping bivalirudin. Univariate analysis was performed to determine variables associated with a higher change in INR when discontinuing bivalirudin. Variables with a p<0.3 were included in a multivariate analysis. Results: Bivalirudin was used as a bridge to warfarin in 50 patient admissions. Variables with ventricular assist devices as a bridge-to-transplant represented the majority of the patient population (37, 74%). The most common INR goals were 2.0–3.0 (24, 48%) and 2.5–3.5 (17, 34%). Notable past medical history included heart failure (46, 92%), atrial fibrillation (30, 60%), stroke (11, 22%) and chronic renal impairment (22, 44%). The mean initial bivalirudin rate was 0.076 mg/kg/hr and the mean increase in INR after starting bivalirudin was 0.6. The mean final bivalirudin rate was 0.13 mg/kg/hr and the mean change in INR after stopping bivalirudin was 0.7. On multivariate analysis, factors associated with a higher change in INR after stopping bivalirudin included a higher serum creatinine (p=0.033), a higher change in INR when starting bivalirudin (p=0.028) and a higher final bivalirudin rate (p<0.001). Conclusions: The change in INR when starting or stopping bivalirudin appears to be a patient-specific dose-related response. Future research efforts will include prospective evaluation of a protocol for appropriate timing of bivalirudin discontinuation.

PRISM III VS. RACHS-1 AS PREDICTORS OF MORTALITY IN CHILDREN WHO UNDERWENT CARDIAC SURGERY

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Learning Objectives: Congenital Heart Disease (CHD) is the most common congenital disorder, and one of the leading causes of death from congenital malformations. Various clinical scoring systems, a uniform and objective perspective to predict severity of illness, clinical course and outcome is obtained for Pediatric Cardiac Intensive Care Unit (PCICU). Pediatric Risk of Mortality (PRISM III) Score is a scoring system that evaluates severity of illness or injury in patient populations, by using information regarding cardiovascular and neurologic parameters, as well as acid-base, electrolyte and hematologic values. Risk Adjustment for Congenital Heart Surgery (RACHS-1) Score is another system that measures the mortality risk in children (<18 yr old) with CHD surgery. The hypothesis is that PRISM III Score correlates better to severity of illness and mortality than RACHS-1 Score in children who underwent cardiac surgery. Methods: A retrospective observational study was conducted evaluating all CHD patients (0–18 yr old) who underwent cardiac surgery at “Centro Cardiovascular de Puerto Rico y el Caribe” hospital from November 2011 to November 2012. Length of stay at PCICU, days in mechanical ventilation, and mortality were collected for PRISM III and RACHS-1 scores in a 14 days period. Patients were categorized in 3 groups according to the PRISM III and RACHS-1 scores. Statistical analysis for these data using Kruskal-Wallis test and univariate logistic regression was performed. Results: A total of 162 patients were used for the study, and the overall mortality was 8.6%. Data showed that non-survivors spent more time at the PCICU (28 days), than survivors (11 days). Patients with higher RACHS-1 and PRISM III scores had more time at PCICU and days with mechanical ventilation. From the statistical analysis, the odds ratio for mortality obtained for PRISM III was 2.6 and RACHS-1 was 5.7. Conclusions: Due to the odds ratio of mortality; we can deduce that in a parameter of 14 days the RACHS-1 is three times more effective in predicting mortality than PRISM III.

EMPIRIC CUT-OFF OF ANTI-XA FOR PREDICTING A SIGNIFICANT THROMBOTIC OR BLEEDING IN ECMO PATIENTS

Natalie Henderson, John Berkenbosch, Janice Sullivan, Aaron Calhoun, John Myers, Terri Wells, Olivia Mittel, Deanna Todd-Tzianotos

Learning Objectives: Recent yr, use of Anti-Xa levels to determine adequacy of anticoagulation during ECMO support has become more popular. Optimal Anti-Xa levels, which accurately predict serious adverse hematologic events (bleeding or thrombosis), have not been well studied. However, this cut-off was not empirically based. In the current study we define the optimal cut-off for Anti-Xa to alert clinicians that an ECMO patient may experience a bad non-fatal outcome. Methods: A single-center, retrospective review of 30 neonatal and pediatric ECMO patients from July 2013 to July 2015 was performed. Lab values studied were collected within a 30-minute window of one another. Two mean receiver operator characteristic curves were developed to evaluate the performance of anti-Xa in predicting a thrombotic event or significant bleeding for ECMO patients. Chi-square tests were used to determine which cut-off was optimal and minimized the error rate of prediction (false positives, false negatives). Results: Anti-Xa performed well at predicting a thrombotic event (AUC=0.721, 95% CI 0.53–0.92, p=0.038). A cut-off of 0.25 was established as the optimal cut-off (sensitivity =81%, specificity=67%, PPV=81%, NPV=58%); and performed significantly better than a cut-off of 0.2 (sensitivity =54%, specificity=47%, PPV=47%, NPV=54%). Anti-Xa did not perform well at predicting a significant bleed (AUC=0.567, 95% CI 0.35–0.79, p=0.549); however, these results may be threatened by the low sample size. Nonetheless, a cut-off of 0.25 was also suggested as the optimal cut-off (sensitivity ~62%, specificity~40%, PPV=51%, NPV=51%). Conclusions: The goal Anti Xa should be at least 0.25 to decrease the risk for significant thrombotic events. Further studies should be performed to determine the optimal range of Anti Xa values which minimizes the risk for bleeding and thrombotic events.

VALIDATION OF USCOM BP+ IN CHILDREN AND ADOLESCENTS: A PRELIMINARY REPORT

Bedangshu Saikia, Graham Derrick, Tony Fordham, Joe Brierley

Learning Objectives: Whilst brachial cuff sphygmomanometry has been the method of choice for BP measurement for over 100 yr, recently a cuff method has been developed and validated in adults enabling non-invasive measurement of central blood pressure (CBP) from upper arm oscillometric waveform acquired at supra-systolic pressures by a portable, simple, “press button” device similar to conventional BP device. If similarly validated in children, this will enable earlier/
better optimisation of hemodynamics/SVRs in severe sepsis as CPB is the force the heart contracts against. Methods: Validation of the device against gold standard direct aortic pressure measurement was undertaken. All children (<18 yr) undergoing cardiac catheterisation with anticipated central aortic cannulation were approached and consented May-July 2015, when research team available, irrespective of underlying cardiac defects. Simultaneous repeated measurements of direct aortic pressures and peripheral BP derived CBP were performed and recorded. Results: 11 patients, total 44 simultaneous cath lab and BP+ central blood pressure measurements. Mean age 6y, SD 5.8yr; range 0–15.5yr. In infants (n=8), mean cSBP and cDBP were both significantly higher when measured with BP+ as compared with cath lab measurements, 171±(26.87) vs 76.5±(0.7), p=0.03 and 96±(12.72) vs 29±(2.82), p=0.02 respectively. In other age groups, the difference in the measurements for both mean SBP and mean DBP (BP+ and cath lab) were not statistically significant; 1–3yr age group(n=16): cSBP 88.25±(10.29) vs 95.75±(15.94), [p=0.46], cDBP 45.5±(10.75) vs 46.5±(4.35), [p=0.80]; 3–12yr group (n=8): cSBP 77.5±(5.5) vs 78±(11.31), [p=0.96], cDBP 41±(9.89) vs 41.5±(10.6), [p=0.5] and 12–18yr group (n=12): cSBP 77.35±(4.6) vs 79.33±(4.6) [p=0.67], cDBP 41.67±(4.73) vs 49.67±(4.62) [p=0.1]. Mean cSBP(sD) and DBP(sD) are in mmHg. Conclusions: Our preliminary observation supports use of this device in children and teenagers, but suggests caution in infants and further work on the algorithm in this population is recommended. However, use in septic shock is now planned.

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RECOVERY OF RENAL FUNCTION IN PEDIATRIC PATIENTS SUPPORTED BY ECMO AND CRRT
Nakano Satoshi, Masaki Osaki, Shinya Miura

Learning Objectives: Acute kidney injury (AKI) is known to be associated with mortality in cardiac extracorporeal membrane oxygenation (ECMO) patients. Simultaneous use of Continuous Renal Replacement Therapy (CRRT) and ECMO remains controversial because it might increase the risk of developing anuria and chronic renal failure (CRF). We sought to clarify the characteristic and recovery of renal function in pediatric cardiac patients supported by ECMO and CRRT, and to identify potential risk factor for developing CRF. Methods: A retrospective chart review of patients supported by ECMO at a tertiary pediatric cardiac center from January 2010 to June 2015. All patients were supported by CRRT simultaneously. Patient demographics, details of ECMO support, and renal function were analyzed. Results: 49 cardiac patients were supported by ECMO/CRRT (single ventricle 33, two ventricle 16). Median age was 3.7 (0-149) mo and body weight was 4.0(2.0–36)kg, 39 patients (80%) were weaned form ECMO, and 26 patients (53%) discharged. Urine outputs at 24 hr after ECMO induction were 0.4ml/kg/h (0.0–8.9), and urine outputs at ECMO weaning were 0.6ml/kg/h (0.0–6.9). Among 39 who came off ECMO, 32 patients (82%) were weaned from CRRT; 16 patients (50%) required some kind of CRRT transiently after weaning from ECMO. 7 patients (18%) failed to be separated from CRRT and developed CRF. Univariate analysis revealed longer ECMO run (276h vs.120h p<0.01), sepsis (3/7 vs. 2/32 patients (18%) failed to be separated from CRRT and developed CRF. Univariate analysis revealed longer ECMO run (276h vs.120h p<0.01), sepsis (3/7 vs. 2/32 p=0.03), single ventricle physiology (7/7 vs.16/32 p=0.05), and lower urine output at ECMO weaning (0.5ml/kg/h vs. 1.15ml/kg/h p=0.01) as a risk factor for developing CRF. Conclusions: For pediatric cardiac patients who supported by ECMO/CRRT, transient renal dysfunction is common phenomenon and spontaneous recovery is expected. However, careful observation is mandatory for patients with longer ECMO run, history of sepsis, single ventricle physiology, and lower urine output at ECMO weaning in this cohort.

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PULMONARY ARTERY OCCLUSION PRESSURE IS A POOR PREDICTOR OF CIRCULATING BLOOD VOLUME
Timothy Perkins, Kiersten Norby, Laura Spector, David Inouye, Richard Severino, Michael Hayashi, Danny Takehanshi, Milae Yu

Learning Objectives: Current resuscitation endpoint guidelines in some patients with shock include central venous pressure (CVP) despite data showing a poor relationship between CVP and blood volume (BV). While the pulmonary artery catheter (PAC) is not used as frequently as in the past, many still find value in the data it provides. Our purpose is to evaluate if pulmonary artery occlusion pressure (PAOP) accurately estimates circulating blood volume when compared with blood volume analysis (BVA). Methods: Surgical ICU patients with various types of shock and respiratory failure underwent simultaneous measurement of PAOP, BVA (BVA-100; Daxor Corp., NY, NY), and hematocrit (Hct) at about 24 hr after initial resuscitation. BVA entailed I-131 tagged albumin injection and waiting 12 min for mixing. Radioactivity was measured in samples drawn at 12, 18, 24, 30 and 36 min from I-131 injection to correct for albumin transudation and calculate plasma volume (PV). PV and Hct were used to calculate red blood cell volume (RBCV) and total blood volume (BV). Results were compared to normal values for height, weight, and gender, then expressed as percent deviation from normal. Values <90% were considered hypovolemic, 0–80% euvoelmic, and >80% hypervolemic. PAOP measurements, in mm Hg, were categorized as <12 (low), 12–17 (normal), and >18 (high). Results: Data from 96 patients were analyzed. Demographics were: age 62 ± 16 yr, 61% male, 49% female, APACHE II score 27 ± 3, and mortality 18%. Types of shock included severe sepsis/septic shock (69%), cardiovascular collapse (15%), and respiratory failure (35%). Sixteen of 96 (17%) had low PAOP; 4 of the 16 (25%) with low PAOP were hypervolemic on BVA. Forty of 96 (42%) had high PAOP; 7 of the 40 (18%) with high PAOP were hypervolemic on BVA. Bowker’s test of symmetry showed lack of homogeneity between PAOP and BV categories (p = 0.0018). Conclusions: We show that 25% of shock patients with low PAOP are hypervolemic on BVA. Among those with high PAOP, 18% are hypovolemic on BVA. PAOP can provide useful cardiac information but does not accurately reflect circulating BV status.

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EFFICIENCY OF SIMPLE HEMOFILTRATION WITH CONCURRENT VENO-ARTERIAL EXTRA-CORPOREAL LIFE SUPPORT
Tanya Chadha, Jeffrey Cies, Wayne Moore, Thomas Beaulieu, Jason Fisher, Arun Chopra

Learning Objectives: We report the efficiency of simple hemofiltration without dialyzer in low with veno-arterial extra-corpooreal life support (VA-ECLS) for a newborn with severe congenital diaphragmatic hernia complicated by oliguric renal failure, fluid overload and pulmonary hypertension. To our knowledge, this is the first time the efficiency of this circuit has been reported. Methods: We conducted a retrospective review of a patient treated with VA-ECLS and concurrent use of hemofiltration from an Arterial-Venous shunt using a Minniret Hemocor HPH Junior hemofilter with a pore size of 65,000 Daltons. While undergoing hemofiltration, samples of effluent were sent to the lab. Concentrations of effluent vancomycin were measured by enzymatic homogenous competitive immunoassay (Instrument: Ortho Clinical Diagnostics Vitros 5600) and concentrations of effluent phenobarbital were measured by chemiluminescent microparticle immunoassay (Instrument: Abbott Architect i1000). Results: The measured vancomycin and phenobarbital effluent concentrations were 8.3 mcg/ml and 17.8 mcg/ml respectively. The blood flow rate to the patient at this time was 110 ml/kg/min with an estimated hemofiltration blood flow rate of 33.5 ml/kg/min. The clearance rate was 664 mg/hour for vancomycin and 1424 mg/hour for phenobarbital. This would correspond to a half-life of 33 hr for vancomycin at the prescribed 45 mg/dose at a serum concentration of 15.1–15.1 mcg/ml and 21 hr for phenobarbital at the prescribed 59.8 mg dose and a serum concentration of 28.5–35.7 mcg/ml with no concurrent renal clearance. Conclusions: There are many variables in the effectiveness of hemofiltration removal of medications without dialysis when running in parallel with an ECLS circuit. Clinically significant removal was achieved in this single infant and this may represent an under-appreciated variable in calculating appropriate dosing and intervals in pediatric patients treated with ECLS and concurrent simple hemofiltration.
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51.5%. While CI-uncal predicted “CI-TD>5L/min*m²”, it failed to predict has acceptable accuracy, precision is not appropriate with a percentage error of 10.35% and prediction of critical thresholds. Although CI-uncalib derived by ClearSight CI-PC provides an assessment of CI-TD with appropriate accuracy, precision and prediction of critical thresholds. Although CI-uncalib derived by ClearSight has acceptable accuracy, precision is not appropriate with a percentage error of 51.5%. While CI-uncalib predicted “CI-TD>5L/min*m²”, it failed to predict “CI-TD<5L/min*m²”. Despite inappropriate estimation of absolute values of CI-TD, CI-uncalib provides acceptable prediction of trends.

122 PREDICTING FLUID RESPONSIVENESS IN POST-CARDIAC SURGERY PATIENTS

Loek Meijs, Alexander Bindels, Arnout Roos, Alexandre Lima, Jan Bakker

Learning Objectives: Mean systemic filling pressure (Pms), representing stressed intravascular volume, is a potential determinant of fluid responsiveness. Pressure to venous return (pVR), the difference between Pms and right atrial pressure (RAP), calculates the driving force for venous return and thus cardiac output (CO). Fluid challenge (FC) is used to increase CO. As an appreciative consideration of preloading dependence, this study identifies the physiological coupling between Pms, pVR and CO during FC in post-cardiac surgery patients. Methods: Prospective, observational study in post-coronary bypass artery grafting (CABG) and post-aortic valve replacement (AVR) patients, equipped with a cardiac output catheter (PICCO*, Pulsion Medical Systems™), receiving a FC (500 mL Ringer’s lactate) in 4 min. Pms and pVR were calculated by a computed algorithm (Navigator™, CPL Innovations, Australia) and hemodynamics were recorded at 2, 5, 10, 15 and 30 min post-FC. CO percent changes were stratified as <0%, 0–5%, 5–10%, 10–15%, 15–20% and >20%. Logistic regression was performed and a p-value <0.05 was considered statistically significant. Results: We included 40 patients (20 CABG / 20 AVR), mean age 66 ± 9 yr. Baseline CO, Pms and pVR were similar in CABG and AVR. An increase in CO >20% was observed in 9 AVR (51.5%) and 11 CABG (55%) patients. After FC, Pms increased 27% and 15%, and pVR increased 11% and 16%, for AVR and CABG respectively. We used stepwise logistic regression to identify best predictors for CO changes, using heart rate, RAP, mean arterial pressure, Pms and pVR as covariates. We found that Pms was an independent predictor of CO changes after FC (estimate= -1; 95%CI: -0.14; -0.03; p=0.007), indicating that the lower Pms at baseline, the more likely the patient would increase CO. Conclusions: This study shows that, based on a predictive model to estimate intravascular filling changes in post-cardiac surgery patients, the most clinically useful identified predictor for FC was Pms. For clinical decision-making, patients with lower Pms (independent of global hemodynamics) are candidates for volume expansion.

123 PREDICTORS OF RESPONSE TO INSULIN, GLUCAGON, AND LIPID EMULSION IN ANTIHYPERTENSIVE OVERDOSE

Hilary Gerwin, Alysha Behrman, Robert Goertzen, Edward Otzen, Madeline Foertsch, Kristen Hillebrand, Jessica Winter, Nicole Harger

Learning Objectives: Optimal treatment for severe beta blocker (BB) and calcium channel blocker (CCB) toxicity is not clear. The study aim was to determine predictors of response when using hyperinsulinaemia euglycaemia therapy (HIET), glucagon, and lipid emulsion in CCB and BB overdose. Methods: Single-center, retrospective cohort study of patients admitted for presumed CCB and/or BB overdose were screened. Patients with a mean arterial pressure <65 mmHg that received HIET, glucagon, or lipid emulsion were included and grouped into responders (R) or non-responders (NR) based on hemodynamic improvement observed following therapy. Dosing strategies and timing of HIET, glucagon, and lipid emulsion therapy were described; in addition to HIET safety. Data presented as mean (SD) or median (IQR). Results: 14 patients were included for analyses (8 R; 6 NR). There were no differences in baseline demographics between groups (age 49 ± 21 vs 52 ± 15 yr, p=0.82; sequential organ failure assessment score 10 ± 4 vs 9 ± 5, p=0.63; number of comorbidities 4 ± 5 vs 2 ± 3, p=0.57). There were no differences in the agents overdosed on between R and NR were observed (CCB: 12.5% vs 50%, p=0.25; BB: 62.5% vs 16.7%, p=0.14; CCB & BB: 25% vs 33.3%, p=1.0). Vasopressor use (50% vs 66.7%, p=0.63) and survival (75% vs 100%, p=0.47) were similar. Use of initial therapies were similar between groups (HIET: 25% vs 16.7%, p=1.0; glucagons: 50% vs 33.3%, p=0.63; lipids: 25% vs 50%, p=0.58). Time, in hr, to initial therapy post ingestion was similar (HIET: 15.5 ± [2–31.7] vs 9 [2.8–7.4], p=0.63; glucagon: 5.5 ± [0.9–11.4] vs 3.1 ± [1–3.5], p=1.0; lipid emulsion: 6.9 [2.3–21.9] vs 4.3 ± [1.6–8.0], p=0.39). Nine (66.7%) patients treated with HIET had a blood glucose <70mg/dL. Conclusions: Hemodynamic response to HIET, glucagon, and lipid emulsion is highly variable. Hypoglycemia was observed with HIET. Larger studies are needed to evaluate the efficacy of HIET, glucagon, and lipid emulsion.

124 DISCREPANCY BETWEEN INVASIVE BLOOD PRESSURE AND NON-INVASIVE BLOOD PRESSURE AS A PREDICTOR OF SCVO2

Junji Kumawasa, Akito Ohara, Hisakazu Kohata, Kenichi Aoyagi

Learning Objectives: The pathophysiological meaning of the discrepancy between systolic blood pressure invasively measured (SIBP) and systolic blood pressure non-invasively (SNIBP) remains unclear. Previous study reported that there was correlation between the discrepancy and central venous oxygen saturation (ScvO2). The aim of this study is to determine whether the discrepancy SIBP and SNIBP can predict whether ScvO2 is lower than 70%. Methods: Design: A cross sectional study. Setting: ICU at a single tertiary medical center in Osaka, Japan. Patients: All adult patients who were 18 yr or older and were admitted to ICU at Sakai City Medical Center from Jul 2013 to Jun 2015. We included consecutive patients who were in shock at the ICU admission and whose SIBP, SNIBP and ScvO2 were simultaneously measured. Interventions: None. Measurements: SIBP was measured at the radial artery and SNIBP was measured at the same side of the brachial by using oscillometric method. ScvO2 was measured by gas analysis of blood sample from central venous catheter. They were simultaneously measured at the same time. We defined the ΔBP as [SIBP – SNIBP]. Results: 111 patients were recruited in this study. The mean SIBP was 80.0 mm Hg (SD 9.5), mean SNIBP was 83.4 mm Hg (SD 10.9), mean ΔBP was -3.46 mm Hg (SD11.4) and mean ScvO2 was 66.4% (SD 10.9). We generate the receiver operating characteristic curve of ΔBP for predicting ScvO2 <70%. The AUC is 0.81 (95%CI, 0.73 - 0.89). When cut off point of ΔBP is defined as 0, sensitivity is 65.7 (95%CI, 53.1 - 76.8), specificity is 97.7 (95%CI, 88 - 99.8), positive likelihood ratio is 28.9 (95%CI, 4.5 - 119.2) and negative likelihood ratio is 0.35 (95%CI, 0.18 - 0.69). Conclusions: The discrepancy between systolic blood pressure invasively measured and systolic blood pressure non-invasively measured can accurately predict whether ScvO2 is lower than 70%. When this discrepancy is higher than 0, ScvO2 is very likely to be lower than 70%.

125 FLUID OVERLOAD FOLLOWING PEDIATRIC CARDIOPULMONARY BYPASS: A PROSPECTIVE, OBSERVATIONAL PILOT STUDY

Elizabeth Wilson, Anthony Sochet, Patricio Ray, John Berger

Learning Objectives: Fluid overload (FO) after cardiopulmonary bypass (CPB) has been correlated with mortality and morbidity. We are currently exploring candidate biomarkers to predict FO after CPB. To delineate statistical power and
recognize relevant clinical variables associated with FO. We assessed the epide-
milogy of FO after CPB in our institution. Methods: We performed a single
center, prospective, observational pilot study in children aged 0 to 18 yr undergo-
ning CPB from June to July 2015. We excluded subjects with existing renal and
hepatic impairment, coagulopathy and prematurity. The primary outcome was
peak %FO ([Postoperative weight (kg) – Daily weight (kg)]/preoperative weight
(kg) x 100%). Extensive descriptive data including anthropometrics, surgical data
and postoperative course were obtained. A FO ≥10% cohort was compared to a
FO <10% cohort using unadjusted, two-tailed Wilcoxon rank-sum tests and
student t tests for continuous data and Fisher’s exact test for categorical data.
Results: 21 patients were enrolled during the study period. Median age was 32
mo (interquartile range 9–102) with seven (33%) patients identified with cyto-
notic heart disease. No patient required dialysis or died during admission. Peak
FO was noted on post-operative day 2 with a mean of 9.1% (+/- 12.9%). Thirteen
(62%) patients had FO <10% and eight (38%) had FO ≥10%. The two cohorts
did not differ in risk stratification or incidence of postoperative acute kidney
injury. The FO ≥10% cohort had longer CPB times (117 vs. 69 min, p=0.03),
cross clamp times (63 vs. 31 min, p=0.04) and higher vasoactive-inotropic scores
(8 vs. 3, p=0.04). The FO ≥10% cohort were younger (7 vs. 50 mo, p=0.05).
Conclusions: These data from our single center pilot suggest a moderately high
prevalence of FO in children after CPB. The degree of FO appears correlated to
surgical duration and inversely to age. These data will allow the stratification
and validation of planned biomarker research.

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AGE-DEPENDENT CHANGES OF AMPK-ACTIVATED
PATHWAY IN THE HEART FOLLOWING HEMORRHAGIC
SHOCK IN MICE

Dzmitry Matsiukevich, Lindsey Klingbeil, Giovanna Piraino, Paul Hale, Basilia
Zingarelli, Vivian Wolfe

Learning Objectives: Aging is a risk factor for multiple organ failure, includ-
ing myocardial depression in critically ill patients. AMP-activated protein kinase
(AMPK) is a crucial sensor of energy metabolism by modulating mitochondrial
biogenesis. We hypothesized that metabolic pathways are altered in the heart during
hemorrhagic shock and are age dependent. Methods: HS was induced in anesthe-
tized young male (2–4 mo old) and mature mice (9–10 mo old) by withdrawing
blood from the femoral artery to a mean arterial pressure of 30 mmHg for 90
min. Animals were then resuscitated with the shed blood and Lactate Ringer’s solution
(1X2). At the time of resuscitation, one group of mice received an AMPK activa-
tor, AICAR (5-amino-4-imidazolecarboxamideriboside-1-β-D-ribofurano-
side), or vehicle intraperitoneally. Mice were sacrificed at 3hr after resuscitation and hearts
were harvested for biochemical assay. Results: In young mice, nuclear expression of
both total and active phosphorylated form of AMPK (pAMPK) was significantly
increased after HS (1.49 and 1.95 fold increase, respectively) in vehicle-treated mice
when compared with baseline levels of age-matched controls. Nuclear expression
of PGC1-α was also increased in vehicle-treated young mice after HS (1.48 fold
increase) when compared with baseline levels. On the contrary, nuclear levels of
AMPK, pAMPK, and PGC1-α were markedly decreased in mature mice after HS
in comparison with levels of age-matched controls. Treatment with AICAR ame-
liorated post-resuscitation MAP levels in young mice when compared with vehicle
therapy. Treatment. This amelioration was associated with increase in nuclear expression
of AMPK, pAMPK and PGC1-α (2.07,4,35 and 1.54 fold increase, respectively)
when compared to baseline levels. However, AICAR treatment did not amelio-
rated MAP or affected AMPK signaling pathways in mature mice. Conclusions:
Our data suggest that during HS, compensatory restorative metabolic pathways
are activated in the heart of young, but not in mature mice, thus suggesting better
capability of a metabolic recovery after stress in young animals.

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SEVERE TRAUMATIC BRAIN INJURY PATIENTS DEVELOPING
DEEP VEIN THROMBOSIS

Paola Mendez, Lacy Avila, Amanda Chavez, Ali Seifi

Learning Objectives: Deep venous thrombosis (DVT), often prudonal for
pulmonary embolism, is known to cause significant morbidity and mortality.
Postoperative chemoprophylaxis use is controversial among clinicians who care
for severe traumatic brain injury patients due to concern of intracranial hemor-
rhage (ICH) and its pernicious effects. Methods: We conducted a retrospective
case control study with patients admitted to University Hospital neurosurgical
ICU in San Antonio, Texas from 2011–2013. Severe TBI was defined as patients
who required intracranial pressure monitoring within 48 hr of admission. Patients
less than 18, DVT on admission, pregnancy, chronic anti-coagulation, and death
within 72 hr were excluded. Demographics, complications, hospital length of stay
(LOS), chemoprophylaxis start date were gathered. ICH progression was defined
as lesion expansion or new ICH on repeat CT scan. Fisher’s and Mann-Whiney
U tests were used to analyze data. Results: A total of 155 records were selected
after exclusion criteria. The cohort was mostly white (71.6%), male (76.8%) with
median age of 41. A total of 122 patients received prophylaxis. The mean number
of days post admission to begin prophylaxis was 5.04±3.93, while post stable
head CT was 6.69. Meaning some received prophylaxis prior to stable CT. DVT
incidence was 12.26% and PE 2.58%. We found 30.5% of patients who did not receive
chemoprophylaxis developed a DVT vs. 7.38% of patients who received prophyl-
axis. We observed 9.3 days longer LOS in those who developed a DVT, and did
not receive prophylaxis. Mortality rate was 18%. ICH progression after prophyl-
laxis was 7.74%. Conclusions: Our data suggest a lower incidence of DVT in
those who received chemoprophylaxis and longer hospital LOS than those who
did not. We found improved mortality in patients who received chemoprop-
lyphaxis at any point of hospital stay. Thus, consider starting chemoprophylaxis
to reduce complications of DVT, LOS and hospital costs.

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AN EMPIRICALLY DERIVED PEDIATRIC CARDIAC
INOTROPE SCORE ASSOCIATED WITH CONGENITAL
HEART SURGERY

Punjak Gupta, Mallikarjuna Rao Rettiganti, Andrew Wilcox, Avisek Chakraborty

Learning Objectives: There are multiple inotrope scores available to quantify
the amount of cardiovascular support needed for children with critical illness.
None of these scores are scientifically derived. The aim of the present study was to
derive an inotrope score in infants undergoing cardiac surgery. Methods:
The study population included patients <12 mo of age undergoing oper-
ations for heart disease (2001–2014). Multivariable logistic regression models were
fitted to evaluate association of seven existing inotrope scores with composite
poor outcome (either mortality or prolonged length of stay). We developed a new
score within a hierarchical framework by representing discrete probability models
using continuous latent variables that depended on the drug dosage employed
on a particular patient. We assumed a multivariate normal prior distribution for
the effects of the four inotropes (epinephrine, dopamine, norepinephrine, and
milrinone) on the mean of the latent variables and used Markov chain Monte
Carlo (MCMC) simulations from the resulting posterior distribution to create
a score function for the composite poor outcome. Results: 367 infants qualified
for inclusion. In multivariable analysis, none of the existing inotrope scores were
strongly associated with composite poor outcome. Using MCMC simulations, we
developed the following formula for pediatric cardiac inotrope score (PCIS):
\[ \Phi(1.37\text{-milrinone})* \Phi(1.78\text{+0.004} \text{-dopamine}-1.35\text{-epinephrine}-4.59\text{-norepinephrine}+74\text{-milrino}) \]
where \( \Phi() \) is the cumulative distribution function of the
standard normal distribution given by \( \Phi\left(\frac{x}{\sqrt{2}} \right) = \frac{1}{2} \left[ 1 + \text{erf}\left(\frac{x}{\sqrt{2}}\right) \right] \).
The new PCIS was significantly associated with composite poor outcome with
an adjusted odds ratio of 1.19 (95% confidence interval, 1.01–1.40, c-statistic:
0.84). Conclusions: The newly proposed empiric pediatric cardiac inotrope score
has a high degree of discrimination for predicting composite poor outcome in
children undergoing heart surgery.

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POOR ECG SIGNAL QUALITY ASSOCIATED WITH FALSE
ARRHYTHMIA ALARMS

Yalda Shahriari, Quan Ding, Richard Fidler, Michele Peltier, Yong Bai, Andrea
Villaroman, Xiao Hu

Learning Objectives: Poor ECG signal is a challenge for human and computer-
ized analysis, and the relationship between signal quality and false alarms (FA) is
unclear. Our recent study at UCSF showed ECG arrhythmia alarms were most of
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THE INCIDENCE OF SUBGLOTTIC STENOSIS FOLLOWING CARDIAC SURGERY IN INFANTS AND CHILDREN
Katherine Kruse, Prashant Purohit, C. Ross Cadman, Feifei Su, Gregory Hammer

Learning Objectives: Acquired subglottic stenosis (SGS) is a complication of tracheal intubation and mechanical ventilation in children following cardiac surgery. Infants <1 year of age may be at high risk due to small tracheal diameter and the need for prolonged postoperative mechanical ventilation. The incidence of SGS in infants has been found to be 2.3%. The use of cuffed endotracheal tubes (ETTs) has also been associated with increased risk of SGS. We hypothesized that the incidence of SGS following cardiopulmonary bypass in pediatrics is higher in younger patients (age <1 year) and in patients intubated with cuffed vs uncuffed ETTs.

Methods: We performed a retrospective review of children <18 yr of age who had cardiac surgery with CPB at Lucille Packard Children's Hospital Stanford (LPCH) between January 2009 and May 2014. We recorded demographics, cardiac/other diagnoses, ETT used (size, cuffed vs uncuffed), duration of CPB and mechanical ventilation, airway complications and outcomes. All patients in our cardiac surgery/CPB database having initial procedures at LPCH and with the diagnosis of “stenosis of larynx” were identified. Results: Fourteen of 2,241 (0.62%) patients undergoing cardiac surgery/CPB were diagnosed with SGS by fiberoptic +/- direct laryngoscopy; 15 of 1,052 (1.2%) infants developed SGS. Age <1 year was associated with the development of SGS (p<0.01). Eight patients had cuffed and 5 had uncuffed ETTs; this information was missing for one patient. The use of a cuffed ETT was not associated with increased risk of SGS. Patients with SGS were mechanically ventilated for more than 3 days, suggesting that prolonged intubation may be an additional risk factor.

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ARGATROBAN DOSE REQUIREMENTS IN OBESE VERSUS NON-OBESE PATIENTS
Emily McCleary, Jennifer Ashton, Marc Zumberg

Learning Objectives: Though the linear effect of actual body weight on argatroban metabolism has been established in non-obese adults, the effect of body mass index (BMI) and obesity is unclear. Data is needed on argatroban dosing in obese critically ill adults. Critical illness increases bleeding and thrombosis risk; one study found that obesity may further increase risk. A single study failed to show associations between obesity and dosing requirements, but had several limitations. This study was conducted to determine if significant differences exist in average argatroban dose required to achieve therapeutic anticoagulation in obese vs non-obese adults with confirmed or suspected heparin induced thrombocytopenia (HIT).

Methods: This single-center retrospective cohort study included adults receiving argatroban between May 15, 2013 and September 30, 2014 for confirmed or suspected HIT with at least one activated partial thromboplastin time (aPTT) post initiation. The primary outcome was average dose achieving therapeutic anticoagulation. Secondary outcomes were initial dose, time to goal aPTT, and the proportion of patients with initial aPTT supratherapeutic, therapeutic, and subtherapeutic. Safety was evaluated by the composite of bleeding, new thrombosis, or failure to achieve goal.

Results: 48 patients were included; 60.4% critically ill, 35% obese. No significant difference existed in average argatroban dose achieving therapeutic anticoagulation in obese vs non-obese patients (p=0.917). There were no significant differences in secondary or safety endpoints. Patients with BMI 40 kg/m² or greater were more critically ill than those with BMI 30–39.9 kg/m² and exhibited a trend toward increased dose achieving therapeutic anticoagulation (3.5 vs 0.96 mcg/kg/min). Conclusions: Results suggest that argatroban dose requirements and clinical outcomes are similar in obese and non-obese patients. Increased dose requirements may exist in the morbidly obese subgroup. A larger, more comprehensive study is needed to evaluate the potential need for increased initial argatroban dosing in this population.

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EFFICACY AND SAFETY OF MILRINONE VERSUS DOBUTAMINE IN CARDIOGENIC SHOCK
Tyler Lewis, Caitlin Aberle, Diana Esiason, John Papadopoulos

Learning Objectives: The initial management of cardiogenic shock (CS) often includes inotropic therapy with milrinone (MIL) or dobutamine (DOB), but limited data exists on the difference in efficacy between the two agents. The objective of this study was to compare effectiveness and safety between MIL and DOB as initial treatment for CS.

Methods: This was a retrospective study of patients with CS who received MIL or DOB from January 2013 through February 2015. We excluded patients with mixed shock or mechanical circulatory support. We used a unique primary endpoint, time to resolution of CS or therapeutic failure, with important clinical relevance. Additional outcomes included specific adverse events, length of stay, and mortality.

Results: A total of 100 patients were included in the analysis. 50 received MIL and 50 received DOB. The median age was 73 yr; primary diagnosis was cardiac surgery; and the most common cause of CS was prolonged cardiopulmonary bypass. Resolution of shock was similar between groups (MIL 76% vs DOB 79%, p=0.50) and the median time to resolution of CS was 24 hr in both groups (p=0.75). Arrhythmias were nearly twice as common with DOB compared to MIL (62.9% vs 32.8%, p=0.001) and DOB was more commonly discontinued due to arrhythmia (14% vs 0%, p=0.01). The most common arrhythmia was sinus tachycardia (MIL 8.2% vs DOB 24.2%, p=0.016). Hypotension occurred equally (49.2% vs 40.3%, p=0.32) and nadir mean arterial pressure was similar (88.5 mm Hg vs 89 mm Hg, p=0.48) for MIL and DOB respectively. MIL was more commonly discontinued due to hypotension (16% vs 0%, p=0.01) but there was no difference in the use of concomitant vasopressors, their dose or duration of use between MIL and DOB groups.

Conclusions: MIL and DOB were equally efficacious for the treatment of CS, DOB was associated with a higher risk of arrhythmias. MIL was more commonly discontinued due to clinician perceived hypotension, but there was no difference in the rate of hypotension between groups. MIL may be as efficacious as DOB, but associated with fewer adverse events. Further studies are warranted to assess these findings.

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THE VASOPRESSOR USE IN CARDIAC INTENSIVE CARE UNIT: 7 YEARS COHORT STUDY
Narat Sirival, Charat Thonggrayorn, Wutichaivongsaiporn

Learning Objectives: The use of vasopressor was common in cardiac intensive care unit (CICU). Due to the lack of conclusive evidence in superiority in efficacy among various types of vasopressors, the choice of vasopressor use mainly
depends on the physician preference. This study aims to describe the prevalence of vasopressor use and the trend in the use of each vasopressor medication in CICU over the past 7 yr. Methods: This is a descriptive study conducted at a tertiary referral hospital. All cardiac ICU admissions at our institution between January 2007 and December 2013 were included in this study. The use of vasopressor within given CICU day (12.00 am – 11.59 pm) during CICU stay was reviewed. Vasopressors were defined as the continuous intravenous administration of norepinephrine, epinephrine, dopamine, phenylephrine, or vasopressin regardless of duration and dosage. The use of each vasopressor was reported as the vasopressor utilization index (VUI), using the following formula Vasopressor utilization index (VUI) = (The total number of ICU days on a given vasopressor)/ (The total number of ICU days on any vasopressor). Results: Out of 5,659 ICU days with vasopressor use, dopamine was used for 4,320 (76%), norepinephrine for 958 (17%), vasopressin for 661 (12%), epinephrine for 534 (9%), and phenylephrine for 471 (8%). From 2007 through 2013, there was a slight decreasing trend in the use of epinephrine (VUIepinephrine was 0.13 in 2007 and 0.06 in 2013), phenylephrine (VUIphenylephrine was 0.14 in 2008 and 0.05 in 2013), and vasopressin (VUIvasopressin was 0.19 in 2007 and 0.05 in 2013). Norepinephrine and dopamine trends did not change. In the cardiac care unit, use of low-dose dopamine is still common (VUILow-dose dopamine was 0.46) without any decreasing trend in its utilization. Conclusions: Dopamine was the most commonly used vasopressor from 2007 through 2013 in cardiac ICU. Despite several recent trials and guidelines showing the adverse effects of dopamine use, it is still used frequently in the cardiac care unit.

134 INTRAVENOUS CHLOROTHIAZIDE IN ACUTE HEART FAILURE REFRACTORY TO LOOP DIURESIS AND ADJUNCT METOLAZONE
Maria Cardinale, Jerry Alsbuler, Jeffrey Testani

Learning Objectives: Thiazide diuretics can be used to augment diuresis in patients with congestive heart failure resistant to loop diuretics. Although intravenous (IV) thiazide diuretics are expected to provide improved bioavailability compared to oral agents, an improvement in diuresis has not been conclusively demonstrated in the literature. This study aimed to evaluate the use of IV chlorothiazide in critically ill heart failure patients deemed unresponsive to metolazone.

Methods: This retrospective study analyzed acute decompensated heart failure (ADHF) patients who were determined to be loop diuretic resistant according to an institutional protocol. All patients received at least one dose of metolazone 10 mg or greater followed by at least one dose of IV chlorothiazide 500 mg if response to metolazone was considered inadequate. Patients were excluded if they were not receiving loop diuretic for an acute exacerbation of chronic congestive heart failure or if the index dose of metolazone was administered within 2 hr of chlorothiazide. Results: A total of 45 patients (90 doses) were included in the analysis. The average IV furosemide equivalent dose of loop diuretics given over the 24-hour period prior to the index dose was 496 mg. The average length of stay was 54.7 days, and in-hospital mortality was 35.6%. The median 12-hour urine output was greater following administration of chlorothiazide compared to metolazone (1075 mL; IQR: 573–1513 mL vs. 875 mL; IQR: 427–1293 mL), but the output was greater following administration of chlorothiazide compared to metolazone. The median 12-hour urine output was 496 mg. The average length of stay for 958 (17%), vasopressin for 661 (12%), epinephrine for 534 (9%), and phenylephrine for 471 (8%). From 2007 through 2013, there was a slight decreasing trend in the use of epinephrine (VUIepinephrine was 0.13 in 2007 and 0.06 in 2013), phenylephrine (VUIphenylephrine was 0.14 in 2008 and 0.05 in 2013), and vasopressin (VUIvasopressin was 0.19 in 2007 and 0.05 in 2013). Norepinephrine and dopamine trends did not change. In the cardiac care unit, use of low-dose dopamine is still common (VUILow-dose dopamine was 0.46) without any decreasing trend in its utilization. Conclusions: Dopamine was the most commonly used vasopressor from 2007 through 2013 in cardiac ICU. Despite several recent trials and guidelines showing the adverse effects of dopamine use, it is still used frequently in the cardiac care unit.

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135 RACIAL VARIATIONS IN ECMO UTILIZATION AFTER CONGENITAL CARDIAC SURGERY
Titus Chan, Cindy Barrett, Ravi Thiggarajan, Susan Bratton

Learning Objectives: Previous studies have demonstrated racial/ethnic disparities in children undergoing congenital heart surgery. Extracorporeal membrane oxygenation (ECMO) has been used to increase survival after congenital heart surgery. For this reason, variations in post-operative ECMO usage in children undergoing congenital heart surgery may be associated with disparities in hospital survival. Methods: All children in the Pediatric Health Information Systems (PHIS) dataset undergoing a Risk Adjustment for Congenital Heart Surgery (RACHS) procedure from 2003–2014 were examined. Multivariate, multinomial logistic regression models examining hospital survival without ECMO usage, survival after ECMO and dying without ECMO usage were constructed. Results: Of 109,213 children undergoing a RACHS procedure, the major racial/ethnic groups included white (54%), black (12%), Hispanic (17%) and “other” race/ethnicity (11%). The overall post-operative ECMO usage rate was 2.3% and was highest in black (2.5%) and “other” race/ethnicity (2.6%) patients. Black patients (Odds Ratio (OR)=1.25, 95% Confidence Interval (CI)=1.11–1.41) and “other” race/ethnicity patients (OR=1.46, 95%CI=1.27–1.68) were at increased odds of overall mortality compared to white patients. In multivariate models adjusting for basic demographics, surgical complexity and other comorbidities, black patients had lower adjusted probabilities of surviving without ECMO (Relative Risk Ratio (RR)=0.79, 95%CI=0.63–0.95), similar rates of surviving after ECMO, and higher rates of dying without ECMO (RR=1.27, 95%CI=1.04–1.54) when compared to white patients. Patients of “other” race/ethnicity had lower rates of survival without ECMO (RR=0.67, 95%CI=0.54–0.84), lower rates of surviving after ECMO (RR=0.61, 95%CI=0.43–0.86), and higher rates of dying without ECMO (RR=1.49, 95%CI=1.20–1.85). Conclusions: Black children and children of other race/ethnicity are at increased odds of mortality after congenital heart surgery. These disparities can be traced to variations in ECMO utilization and ECMO outcomes across racial/ethnic groups.
ST elevation by definition) and progressive symptoms, patients who ‘rule-in’ for an MI with a second or later sample cardiac enzyme elevation, create a poorly described subset of NSTEMI patients. Methods: All patients presenting to the ED and receiving EKG and Cardiac enzyme for chest pain were included in a consecutive, observational study over a 12 month period NSTEMI meant no ST elevation, WHO criteria for chest pain and elevation of CK-MB > 5.0 or Tn I > 0.15 or elevation of both markers. The two groups were divided into those with a cardiac enzyme elevation on initial enzyme or on a later enzyme drawn between 4–6 hr later and repeated 8–12 hr after the first enzyme was drawn. Confirmatory Chart Review for all ED patients diagnosed with NSTEMI by Cardiology Admitting Team, patients Followed for 3 mo Post Diagnosis for MACE. Results: 6 Month Study of consecutive patients presenting to ED; 2,894 Chest Pain Patients were admitted, with 4.8% of patients having an AMI (141 Diagnosed AMI), Of that 105 met NSTEMI Criteria with 60 Pts (Early) Initial Cardiac marker elevation (Troponin I) Mean 2.2 hr to diagnosis, and 45 Pts (DD) Delayed Cardiac marker elevation Diagnosed within 5–13 hr. Early N-NSTEMI Delayed N-NSTEMI Mean Age 64.3 yr 65 yr NS Gender 62% Male 74 % Male p= .05 LOS 6.4 days 9.6days p= .05 83% Cath 94% Cath p = .05 Mean time to Cath; 16 hr 57.6 hr p = .01 In Hospital Mortality: 6.4% 4 % NS CABG; 15% 26% p= .04. Conclusions: The ED groups for N-STEMI were well matched for Demographics. The Delayed Diagnostic Group had delays to discovery of critical lesions (Cath) and Greater Rates of Need for CABG with Longer Hospital Stay. Better early detection protocols and testing are needed.

138 PREVALENCE OF TAKOTSUBO CARDIOMYOPATHY IN EMERGENCY DEPARTMENT

Akiko YASHIO, Kenichi Nitta, Katsunori Mochizuki, Hiroshi Imanura

Learning Objectives: Takotsubo syndrome (TTS) is an acute, reversible disorder of the heart characterized by left ventricular dysfunction. It has been reported that 1–3% of patients suspected acute coronary syndrome has this condition. TTS is often reported as a complication of various illness. However, the prevalence of TTS is still unknown. Thus, we investigated the prevalence of TTS among emergency patients. Methods: 14,178 patients were transferred to our emergency and critical care center from April 2003 to March 2014. All the patients with chest discomfort, abnormal ECG, pulmonary edema or hypotension with unknown etiology underwent echocardiography as a screening for TTS. Clinical feature of patients with TTS were investigated. Results: Thirty three patients (male 36%, female 64%, age 74 ± 11) were diagnosed having TTS. Thus, the prevalence of TTS among emergency patients was 0.23%. Only 36% of patients had chest pain. 15% of patients had dyspnea. On the other hand, 59% of patients had no chest symptom. Trigger events of TTS were emotional stress in 18%, physical illness in 60% and unknown in 22%. Conclusions: The prevalence of TTS was 0.23% in the real world emergency patients. Over a half of patients had no chest symptom. TTS could be complicated with any kinds of illness. Emergency and critical care physician should take into consideration of this disease.

139 TETRASTARCH SUPPRESSES VASCULAR PERMEABILITY IN AN ACUTE HEMORRHAGE MOUSE MODEL

Kohji Uzawa, Tomoko Yorozu, Akira Ushiyama, Hideki Miyao

Learning Objectives: Resuscitation using a crystalloid solution for severe acute bleeding increases the permeability of peripheral blood vessels and induces extravasation of the plasma components, which deteriorates microcirculation. We aimed to investigate the effectiveness of tetrastarch (6% HES 130/0.4/9) in improving the permeability of peripheral vessels in a mouse model of severe acute bleeding. Our results indicate that fluid resuscitation with tetrastarch prevents extravasation of the plasma components, which deteriorates microcirculation, and then reduce the mortality after severe acute bleeding.

140 IMPROVED EARLY DIAGNOSIS OF TAKO-TSUBO SYNDROME: RATIO OF BNP: TROPONIN I FOR CARIOGENIC SHOCK PTS

Dave Milzman, Albert Chin, Matthew Albert

Learning Objectives: The actual prevalence Takotsubo cardiomyopathy (TC) is unknown, but this syndrome likely accounts for 1%-2% of all cases of suspected acute MI. Patients with TC present with chest pain, ECG ST-segment elevation, and elevated cardiac enzyme levels that are consistent with an acute MI. However, TC usually is not recognized until heart catheterization reveals typical wallmotion abnormalities in the absence of significant coronary artery disease. Objective: To determine if early identification using cardiac biomarker profile in the ED (Frolichl 2011 and Madhavan 2004) and follow up echo can reduce need for invasive (PCI- cath) can be accomplished. Methods: A retrospective review of all cases of TC from four teaching hospitals in the DC-Baltimore region for 10 yr (2005–15) required a discharge dx of ICD-9: 429.83 for inclusion. In addition, cases had to have cardiology confirmation of diagnosis and biomarkers: BNP, cTnl. Lactate as well as Echocardiography and coronary cath performed. Ratio of biomarkers were determined and compared for accuracy in disease determination for TC.

Results: A total of 228 confirmed cases of Takotsubo Cardiomyopathy from nearly 2.3 million patients produced an incidence of 1% during the 10 year study period. 117 had adequate initial lab data and confirmatory cath and each data for study inclusion. mean values revealed that 88% were female, mean age 65.6 (95% CI: 61.2–70.9) with 65% white and 35% African American. 91% presented through the ED and others were transferred, 85% required at least one ICU or CCIU day and mortality was 1.5% in hospital. Ratio of BNP or Pro/BNP / cTnl were found in acceptable ratio >2000/1 in 75% of TC patients and early elevated lactate was found in all of these pts and proved a better early marker in the 20% not found with predicted ratio. Conclusions: In the largest report of TC; prior reported ratios improve early detection disease from STEMI were confirmed (BNP/cTnl=2000) Delays occur due to ECG and bio-marker changes c/w STEMI and only negative ctau and confirmatory wall motion abnormality currently define TC.

141 INTRAPATIENT RELATIONSHIP BETWEEN QRS AMPLITUDE AND BRAIN NATRIURETIC PEPTIDE LEVEL IN AN ICU COHORT

Quan Ding, Michele Pelter, David Mortara, Richard Felder, Yong Bai, Andrea Villaroman, Xiao Hu

Learning Objectives: Studies have shown association between heart failure decompensation and attenuation of QRS complexes, presumably from fluid shifts following treatment with diuretics. Since brain natriuretic peptide (BNP) level is an indicator of heart failure, this study aimed to examine the intrapatient relationship between QRS amplitude and BNP level. Methods: We conducted a retrospective observational study of patients who were admitted to the ICU at University of California, San Francisco (UCSF) Medical Center from March 2013 to March 2015. Patients had more than 1 BNP lab test while in the ICU. A continuous two-hour ECG period, one hour before and one hour after the BNP was obtained. QRS amplitudes were calculated using SuperECC, a research ECG analysis program, and then averaged over the two-hour interval for each of the 6 limb leads (II, III,
Results: The study consisted of 45 patients with more than 1 BNP lab test while admitted to the ICU from March 2013 to March 2015. Among the 45 patients, 51.1% (23/45) had a negative correlation between QRS amplitude and BNP level, while the other 48.9% (22/45) had a positive correlation. Conclusions: While the intrapatient changes of QRS amplitude alone cannot predict changes of BNP level, there may be other confounding variables such as body weight, treatment for establishing the relationship between serial QRS amplitudes and BNP levels. This will be the focus of a future study.

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OUTCOMES OF PEDIATRIC CARDIAC PATIENTS WITH ACUTE KIDNEY INJURY AT RAPID RESPONSE EVENTS
Kimia Rafie, Cody Cruz, Ayne Arian, Paul Checchia, Aarti Bavare

Learning Objectives: Pediatric cardiology patients are at a high risk for developing acute kidney injury (AKI). These patients also have a proclivity for experiencing acute decompensation events, or rapid response events (RREs). There is little data about the outcomes of these patients when AKI already exists at the time of RRE. We hypothesized that the coincidence of AKI with RRE for this patient population would correlate with increased incidence of high-risk surgery prior to RRE, pre-RRE ICU stay, need for interventions after RRE, and mortality.

Methods: A retrospective review of patients admitted to a tertiary referral pediatric cardiac center was conducted. The study captured all RREs in cardiac patients over 3 yr. (7/2011 to 6/2014). RREs, AKI scores (using KDIGO index), interventions and outcomes were reviewed. Analysis was performed using descriptive and comparative (Chi-Square) statistics. Results: There were 145 RREs in 117 pediatric cardiac patients. 59 (40%) had AKI at the time of RRE (AKI-RRE) (KDIGO Stage 1: 36%, Stage 2: 42%, Stage 3: 22%). The primary cardiac diagnoses in AKI-RRE cohort were: hypoplastic left heart syndrome (13, 22%), atrioventricular canal defect (13, 22%), cardiomyopathy (9, 15%) and other congenital and acquired heart conditions (24, 41%). Congenital heart surgery (30% with RACHS≥3) occurred prior to RRE in 78% of AKI-RRE cases (29% within 30 days) and 70% (35% within 30 days) of no AKI-RRE cases. 20 (34%) AKI-RRE and 34 (40%) no AKI-RRE cases were admitted to the ICU up to 7 days prior to the RRE. [p=0.49] Interventions needed were: Ventilation: AKI-RRE 37%, No AKI-RRE 36% [p=0.87]; Hemodynamic support: AKI-RRE 29%, No AKI-RRE 14% [p=0.02]; Invasive procedures: AKI-RRE 22%, No AKI-RRE 19% [p=0.6]. Mortality occurred in 29% of AKI-RRE cases and 19% of no AKI-RRE cases. [p=0.14]. Conclusions: During the study period, a substantial number of pediatric cardiac patients had AKI at the time of RRE. AKI was associated with high-risk cardiac diagnosis, AKI when present at RRE was associated with statistical significance higher need of hemodynamic support after RRE.

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SURVEY OF PEDIATRIC CENTERS AND THE TREATMENT OF CRITICALLY ILL CHILDREN WITH PULMONARY HYPERTENSION
Meghan Bernier, Lewis Romer, Melania Bembea

Learning Objectives: Pulmonary hypertension (PH) is a growing pediatric problem. Acute PH crisis requires a multidisciplinary approach for control and stabilization. The aim of this study is to describe the care currently provided for PH crisis as a first step in developing comprehensive treatment plans that incorporate and go beyond pulmonary vasodilator therapies. Methods: A cross sectional survey of physicians providing care to children with acute PH crisis was distributed to academic and research institutions beginning in June 2015. Questions focused on treatment for establishing the relationship between serial QRS amplitudes and BNP levels. This will be the focus of a future study.

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KNOWLEDGE CAPTURE TECHNIQUES TO DESIGN A SCORE OF OVERALL PHYSIOLOGICAL STATE IN CRITICAL ILLNESS
Malcolm Sim, Laura Moss, Derek Sleeman, John Kinsella

Learning Objectives: Current scoring systems for use in critical illness do not take into account levels of simultaneous physiological or pharmacological support. Yet, clinicians at the bedside subconsciously interpret cardiovascular parameters in the context of this support. In the acquisition of subconscious expertise it is established that it is better to observe an expert solve a problem in real time than to ask them to describe what they do in the abstract. Hypothesis: Using knowledge capture techniques it is possible to design a scale of the overall state of a critically ill patient underpinned by a sophisticated physiological rule base.

Methods: Data sets were prepared from the Electronic Records of 10 patients with 2761 time points of routinely collected physiological and pharmacological parameters. A clinician scored each time point as stable (A) through to unstable (E) whilst simultaneously describing a rule set of ranges (A-E) of derangement for each parameter. The same time points were annotated automatically using the rule set described in the abstract and inconsistencies between the two sets of annotations compared in a confusion matrix. Each disagreement was analyzed and changes made to the rule base where appropriate to better capture clinical expertise. The process was repeated with two other clinicians, their clinical annotations being tested against the previous clinician’s rule set, resulting in further refinements. Results: Agreement between clinician 1’s final rule set and annotations post refinement was 96.7%. Agreement between clinician 1’s final rule set, clinician 2’s initial annotations and was 10.7% (97.6% after refinement). Initial agreement between clinician 2’s final rule set and clinician 3’s initial annotations was 90.6% (98.1% after refinement - the final A to E rule set for the new score). Conclusions: There was a higher agreement between the final rule set of the first clinician and the initial annotations of each subsequent clinician as the refinement proceeded. It is possible to design a sophisticated rule base underpinning a physiological score using knowledge capture techniques.
be substantially affected (positively or negatively) by pharmacological or physiological intervention were weighted accordingly. Mean arterial pressure was weighted for quantities of inotropes, vasopressors, fluids and sedation. Oxygen saturation was weighted for inspired oxygen fraction and positive end expiratory pressure. Up to 6 points could be added or subtracted according to the parameter and the weighting factor. An iterative and incremental development approach was used to repeatedly refine the scoring system against a series of virtual clinical scenarios to ensure that changes in individual parameters led to appropriate adjustment of the score. Results: Repeated iterations of the scenarios resulted in the final version of the 51 point score. This score was then calculated repeatedly using real datasets and graphical outputs displayed. Conclusions: This new quantitative score may have clinical utility because of the ability to reflect alterations in underlying physiology which may be masked by increasing levels of support.

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CARBOXYHEMOGLOBIN ASSOCIATED WITH HEMOLYSIS AS A MARKER OF IMPE synopsis of free hemoglobin, elevated levels of LDH, unconjugated bilirubin and carboxyhemoglobin (COHb). Normal COHb levels range from 1% to 3% of total hemoglobin. Methods: COHb is readily measured by blood gas analyzer (ABL800 FLEX blood gas analyzer, Radiometer Medical ApS, Denmark). Samples from every patient were taken every hour and postoxygenator every 6 hr. Results: We compare two patients supported with peripheral VA-ECMO for refractory cardiac shock. Our first patient had pulmonary veno-occlusive disease and required VA ECMO as a bridge to heart-lung transplant. Our second patient had Glucose-6-phosphate dehydrogenase deficiency and developed acute heart failure. Both patients demonstrated hyperbilirubinemia and elevated levels of COHb despite maximal O2 administration via the oxygenator. Hyperbilirubinemia was associated with hemolysis in both cases explaining the elevated COHb levels observed (over 3%). In the first patient the level of COHb went over 6%, associated with impaired oxygenation as measured post-oxygenator and rising transmembrane pressures. In the second patient COHb peaked (probably related with high level of hemolysis) but we did not observe problems with oxygenation or transmembrane pressure. We treated the worsening hypoxia in the affected patient by electrolytically changing out the oxygenator. Following this, markers of hemolysis and COHb levels promptly fell, the transmembrane pressure stabilized and oxygenation improved. Conclusions: Increasing hemolysis associated with a rising COHb can be an early indicator of impending oxygenator failure, before the later onset of rising transmembrane pressures. Severe hemolysis leads to increased endogenous production of carbon monoxide (CO) via the hydrogenase-dependent pathway. The corresponding rise in COHb contributes to tissue hypoxia and requires prompt action, typically exchange of the ECMO circuit.

Research Snapshot Presentations: CPR/Resuscitation

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POST-ARREST FLUIDS IMPROVE SURVIVAL WITH BETTER METABOLIC PROFILE USING PLASMA-LYTE A OVER 0.9% NACL

Lorissa Lamoureux, Alvin Baeting, Jejeabai Radhakrishnan, Raul Gazmuri

Learning Objectives: Veno-Arterial extracorporeal membrane oxygenation (VA ECMO) is an advanced method of organ support. Hemolysis is a recognized complication of an extracorporeal circulation. Indicators of intravascular hemolysis are which hemodynamic variable is the best predictor of poor outcome. Methods: Analysis of a database of adult CA patients admitted to our Department from January 2009 to January 2013. We excluded patients who died within the first 24h (n=58) and those treated with an intra-aortic balloon pump (n=16) or extracorporeal circulation. Indicators of intravascular hemolysis were defined as the Cerebral Performance Categories score (cCPC) at 6h after CA and the worst modified SOFA (mSOFA) score. Results: Among the 170 patients (median age 63 yr, 67% male, 60% out-of-hospital CA), 64 (37%) had a FO at 5 mo. Admission lactate levels were higher in patients than in those with FO (4.5 vs 2.7 mEq/L; p=0.003), as were the cCPC (3[0–4] vs 0[0–3]; p=0.007) and mSOFA (5[3–8] vs 4[2–6]; p=0.03) scores. There were no differences in HR or SAP in the first 24h after admission between patients with PO and those with FO, but DAP was lower in patients with FO than in those with PO (4.5 vs 2.7 mEq/L; p=0.003), as were the cCPC (3[0–4] vs 0[0–3]; p=0.007) and mSOFA (5[3–8] vs 4[2–6]; p=0.03) scores. There were no differences in HR or SAP in the first 24h after admission between patients with PO and those with FO, but DAP was lower in those treated with vasopressors, with a cCPC of 0–1 (p=0.04;n=20). Conclusions: In patients admitted to the ICU after CA, admission lactate concentration, and DAP and cCPC in the first hr after admission were associated with PO. In particular, DAP was lower in patients with PO who were treated with vasopressors.

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RANDOMIZED TRIAL OF APNEIC OXYGENATION DURING ENDOTRACHEAL INTUBATION OF THE CRITICALLY ILL

Matthew Semler, Todd Rice, David Janz, Robert Lentz, Michael Noto

Learning Objectives: Hypoxia is common during endotracheal intubation of critically ill patients and may predispose to cardiac arrest and death. Administration of supplemental oxygen during laryngoscopy (apneic oxygenation) may prevent hypoxia. Methods: A randomized, open-label, pragmatic trial in which 150 adults undergoing endotracheal intubation in a medical ICU were randomized to receive 15 L/min of 100% oxygen via high-flow nasal cannula during laryngoscopy (apneic oxygenation) or no supplemental oxygen during laryngoscopy (usual care). The primary outcome was lowest arterial oxygen saturation between induction and two min after completion of endotracheal intubation. Results:
Characterizing Initial Cardiorespiratory Instability Patterns in Monitored Step-Down Unit Patients
Eliezer Bose, Gilles Clermont, Lujie Chen, Arrur Dubrawski, Michael Pinsky, Marilyn Hravnak

Learning Objectives: Cardiorespiratory instability (CRI) in noninvasively monitored step-down unit (SDU) patients has a variety of etiologies, and therefore likely manifests in different patterns of vital signs (VS) changes. We explored use of k-means clustering to identify patterns of VS change in the initial CRI epoch.

Methods: Continuous noninvasive monitoring data of heart rate (HR), respiratory rate (RR), and pulse oximetry (SpO2) were sampled at 1/20Hz for 307 SDU patients. CRI was defined as VS beyond stability thresholds (HR=40–140/min, RR=8–36/min, SpO2=85%). We identified CRI1 epochs (initial exceedance of VS across thresholds after SDU admission, and total time over threshold) in 133 patients, and employed k-means clustering on the feature space of mean, median, mode, maximum and minimum values per VS. We tested several clustering solutions and used 10-fold cross validation and ANOVA to establish the best solution. Inter-cluster differences in admission characteristics and outcomes were also assessed.

Results: Four main clusters (C) were derived: C1= normal HR and SpO2, high RR (n=9); C2= normal HR and low/normal RR, low SpO2 (n=61); C3= normal HR, low RR, normal SpO2 (n=25); and C4= high HR, normal RR and SpO2 (n=8). Clusters were significantly different based on age (p=0.001; younger patients in C1 and older in C2), number of comorbidities (p=0.01; more C2 patients had ≥2), and admission source (p=0.008; more C1 and C4 patients transferred in from a higher intensity monitoring unit). There were no between-cluster differences in SDU or hospital length of stay, discharge destination, or mortality.

Conclusions: Four different clusters of VS presentations for CRI1 in SDU patients representing phenotypes of failure were identified, with C2 (normal HR; low/normal RR, low SpO2) most prevalent. The clusters varied on age, number of comorbidities and SDU admission source. Future study is needed to determine if there are common physiologic underpinnings to these phenotypes which might inform monitoring practices and clinical decision-making when CRI1 first manifests.

Fluid Balance and ECMO Outcomes
Idris Evans, Joan Sanchez De Toledo, Timothy Maul, Peter Wearden

Learning Objectives: Fluid balance has been shown to have an impact on survival in the critically ill. Fluid balance and outcomes on ECMO in the pediatric population has not been thoroughly studied.

Methods: A retrospective analysis of 84 children who were placed on ECMO during 2012 to 2014 at our tertiary care children’s hospital was performed. Univariate and multivariate analyses were done to assess if a fluid overloaded state (defined as ≥50 cc/kg) during the entire ECMO run affected ECMO survival.

Results: Of the 84 patients, 59 (70%) were fluid overloaded during their ECMO run. Mortality on ECMO for those patients who were fluid overloaded was 27% as compared to 8% for those patients who were not fluid overloaded. (p=0.05). A logistic regression model, adjusting for patient age, gender, indication for ECMO, type of ECMO, cannulation location, a state of fluid overload at the initiation of ECMO, P-MOD score and other factors, was used to model the association between fluid overload and survival.
at initiation of ECMO and PELOD score at initiation of ECMO, revealed that a state of fluid overload during the entire ECMO run increased the odds of death during ECMO therapy (OR=8.8, p = 0.04). Conclusions: A state of fluid over-load during ECMO therapy increased mortality while on ECMO. Efforts should be taken to minimize a patient’s net fluid balance while receiving ECMO therapy.

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REASON FOR FAILED ATTEMPTS AT LARYNGOSCOPY DIFFERS BETWEEN VIDEO AND DIRECT LARYNGOSCOPES
Duncan Johnston, Jarrod Mosier, Raj Joshi, Josh Malo, John Sakdes, John Bloom, Cameron Hypes

Learning Objectives: First attempt success (FAS) has become a preferred outcome in intubation related research because of reduced odds of adverse events. Video Laryngoscopy (VL) has demonstrated increased FAS in recent observational and experimental studies when compared to direct laryngoscopy (DL). Despite this improved FAS with VL, a substantial proportion of intubations with VL require >1 attempt. The aim of this study is to characterize the reasons for failure of VL on first attempt compared to DL. Methods: Prospective observational study of all patients intubated in the ICU of a university medical center from January 1, 2012 to December 31, 2014. The intubation method and devices used, success or failure of each attempt, operator and patient demographics, the presence of difficult airway characteristics (DACs), and occurrences of any complications were recorded through a continuous quality improvement program. Results: Over the 36-month data collection period, a total of 809 patients were intubated. Of these, 673 were intubated with VL and 136 with DL. Of the first attempt failures (VL 132/673, 20% vs DL 47/136, 35%) reason for failure was reported in 131 and 47 cases respectively. Reasons for failure included: inability to see the vocal cords (VL 47/131, 36%; DL 30/47, 64%; p=0.001), inability to direct the endotracheal tube (VL 52/131, 40%; DL 10/47, 21%, p=0.032), aborted attempt due to inadequate sedation, hypotension, or hypoxemia (VL 28/131, 21%; DL 5/47, 11%, p=0.13) and equipment failure (VL 4/131, 3%; DL 2/47, 4%, p=0.65). Reason for failure did not differ with level of operator experience or laryngoscope blade design. Conclusions: First attempt failures with DL most commonly occur because of inability to see the vocal cords while a larger proportion of failures with VL occurred because of inability to direct the endotracheal tube. These data present targets for minimizing first attempt failures when performing tracheal intubation in the ICU.

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SURVIVAL AFTER INPATIENT CARDIAC ARREST IS NOT Affected BY LEVEL OF Training OF CODE LEader
Anita Oh, Omar Mohamedaly, Rebecca Sell

Learning Objectives: Over 200,000 inpatient cardiac arrests occur every year, however survival remains poor. Few studies have looked at the level of training of the physician code leader, but no studies have examined the effectiveness of internal medicine residents leading cardiopulmonary resuscitation. We hypothesized that internal medicine resident code leaders at our institution had outcomes and survival to discharge rates that were not inferior to those run by senior physicians. Methods: A retrospective study of code blue events at our academic hospital was performed from July 2005 to December 2013. A comprehensive database of all inpatient resuscitative events is maintained at our institution, including demographic, clinical, and outcomes data. Internal medicine resident led codes were compared to all other code blue events led by senior physicians. Cardiac arrests are defined as defibrillation and/or chest compressions. Arrests were categorized by primary etiology: circulatory, dysrhythmia, neurologic, respiratory, or unknown. Arrests were further stratified by location (ICU vs. non-ICU), AM vs. PM, and weekend vs. weekday. Multivariate logistical regression was used to explore the association between MD code leader level of training and clinical outcomes including return of spontaneous circulation (ROSC) and survival to discharge. Results: There were a total of 686 cardiac arrests. Internal medicine residents led 268 (39.1%) codes. Residents were more likely to be code leaders during the night and in a non-ICU setting. With univariate analysis, there was an increased likelihood of ROSC in resident led codes (76.5% vs. 67.2%, p=0.009). Survival rates were 36.6% for residents vs. 30.1% for senior physicians (p = 0.080). When adjusted however, there was no statistically significant difference in ROSC or survival to discharge, regardless of level of training. Conclusions: Internal medicine residents are equally effective as senior physicians as code blue leaders, with no statistically significant difference in ROSC and survival. This may reflect ongoing resident training and collaboration with multidisciplinary code team.

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QUANTITATIVE ANALYSIS OF DUTY CYCLE DURING IN-HOSPITAL PEDIATRIC AND ADOLESCENT RESUSCITATION
Heather Wolfe, Ryan Morgan, Aaron Donoghue, Dana Niles, Peter Kudenchuk, Robert Berg, Vinay Nadkarni, Robert Sutton

Learning Objectives: High quality cardiopulmonary resuscitation (CPR) is associated with improved cardiac arrest outcome. Duty cycle (DC) – the percentage of time spent during the down-stroke of compression – currently represents an understudied element of pediatric CPR quality. Our objective was to quantitatively analyze DC during real pediatric and adolescent cardiac arrest. We hypothesized that less than 25% of resuscitations would have an average DC compliant with American Heart Association (AHA) recommendations of 50 ± 5%. Methods: Retrospective observational study of in-hospital cardiac arrests at a large academic children's hospital. Quantitative CPR quality data were collected via CPR recording defibrillator (Heartstart MRx with Q-CPR technology). CPR quality variables included event averages for chest compression (CC) rate (min-1), CC depth (mm), CPR fraction (%), and DC (%) up to the first 10 min of recorded CC. Method of DC calculation was effective compression time. AHA DC compliance was defined as an average event DC of 50 ± 5%. Percentage of events compliant with AHA DC was compared to an a priori hypothesized compliance percentage of 25% using chi-square. Association between DC quartiles and categories of depth (<38, 38–49, ≥50mm) and rate (<100, 100–120, ≥120min-1) were analyzed by chi-square test for trend. Results: Between Oct 2006 and June 2015, 97 events from 87 patients were analyzed. Average age was 13.3 ± 5 yr; 42 of 87 (48%) were male. Mean DC for all events was 40 ± 28%. DC quartiles: Q1 (DC =<38.3%), Q2 (<=40.1%), Q3 (<=42.1%), Q4 (>42.1%). Only 5 (5.2%) events met AHA DC compliance, less than the a priori hypothesis of 25% (p=0.001). Average CC rates trended higher across DC quartiles: Q1 (105 ± 9), Q2 (106 ± 9), Q3 (112 ± 8); and Q4 (118 ± 14min-1; p=0.001). Other CPR quality variables were not associated with DC. Conclusions: Compression duty cycle during the resuscitation of real in-hospital cardiac arrest in children and adolescents met AHA recommendations in only 5% of events. CC rate trended higher across quartiles of compression DC (faster CC rate seen with longer DC).

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THE ASSOCIATION BETWEEN SODIUM BICARBONATE ADMINISTRATION AND RESUSCITABILITY IN CARDIAC ARREST
Jungho Choi, Kyuseok Kim

Learning Objectives: Sodium bicarbonate (SB) is frequently used for patients unresponsive to cardiopulmonary resuscitation (CPR). Its use may be associated with longer resuscitation duration as well as more severe metabolic acidosis. We applied a new analytical method based on a matched case-control study design to control for potential confounders. Methods: Data from out-of-hospital cardiac arrest (OHCA) patients who received CPR in the emergency department (ED) for at least 20 min or until there was any return of spontaneous circulation (ROSC) were analyzed. We controlled for different severities of metabolic acidosis by matching patients with ROSC to those without based on initial bicarbonate levels categorized using the cut-off points of 10, 15, 20, 25 and 30 mEq/L. Different CPR durations were controlled by limiting the observation time during ECMO therapy increased mortality while on ECMO. Efforts should be taken to minimize a patient’s net fluid balance while receiving ECMO therapy.

Conclusions:

1. Ongoing resident training and collaboration with multidisciplinary code team.

2. A state of fluid overload during the entire ECMO run increased the odds of death during ECMO therapy (OR=8.8, p = 0.04).

3. Conclusions: A state of fluid overload during ECMO therapy increased mortality while on ECMO. Efforts should be taken to minimize a patient’s net fluid balance while receiving ECMO therapy.

4. The association between SB and ROSC was examined using both univariable and multivariable conditional logistic regression analysis. Results: Two matched groups, one with ROSC and the other without (both N=258), were generated. The administration of SB and its total cumulative dose were significantly associated with an increased chance of ROSC, with odds ratios (ORs) for ROSC of 1.86 (95% confidence interval [CI], 1.09–3.16; p=0.022) and 1.18 (per 20 mEq; 95% CI, 1.04–1.33; p=0.008), respectively. The positive associations remained unchanged after multivariable adjustment, with ORs for ROSC of 2.54 (95% CI, 1.37–4.72; p=0.003) and 1.28 (95% CI, 1.11–1.47; p=0.003), respectively.
Conclusions: Administration of SB was associated with an increased chance of ROSC in the ED.

PROGNOSTIC IMPLICATIONS OF FEVER AFTER THERAPEUTIC HYPOTHERMIA: A META-ANALYSIS
Anurag Baijaj, Parul rathor, Ajay Shetty, kabak Besher, Srikanth Houkar

Learning Objectives: Therapeutic hypothermia (TH) or Targeted temperature management after cardiac arrest has been shown to improve survival as well as neurologic outcomes. Post hypothermia fever (PHF) after discontinuation of TH is a common occurrence, but the prognostic implications of PHF are unclear. We performed a meta-analysis of studies done in patients on TH after cardiac arrest to determine the prognostic value of PHF after TH.

Methods: A Systematic search of Medline, EMBASE and Cochrane reviews was done by 2 reviewers using the text word “cardiac arrest” and “hypothermia”. Additionally, conference abstracts, review articles and bibliographies were searched. Studies were included if those were done in post cardiac arrest patients and TH was used after return of spontaneous circulation. PHF was defined as temperature > 38 or 38.5°C within 24–96 hr after TH. A poor neurologic outcome was defined as Cerebral performance category scale of 3–5 or modified Rankin Scale of 3–6. The primary outcome was mortality (in hospital or 30 day). The secondary outcome was poor neurologic outcomes. A study level analysis was done using Review manager 5.2 (The Nordic Cochrane Centre, The Cochrane Collaboration, 2008).

Results: Overall, six studies (5 full text and 1 abstract), including 1057 patients were included in the final analysis. Five studies reported mortality data. 48.3% patients died in the PHF group as compared to 44.6% in no fever group. There was no significant difference in mortality between two groups (odds ratio [OR], 1.33; 95% CI, 0.84 to 2.11, 12–57%). Five studies reported neurologic outcomes. There was no significant difference in neurologic outcomes between two groups (OR, 1.31; 95% CI, 0.86 to 2.00, 12–45%); however, after excluding one study which was a abstract, the heterogeneity becomes zero and PHF was associated with poor neurologic outcomes (OR, 1.62; 95% CI, 1.14 to 2.30, 12–0%).

Conclusions: PHF after cardiac arrest is not associated with increased mortality but may be associated with poor neurologic outcomes. PHF may be useful for prognostication after therapeutic hypothermia.

OBESITY AS INDEPENDENT RISK FACTOR FOR INCREASED MORTALITY IN ADVANCED CARDIAC LIFE SUPPORT (ACLS)
Arthur Holzhclaw, James Coyle, Roland Green, Christopher Colombo, Zorana Mrsic

Learning Objectives: The obesity epidemic continues to worsen with over 35% of adult Americans considered obese. Unsurprisingly, one study has shown increased mortality among morbidly obese patients undergoing ACLS for in-hospital cardiac arrest compared to normal weight controls. However, this study occurred prior to the 2010 ACLS guideline update emphasizing quality CPR. We have conducted a pilot study in preparation for a multicenter trial to replicate the above data and evaluate potential etiologies including decreased quality of chest compressions and increased thoracic impedance leading to less effective defibrillation.

Methods: A retrospective chart review was conducted to evaluate the effect of a patient’s BMI on the outcomes of at our facility from 2009 to 2012. All patients between ages 18 and 89 who underwent ACLS were included with exclusion criteria of pregnancy, amputation, out-of-hospital arrest or lack of documentation. Data was compiled to include patient demographics and comorbidities as well as initial rhythm and outcome of ACLS to include ROSC, survival to 24 hr and survival to discharge. Patients were grouped by BMI with calculation of odds ratios with 95% confidence intervals to evaluate for differences in mortality.

Results: 193 episodes of ACLS were identified with 82 excluded. Overall ROSC was 65% with a 24 hour survival of 52% and discharge survival of 37%. Obese patients were found to have a decreased survival that did not reach statistical significance: Odds ratio (OR) for ROSC 0.89 (95% CI: 0.34–2.34), 24 hour survival OR 0.94 (95% CI: 0.37–2.37), discharge survival OR 0.79 (95% CI: 0.30–2.08).

Conclusions: This study shows overall increased survival among all groups compared to prior studies but similar trend towards increased mortality among the obese. Using these data to generate a power analysis, we plan to expand this trial to multiple centers to evaluate for changes in mortality pre- and post-ACLS update as well as evaluating possible causes by analyzing objective data for CPR quality and average joules per defibrillation now available in code databases.

NEAR INFRARED SPECTROSCOPY IS SUPERIOR TO CAPILLARY REFILL TIME IN DISCRIMINATING SCVO2 <70%
Sandeep Arya, Paul Bauer, Yong Han

Learning Objectives: Shock is a life threatening condition. Early identification and aggressive resuscitation with goal ScvO2≥70% is associated with improved outcome in children (1,2). Most critically-ill children are initially stabilized at local community hospitals where equipment and expertise for CVL placement are not readily available, precluding the ability to monitor ScvO2. In this regard, Pediatric Advanced Life Support advocates the use of capillary refill time (CRT) for shock resuscitation in children. Additionally, CRT >2 sec has been shown to be associated with ScvO2<70% (3). However, CRT does have important clinical limitations including inter-observer variability and patient/environmental temperature effects. NIRS is a noninvasive regional saturation monitor without temperature effects. NIRS-CRT-ScvO2 data were obtained from 49 concomitant NIRS-CRT-ScvO2 data were obtained from 15 patients. ROC curve analyses in discriminating ScvO2<70% are as follows [AUC (95% CI)]; brain NIRS [0.878 (0.765–0.990)]; cerebral NIRS [0.748 (0.611–0.886)]; central CRT [0.707 (0.543–0.871)]; peripheral CRT [0.672 (0.494–0.851)]. Optimal discrimination points for ScvO2<70% were as follows
93.6%, whereas agreement between an experienced user and a beginner observer ing. Agreement between two people with several mo of using CERTAIN was agreement of 76.7% was observed for assessment of air entry and work of breath-airway compromise, stridor, cardiac rhythm, weak pulse and skin exam. Least that an agreement of 80% indicates good reliability. Overall agreement of ICU admission. There is a good correlation between beginner and experienced CERTAIN users indicating short learning curve.

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ROLLING REFRESHER SIMULATION TO IMPROVE PICU NURSING CODE CART MANAGEMENT Kimberly Allen, Marcy Singleton, Urs Naber, Kevin McNerney, Madonna Gordon, Zhongze Li, Sholeen Nent, Matthew Braga Learning Objectives: PICU nurses (PICU RNs) manage the code cart during pediatric codes at the Children's Hospital at Dartmouth but have infrequent opportunities. We developed a rolling-refresher training program to establish code cart competency. Methods: Five simulated scenarios, including 22 code-cart skills, were developed in collaboration with MD and RN experts. Each PICU RN underwent monitored competency assessment. If a skill was not performed competently within the established time, the participant received immediate feedback and repeated the task to mastery. Results: 32 RNs participated. Median PICU RN experience was 3 yr [IQR 1.38, 8]. RNs had attended a median of one pedi- 
dric code in the preceding year [IQR 0, 2]. About 65% had PALS training in the preceding year. Median number of first attempt failures was 2 [IQR 1, 5]. No participant completed all tasks successfully on first attempt. Using multiple logistic regression, the following characteristics were significantly associated with first 

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RELIABILITY OF THE CHECKLIST FOR EARLY RECOGNITION AND TREATMENT OF ACUTE ILLNESS (CERTAIN) Alexander Kogan, Kelly Pennington, Saraschandra Vallabhajosyula, Jeff Jensen, John O’Horo, Ogjen Gajic Learning Objectives: CERTAIN (Checklist for Early Recognition and Treatment of Acute Illness) is an electronic charting and prompting tool designed in order to assure error-free management of critically ill patients during early (golden) hr of the illness. In this study we tested reliability of CERTAIN charting at the time of ICU admission. Methods: We conducted a single center prospective observa- 
tional study of 30 adult critically ill patients admitted to MICU at Mayo Clinic, Rochester, MN. Three physicians (two critical care fellows or a critical care fellow and an internal medicine resident) independently used CERTAIN to chart events that occurred during resuscitation of each patient after admission to the MICU. Two observers used CERTAIN for several mo, while the third observer had no experience with CERTAIN prior to this study. Charted data included immediate life threats, diagnosis, history, problem list, medications, interventions, physi- 
cal exam. Reliability was assessed as percentage agreement. A priori we decided that an agreement of 80% indicates good reliability. Results: Overall agreement was 92.3%. Data points with most agreement of 96.7% included assessment of airway compromise, stridor, cardiac rhythm, weak pulse and skin exam. Least agreement of 76.7% was observed for assessment of air entry and work of breath- 

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SOMATOSENSORY EVOKE POTENTIALS ARE ASSOCIATED WITH POST-RESUSCITATION RECOVERY WITH HYPOTHERMIA Leanne Young, Russan Deng, Xiaofeng Jia Learning Objectives: Cardiac arrest (CA) has a prevalence of roughly 326,200 out-of-hospital cases among adults in the US annually, often resulting in poor functional outcome. Therapeutic hypothermia (TH) is a recommended effective treatment to improve neurologic recovery following resuscitation. The bilateral absence of N20 somatosensory evoked potential (SSEP) peaks 24 hr post-resuscitation has been shown to predict poor outcome, however the signal interpretation is highly subjective and the prognostic value of N20 during early recovery has not been elucidated. We aim to explore the prognostic value of the N10 ampli- tude (N20 in humans) of SSEP signals in rats during the early recovery period post-resuscitation under TH. Methods: Twelve adult male Wistar rats underwent 7-min asphyxial CA followed by immediate hypothermia (33 ± 1°C) or normo- thermia (37 ± 0.5°C) (n=6 per group, randomly assigned). SSEPs were recorded in 15-min intervals until 4 hr post-resuscitation. N10 amplitudes were calculated and normalized for each 1 hr period after CA using our custom algorithm. The neurologic deficit score (NDS) at 72 hr post-resuscitation was used to determine functional outcome. Results: The N10 amplitude was significantly higher in hypothermic (0.50 ± 0.05) compared to normothermic (0.18 ± 0.02) (p<0.01) rats in the first 4 hr post-resuscitation and during each hour of early recovery (all p<0.01). This is consistent with NDS scores (median, 25th, 75th%) being higher in 

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NOVEL APPLICATION OF TELE-ICU PRESENCE TO SUPPORT RAPID RESPONSE CALLS IN A COMMUNITY HOSPITAL Christina Canfield, Marianne Harris, John Tote, Chiedozie Udeh, Jorge Guzman, Marc Petre, Lara Jhi, Belinda Udeh Learning Objectives: The growth of telemedicine has been spurred by the demand for efficient and accessible adjuncts to traditional care models. Formal ICU telemedicine programs now monitor over 10% of ICU beds in non-federal hospitals. Although telemedicine has been used in a variety of settings, a review of literature reveals limited use of tele-ICU to support rapid response teams. In this project, we describe the initial clinical and economic impact of tele-ICU support of a rapid response program. Methods: In early 2014, a home-grown tele-ICU was deployed for overnight monitoring of patients in ICUs at 3 hospitals in a multi-hospital system. The tele-ICU is staffed by an intensivist and 2 critical care nurses. In May 2015, the tele-ICU began consulting via hand-held tablet on all non-obstetric rapid response calls from 1900 - 0700 at a 488 bed community hospital. Intensivists in the tele-ICU center have full access to the patient’s elec- 

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cost between regular unit and ICU of $3200, and assuming a 1-day ICU stay after unwarranted transfer, the decrease in ICU transfers equates to a monthly saving of $48,000. Conclusions: Tele-ICU consultation via tablet devices can be used for immediate expert assessment during rapid response calls. Patient care, and allocation of limited ICU resources (personnel and beds), can be positively impacted by tele-ICU support during rapid response calls.

OUT-OF-HOSPITAL CARDIAC ARREST (OHCA) IN CENTENARIANS IN JAPAN
Toshikazu Abe, Nanako Tamiya, Isao Nagata, Uchida Masatoshi, Yui Yamanka

Learning Objectives: Centenarians, who are 100 yr old and older, used to be special people. Little fact about centenarians is known although an increase in centenarians will become the new global issue of medicine. Our aim is to describe characteristics of centenarians who are survived from OHCA in Japan. Methods: Our study is a nationwide population based observational design, which involved consecutive patients with OHCA in Japan from 2005 to 2010. We compared patient and EMS characteristics between patients with neurologically favorable outcome and those with neurologically unfavorable outcome in all centenarians with OHCA. We also stratified centenarians with OHCA who were performed CPR by witnessed bystander. Results: There were 2,943 centenarians. Patients with neurologically favorable outcome were more witnessed and performed bystander CPR than the others (P=0.014, P<0.01, respectively). They got return of spontaneous circulation (ROSC) more at pre-hospital (87.5% (14/16) vs 2.6% (75/2,925), P<0.01) in short durations (median 7 (5–8) min vs 19 (6–10) min, P=0.01). There was no bystander who was a familiar layperson in the group with neurologically favorable outcome. They were less performed airway protection by EMS than the others (37.5% (6/16) vs 81.2% (2,374/2,925), P<0.01). Stratified analysis also showed similar results with all patients although stratified population become one fifth of all. Rate of one-month survival and neurologically favorable outcome were 1.9% (56/2,941) and 0.9% (16/2,941), respectively in all and 4.0% (26/646) and 1.5% (10/646), respectively, after stratification. Among 16 centenarians neurologically favorably survived from OHCA, at least nine patients had gotten ROSC before EMS arrival. They were not performed advanced pre-hospital treatment at all. Conclusion: Surprisingly, there were 16 centenarians with neurologically favorable outcome one month after collapsed. To get pre-hospital ROSC in a very short period with basic life support by witnessed bystander who was not a familiar person is an associated factor to get neurologically favorable outcome for centenarians with OHCA.

THE SIGNIFICANCE OF THE SERUM CATECHOLAMINE CONCENTRATIONS ON ROSC IN PATIENTS WITH CARDIAC ARREST
Kiyohiro Oshima, Shuichi Hagiwara, Masato Murata, Makoto Aoki, Minoru Kaneko, Jun Nakajima

Learning Objectives: Adrenaline is the first-line drug for the patients with cardiopulmonary arrest (CPA) in Guideline 2010, however, there are some reports to doubt about the efficacy of adrenaline recently. The purpose of this study is to determine the relationship between the serum concentrations of catecholamines in patients with CPA are not related to ROSC.

Conclusions:

A NEW CHEST COMPRESSION DEPTH INDICATOR WOULD INCREASE COMPRESSION DEPTH WITHOUT INCREASING RISK
Jong Dae Park, Joonghee Kim, Kyuseok Kim

Learning Objectives: Adequate chest compression (CC) depth is critical for effective CPR. Pediatric resuscitation guidelines recommend that CC be at least one third of the anterior-posterior (AP) chest diameter or approximately 4 cm in infants and 5 cm in children. We aimed to find a better indicator of CC depth that maximizes CC depth while also minimizing injury. Methods: Chest CT images of patients aged 8 and younger were measured for external diameter (ED, AP distance from skin to skin) and internal diameter (ID, AP distance between internal surface of anterior chest wall and anterior surface of vertebral body) at the midway of the lower half of the sternum. Compressible depth was defined as 1 cm short of ID. We determined that up to a 10% estimated risk of over-compression is acceptable and approximated a quantile regression line for the 10th percentile of compressible depth on ED. After rounding coefficients, we used its equation as a new indicator. Results: 426 images were analyzed. The new indicator had a slope of 0.3 and an intercept of -1.9 cm (one fingerbreadth). Compared to one third ED, the new indicator would provide deeper CC with average difference of 1.9 mm (95% confidence interval [CI], 1.6–2.2 mm) without increasing the risk of over-compression (both 4.9%). 4/5 cm CC would provide deeper CC compared to the new indicator (difference: 3.5 mm, 95% CI: 2.7–4.1 mm), however, its over-compression risk was too high (31.5%). Conclusions: CC of one half ED minus one fingerbreadth maximize CC depth without increasing over-compression in pediatric population.

ULTRASOUND AS A STETHOSCOPE: INCORPORATING US INTO THE INITIAL ASSESSMENT OF THE ACUTELY ILL PATIENT
Courtney Bennett, Sandyha Samavedam, Hiroshi Sekiguchi, Ogjen Gajic, Alexander Kogan

Learning Objectives: Handheld ultrasound (US) skills are easily learned by emergency and critical care clinicians and the use of US was shown to improve the time to diagnosis and treatment in multiple settings. The best method and timing to perform the US during the initial assessment of acutely ill patient is not known. Methods: This study used simulation to determine the most efficient choreography for incorporating US into the structured clinical assessment of the acutely ill patient (CERTAIN –Checklist for Early Recognition and Treatment of Acute Illness). We utilized a combination of US exams to assess the lungs, heart, vasculature and abdomen in parallel (US simultaneously with the physician exam) and series (US after the physical exam) using a crossover model. Participants with ACLS certification and varying experience with ultrasonography were recruited. Conclusions: A NASA-TLX evaluation to determine the cognitive burden of each scenario. They also provided qualitative feedback. The time to complete each scenario was recorded. Wilcoxon signed rank test was used to compare the results between the two methods.

Conclusions:

1. The median (Q1, Q3) age and male/female ratio were 81 (68, 87) year-old and 23/18, respectively. The ECG wave patterns when emergency administration of adrenalin. The relationship between the serum concentrations of catecholamines in patients with CPA affects the prognosis of CPA patients.

Conclusions: The serum concentrations of catecholamines in patients with CPA are not related to ROSC.

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Conclusions: The serum concentrations of catecholamines in patients with CPA are not related to ROSC.
p = 0.016). There was no significant difference in overall time to task completion (mean difference: -47.43 +/- 38.34 seconds, p = 0.29). Conclusions: In this pilot study we observed that the cognitive burden to perform critical care US was lower in the series model compared to parallel. Clinical studies are warranted to test the feasibility, best method and clinical utility of incorporating hand-held US in the initial assessment.

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TIME-COURSE OF LACTATE LEVELS AFTER IN-VS. OUT-OF-HOSPITAL CARDIAC ARREST
Antonio Dell’Anna, Claudio Sandroni, Irene Lamanna, Jacques Creteur, Katia Donadello, Massimo Antonelli, Jean-Louis Vincent, Fabio Silvio Taccone

Learning Objectives: High lactate levels (Lac) may reflect the severity of cardiovascular alterations in cardiac arrest (CA) survivors. However, the time course may be different in patients with in-hospital (IHCA) or out-of-hospital CA (OHCA). We thus explored the time course of Lac over the first 48 hr after OHCA and IHCA and defined their relationship with neurologic outcome. We defined also which variables are independent determinants of Lac on admission. Methods: Analysis of adult CA, admitted to our Dept of Intensive Care from January 2009 through January 2013. We excluded patients died within the first 24 hr. We retrieved all data concerning CA characteristics and Lac on admission and 6, 12, 24 and 48 hr thereafter. We separated patients with a “Higher-Lacrate” (HL) and “Lower-Lacrate” (LL) than the median Lac on admission. Neurologic outcome was evaluated at 3 mo; favorable neurologic outcome (FO) was defined as a Cerebral Performance Categories (CPC) score of 1–2; poor neurologic outcome (PO) as a CPC 3–5. Results: Out of 214 patients (66% male, 59% OHCA), 74 (35%) had FO. IHCA were more likely to receive bystander CPR (89% vs. 44%; p = 0.001) and had a shorter time to ROSC (15.5 ± 14.9 vs. 21.2 ± 13.2 min; p = 0.006) than OHCA. Though more IHCA received vasopressors on admission, they had also a lower mean arterial pressure (MAP) when compared to OHCA (147 ± 39 vs. 165 ± 45 mmHg; p = 0.003; in-hospital: 34.9% floor vs 23.4% ICU, p = 0.001). In IHCA patients, no significant differences in Lac between those with FO and PO were found (except at 24 hr), while in IHCA patients, Lac were lower at each time point in PO than in FO. In a multivariable analysis, low MAP, the use of vasopressors on admission and a high time to ROSC were independently correlated to HL (OR 0.981; 95%CI 0.967–0.996 = p = 0.01; OR 2.423; 95% CI 1.25–4.7; p = 0.02; OR 1.04; 95% CI 1.01–1.07; p = 0.004, respectively). Conclusions: No significant differences in Lac between OHCA and IHCA were found, while Lac found (except at 24 hr), while in IHCA patients, Lac were lower at each time point in OHCA compared to IHCA. Though more IHCA received vasopressors on admission, they had also a lower mean arterial pressure (MAP) when compared to OHCA. Though more IHCA received vasopressors on admission, they had also a lower mean arterial pressure (MAP) when compared to OHCA. Results: We studied 42 patients (N20ABS n=19). Demographics, comorbidities and CA characteristics were similar between groups; 11 patients (26%) had a good neurologic recovery and none of them had N20ABS. Patients with N20ABS had a higher incidence of absent pupillary reflexes (14/19 vs. 4/23; p = 0.004), absent or posturing motor response (18/19 vs. 10/23; p = 0.007) and status myoclonus (4/19 vs. 0/23; p = 0.03) in day 2–3 than others. Also, patients with N20ABS presented more frequently a malignant EEG patterns (16/19 vs. 5/23; p = 0.001) and a non-reactive EEG (19/19 vs. 5/23; p = 0.001) than others. The N20ABS was associated with the concomitant presence of EEG findings (e.g. non-reactive EEG or malignant pattern) and clinical signs (e.g. bilateral absence of pupillary reflexes or status myoclonus on day 2–3 after arrest) of poor prognosis in 12/19 of patients when compared to 5/23 others (p = 0.001). Conclusions: Bilateral absence of N20 to SSEPs is frequently associated with the presence of clinical and EEG signs of poor prognosis. These data support that N20ABS reflect severe post-anoxic injury.

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SURVIVAL OF ADULT IN-HOSPITAL CARDIOPULMONARY ARREST: A 4-YEAR RETROSPECTIVE STUDY
Gaurav Sachdev, Grayson Eubanks, Peter Fischer, A. Christmas, Ronald Sing

Learning Objectives: Despite recent advances in resuscitation, the incidence and outcomes of in-hospital cardiopulmonary arrest have changed little. Up-to-date survival data are needed to investigate any trends in survival. Methods: This retrospective study, conducted in an 874-bed teaching hospital, evaluated patients who experienced cardiopulmonary arrest between January 2009 and December 2012. Data, which included arrest survival, in-hospital survival, medical or surgical admission, etiology (cardiac or pulmonary), and location (floor vs intensive-care unit, ICU) of the arrest, were prospectively collected into a performance improvement database. Statistical analysis for categorical variables was performed with the chi-square test. Results: Throughout the study period, 909 arrests occurred; these resulted in 68.87% event survival and 28.6% in-hospital survival. Clinical characteristics of such patients in comparison to those with present cortical response.

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THE CHARACTERISTICS OF PATIENTS WITH BILATERAL ABSENT EVOKED POTENTIALS AFTER POST-ANOXIC INJURY
Leda Nobile, Nicolas Goldziehein, Jacques Creteur, Jean-Louis Vincent, Fabio Silvio Taccone

Learning Objectives: Bilateral absence of cortical response (N20ABS) to somatosensory evoked potentials (SSEPs) is an established marker of poor neurologic outcome after cardiac arrest (CA). However, few data are available on the clinical characteristics of such patients in comparison to those with present cortical response. Methods: Retrospective analysis of an institutional database (Jan 2010–Jan 2013) including adult patients admitted to the Intensive Care Unit after CA and undergoing SSEPs 48–72 hr after arrest. All patients underwent targeted temperature management (TTM; 32–34°C) for 24 hr. We collected the absence of pupillary reflexes; absent or posturing motor response; status myoclonus (on day 2–3); electroencephalography (EEG) data (absence of reactivity to painful stimuli; presence of a malignant pattern, e.g. burst-suppression or flat tracings; status epilepticus) at normothermia. Outcome was assessed at 3 mo using the Cerebral Performance Categories (3–5 = poor recovery; 1–2 = good recovery). Results: We studied 42 patients (N20ABS n=19). Demographics, comorbidities and CA characteristics were similar between groups; 11 patients (26%) had a good neurologic recovery and none of them had N20ABS. Patients with N20ABS had a higher incidence of absent pupillary reflexes (14/19 vs. 4/23; p = 0.004), absent motor response (18/19 vs. 10/23; p = 0.007) and status myoclonus (4/19 vs. 0/23; p = 0.03) on day 2–3 than others. Also, patients with N20ABS presented more frequently a malignant EEG patterns (16/19 vs. 5/23; p = 0.001) and a non-reactive EEG (19/19 vs. 5/23; p = 0.001) than others. The N20ABS was associated with the concomitant presence of EEG findings (e.g. non-reactive EEG or malignant pattern) and clinical signs (e.g. bilateral absence of pupillary reflexes or status myoclonus on day 2–3 after arrest) of poor prognosis in 12/19 of patients when compared to 5/23 others (p = 0.001). Conclusions: Bilateral absence of N20 to SSEPs is frequently associated with the presence of clinical and EEG signs of poor prognosis. These data support that N20ABS reflect severe post-anoxic injury.
FIRST ATTENTION SUCCESS AT INTUBATION IS ASSOCIATED WITH A LOWER ODDS OF ADVERSE EVENTS IN THE ICU. Jeremy Greenberg, Jarrod Mosier, Raj Joshi, John Bloom, Josh Malo, John Sakles, Cameron Hypes

Learning Objectives: First Attempt Success (FAS) at endotracheal intubation has been associated with a reduced occurrence of adverse events (AEs) in Emergency Department (ED) intubations and, as a result, has become the surrogate outcome of choice in studies on airway management across multiple disciplines. Despite this, there is limited evidence associating FAS with reduced rates of AEs during intubations performed in the ICU. The aim of this study is to evaluate the association of FAS with odds of AEs during intubations performed by intensivists in the ICU. Methods: Prospective observational study of 809 consecutive patients intubated in the ICU of a university medical center from January 1, 2012 - December 31, 2014. Data were collected through a continuous quality improvement program on all patients intubated in the ICU over the study period. Data relating to patient demographics, each intubation attempt, and AEs were analyzed. An adjusted multivariate logistic regression analysis was used to determine the relationship between FAS and AEs. Results: Over the 36-month data collection period, a total of 809 patients were intubated, of these 673 were intubated using video laryngoscopy and 136 using direct laryngoscopy. FAS occurred in 635 cases (78.5%) whereas a second attempt was required in 137 cases (16.0%), a third attempt was needed in 28 (3.5%) while four or more attempts were necessary in 9 (1.1%) cases. FAS was associated with at least one AE in 20.2% while > 1 attempt was associated with at least one AE in 66.1% (p<0.001). In logistic regression analysis more than one intubation attempt was associated with 8.1 times the odds of an AE (95% CI 5.5 to 12.1), adjusting for method of intubation, use of video laryngoscopy, operator experience, and prior noninvasive ventilation use. Conclusions: During endotracheal intubation in the ICU, a failed first attempt at intubation is associated with a higher odds of AEs. These data support that FAS is an appropriate outcome when studying airway management in the ICU.

OUTCOME OF PATIENTS WITH REFRACTORY CARDIORESPIRATORY FAILURE MANAGED BY COMBINATION ECMO AND IABP Pramod Guru, Devang Sanghavi, Troy Seelhammer, Gregory Schears

Learning Objectives: Extracorporeal membrane oxygenation (ECMO) and Intra-aortic balloon pumps (IABPs) are frequently used as bail out mechanical circulatory supports for patients with refractory cardiogenic shock. Recently there has been increased use of ECMO as part Cardiopulmonary Resuscitation (ECPR) in patients with both in and out-of-hospital cardiac arrest. Few studies have specifically looked into the outcome of use of IABP and ECMO in these highly selective patient group. Here we report our experience on patients who undergo ECPR and also had IABPs. Methods: Retrospective analysis of an IRB approved data registry for adult extracorporeal membrane oxygenation (ECMO) patients (n=488) from 05/01/2001 to 12/31/2014 is performed. Adult patients more than 16 yr old (n=101) with cardiac arrest with documented resuscitation on the chart prior to initiation of ECMO were included. Fifty patients (49.5%) noted to have received IABPs. We recorded the patient demographics, types of ECMO support and survival. Results: 94% patient received Veno-Arterial ECMO. 53 (52.5 %) were male and the median (IQR) age was 56 (37–67) yr. The median (IQR) ECMO time was 100 hr (47–157) and duration of CPR was done for 25 (15–47) min. A total of 47 (46 %) patients had cardiac arrest following cardiac surgery, 11 (11 %) post myocardial infarction, 4 (4%) ARDS, and 39 (38%) had other. 52 (51%) patients survived 30 days, 37 (71 %) withdrew care, 52 (51.5%) expired in hospital, and 6 (6%) died after hospital discharge. Patient with IABP vs. without IABP has no difference in hospital mortality, 24 (48%) vs. 28 (55%); p=0.5. No difference was also noticed for duration of CPR, duration in ECMO and ICU length of stay between the two groups. Conclusions: Use of ECMO and IABP in patients with cardiac arrest does not improve the outcomes.

METHODS FOR IMPROVING ADHERENCE TO AHA GUIDELINES DURING PEDIATRIC CODE BLUE ACTIVATIONS Claire Stewart, Andrew Davis, Katherine Edmunds, Jamie Shoemaker, Rachel Keller-Smith, Ken Tegtmeyer

Learning Objectives: Our code team is a multi-disciplinary group of residents, fellows, respiratory therapists, nurses, and paramedics. In January 2014, code team training was implemented to improve team dynamics. Twelve sessions from January 2014 through December 2014 were analyzed for adherence to the 2013 American Heart Association resuscitation guidelines and were found to be lacking in the areas of ventilation rate (VR), compression rate (CR), and time spent on chest compressions (chest compression fraction or CCF); we lacked objective, real-time feedback for chest compressors. We hypothesized that by changing the dynamic of chest compressors and adding just-in-time training, we would be able to improve adherence to AHA guidelines. Methods: Members of the team met monthly. A high-fidelity simulation was run and each session videotaped. Prior to the start of the simulation, the compression resisters were coached on CR, depth, and technique to minimize time off chest. The chest compression team was modified from a paramedic and two residents to three residents due to observed hesitancy of feedback by the paramedic. Three reviewers watched the videos for adherence to AHA guidelines: the presence of a team leader and backboard for compressions, VR of <12 breaths per minute, CR between 100–120 per minute, and a CCF of >80%. Results: Nine sessions were completed since the change; the videos of these sessions were reviewed. Team leader and use of backboard guidelines remained at 100%. 67% of sessions adhered to VR less than twelve, 67% adhered to a CR of 100–120. 67% of 9 adhered to a CCF of >80%. Conclusions: Code teams continue do well in the areas of team leader and backboard use. After our interventions, we noted worsening CCF with similar VR and CR. This comes...
DOES THE CHOICE OF INITIAL VASCULAR ACCESS DEVICE DELAY CARDIAC ARREST RESUSCITATION?

James Paxton, John Willburn, Jonathan Ottolini, Robert Sherwin

Learning Objectives: Current guidelines for the emergency department (ED) management of out-of-hospital cardiac arrest (OHCA) call for immediate vascular access device (VAD) placement for medication and fluid infusion. Methods: Unplanned interim subgroup analysis was performed on the first 26 OHCA patients requiring immediate vascular access device (VAD) placement for medication and fluid infusion.

Results: A total of 25 teams were assessed, including leader-assigned (n=14), control (n=11). Among the assigned groups, 8 were MD-led and 6 were RN-led. The median time to VAD in the assigned group was 41.5 seconds (IR 27–85) for controls (p=0.13). In the assigned group, 85% of the teams (12/14) initiated VAD in less than 1 minute compared to only 54% teams (6/11) in the control group (p=0.18). 100% of the RN-led teams (6/6) initiated VAD in less than 1 minute, compared to 75% of MD-led teams (6/8) and only 54% of the controls (6/11) (p=0.19). Conclusions: The findings indicate clear differences, in the expected direction, among the clinical performance of nurse-led, physician-led, and control teams, although the differences are not statistically significant due to small sample size. Findings suggest promising directions for future research.


Shuichi Hagiwara, Kiyohiro Oshima, Dai Miyazaki, Atsushi Sakurai, Ken Nagao, Nashihiro Yonemoto, Arino Yaguchi, Naoto Morimura

Learning Objectives: To evaluate whether the numbers of paramedic in an ambulance improve the outcome of patients with out-of-hospital cardiac arrest (OHCA). Methods: SOS-KANTO 2012 study is a prospective, multicenter study focused on the early ED management of hypotensive (systolic blood pressure <90 mmHg) adult (≥ 18-year-old) patients requiring immediate vascular access device (VAD) placement. All VADs were classified as peripheral intravenous (PIV), intraosseous (IO), or central venous (CVC) catheter. Results: Twenty-six OHCA patients were included, with mean age 63.3 yr (SD 14.7 y). Eighteen patients were male (69.2%). Only ten (38.5%) patients arrived to the ED with prehospital VAD placement (4 IO and 6 PIV lines). A total of 26 VADs were successfully placed on 19 patients while in the ED. Median time from ED arrival to first successful VAD placement for all patients was 235 seconds (IQR 165–360 sec). Median time required for VAD placement was 50 seconds for IO (n=12, IQR 32–81), 95 seconds for PIV (n=12, IQR 28–188), and 780 seconds (n=2) for CVC lines. The times required to place IO and PIV lines were not significantly different (p=0.145). Success rates for initial VAD attempt in the ED were 75% (3 of 4) for IO, 33.3% (5 of 15) for PIV, and 50% (1 of 2) for CVC lines. Of the 16 patients without prehospital VAD placement, the VAD selected for initial ED placement was PIV in 12 cases (75%), IO in 3 cases (18.8%), and CVC in 1 case (6.3%). Nine (34.6%) patients experienced an identifiable delay in obtaining vascular access due to aborted failed VAD placement attempts. Eight of these 9 delayed cases (88.9%) were associated with selection of PIV as the initial VAD attempt type, with a median delay of 115 seconds (IQR 86–227). Conclusions: Our pilot data suggest that selection of PIV as the initial VAD of choice may be associated with delayed vascular access among adult ED patients.
(36.1 ± 10.6 min) than in Group One (37.3 ± 10.3 min). The mean time from emergency call to the 1st injection of adrenaline was also significantly (p=0.01) shorter in Group Two (31.8 ± 11.6 min) than in group A (35.9 ± 10.8 min). There were 12 patients with good neurologic outcomes after 90 days in the Group One and 30 in the Group Two, and there was no significant difference in the neurologic outcomes after 90 days between the two groups. **Conclusions:** Patients in the Group Two was transferred to hospitals and administered 1st adrenaline significantly faster than in the Group One, however, those did not affect the neurologic outcome of patients with OHCA.

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**FACTORS INFLUENCING THE TIME REQUIRED FOR IN-HOSPITAL EMERGENCY ENDOTRACHEAL INTUBATION**

Craig Jabaley, Ed George, Edward Bittner

**Learning Objectives:** Emergency endotracheal intubation requires coordination between providers, and timely airway management improves patient outcomes. We hypothesized that periprocedural delays and disorganization as measured by perceived chaos would lengthen the time required for intubation. **Methods:** We conducted a prospective observational study of all consults by an emergency airway team between Dec 8, 2014 and May 16, 2015 within the Massachusetts General Hospital. Time of arrival, induction, confirmation of intubation, and departure were marked electronically. Surveys assessed the team’s perception of chaos on an ordinal scale and categorized delays. Demographic and supporting data were linked retrospectively. Following descriptive statistics, comparisons were made by unpaired t-tests (with two-tailed P values reported) unless noted. Data are reported as mean ± SD. **Results:** 279 intubations were performed on 267 patients. Surveys were completed for 186 (66.6%) encounters, and of those 65 (34.9%) had timing data. The average time for an encounter was 20.8 ± 8.18 min. Time for preparation (10.4 ± 5.63 min) exceeded that of intubation (3.40 ± 3.72 min) and post-intubation stabilization (6.91 ± 4.19 min). There was a significant difference in the time required for encounters ranked less than the median chaos score (n=31, 18.6 ± 7.16 min) and those equal to or exceeding it (n=34, 22.7 ± 8.65 min) (p=0.04). Similarly, encounters during which vasoactive infusions were initiated or up-titrated (n=25, 23.3 ± 8.53 min) were significantly longer than those without such actions (n=40, 19.1 ± 7.61 min) (p=0.05). The difference between encounters with zero (n=52, 19.8 ± 9.01 min), one (n=22, 20.6 ± 6.70 min), or two (n=11, 23.8 ± 8.28 min) identified delay domains was not significant by one-way ANOVA (p=0.37). Location and time of day also failed to demonstrate significant differences in the time required. **Conclusions:** Prior descriptions of the time needed for elements of emergency airway management have been scant. Efforts to enhance teamwork and speed periprocedural tasks may improve efficiency and reduce perceived chaos.

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**INTRAOSSEOUS PRESSURE MONITORING IN CRITICALLY ILL AND INJURED PATIENT**

Joshua Salman, Aaron Burnett, Ralph Frascione, Nicholas Loken, Sandi Wewerka, Abigail Zagar, David Dries

**Learning Objectives:** Intraosseous (IO) pressure monitoring has not been explored as a potential invasive monitoring option. The objective of this study was to describe IO pressure measurements and their relationship to blood pressure obtained via external blood pressure cuff in ICU patients. **Methods:** This is a prospective, convenience sample, proof of concept pilot study conducted in the medical and surgical ICUs at an urban, Level I trauma center. Patients were identified in the Emergency Department and enrolled under a waiver of informed consent. Inclusion criteria included: age ≥ 18 year old, presence of an IO placed by EMS or in the Emergency Department, and planned admission to the Medical or Surgical Intensive Care Unit. External cuff pressure readings were recorded every 15 min, and IO pressure data obtained via pressure transducer were recorded continuously for up to 12 hr. IO systolic, diastolic, and mean pressure (IO SBP, IO DBP, IO Mean) readings were summarized for the minute before and minute following an external cuff pressure reading. The ratios of IO pressures to external cuff pressures (IO Systolic Blood Pressure / Cuff SBP; IO DBP / Cuff DBP; IO Mean / Cuff Mean) were calculated. **Results:** Twenty patients were enrolled between January 2014 and May 2015. Average patient age was 60 (range = 45–81), and 80% were male. Primary diagnoses were mostly medical in nature. The average IO SBP, IO DBP, and IO mean were 35.4 ± 14.10 mm Hg, 30.51 ± 8.99 mm Hg, and 34.26 ± 9.98 mm Hg respectively. The ratio of IO SBP to cuff SBP, IO DBP to cuff DBP, and IO mean to cuff mean are 28.4 ± 11.7%, 31.9 ± 23.5%, and 32.3 ± 20.7% respectively. The correlation of determination (R2) for IO SBP to cuff SBP was higher than the relationship between diastolic and mean IOP to cuff pressure (range 0.5 – 0.66). There were no adverse events reported during the monitoring period. **Conclusions:** IO pressure was reliably obtained and roughly 30% of external blood pressure cuff readings. This method of pressure monitoring may be an alternative to invasive central monitoring in the future.

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**SIMULATION-BASED MOCK CODES: IMPROVING TEAMWORK AND COMMUNICATION IN A TELE-ICU PRACTICE**

Sarah Bell, Julie Schmidt

**Learning Objectives:** Mayo Clinic’s Tele-ICU program involves remote monitoring of ICU patients by a centralized team of Intensivist’s, N/P/PAs, and critical care RNs. This collaboration has resulted in an improvement of severity-adjusted mortality metrics with ICU mortality decreasing by 30.5% and hospital mortality decreasing by 11.6%. Collaborating via video during a cardiopulmonary arrest can prove to be difficult; tele-ICU staff rely on bedside staff to notify them of patients near arrest due to limitations in technology. Simulation-based mock codes between tele-ICU and bedside staff were implemented to promote team work, provide definition of roles, and increase collaboration between teams. **Methods:** Mayo Clinic educators traveled on-site to take bedside members through the event while nursing education staff were in the monitoring center located in Rochester MN. Bedside staff were told to respond as they normally would to the event, they were not prepped about the possibility of involving tele-ICU in the event. This was intentional to measure the rate that tele-ICU staff were included by the bedside staff. Monitoring center RNs and Intensivist were not informed that mock codes were taking place so the scenario’s could elicit an un-prepared reaction. **Results:** Results found that traditional team member positions and roles need modification for interaction with tele-ICU. Closed-loop communication has greater emphasis so remote team members can be effective. Identification of a team leader remains an essential part of resuscitation, however the location of the team leader, whether remote or at the bedside, does not impact their overall ability to lead. **Conclusions:** Simulation-based mock codes were instrumental in defining tele-ICU team members’ roles in resuscitation events. It also provided the opportunity for bedside staff to identify the value of remote team members during a critical event. Mock events have been instrumental in continuing to build relationships between bedside and remote staff. This relationship is the key to providing high quality care in a tele-ICU environment.
was noted. Of 36 patients who received resuscitation measures within 5 min, 33 (92%) survived and 27 (85%) survived neurologically intact. Bystander CPR decreased the DownTime and the time to ROSC. Conclusions: It is difficult for EMS to arrive and start CPR in less than 5 min of an event. Thus, the only viable option is bystander CPR. In our study, bystander CPR had converted many potentially full-blown cardiac/respiratory arrest into an ALTE event.

EXPLORATORY STUDY OF DURATION OF HYPOTHERMIA FOR NEUROPROTECTION AFTER PEDIATRIC CARDIAC ARREST
Cassandra Baker, Kerry Francis

Learning Objectives: The best approach to targeted temperature management after pediatric cardiac arrest (CA) needed to optimize outcomes remains unclear. Serum and imaging brain injury biomarkers may potentially assist with prognostication and interventions. Hypothermie: 72 versus 24h of hypothermia would produce more favorable brain injury biomarker profiles after pediatric CA. Methods: In a single center prospective randomized trial, 34 (17/group) children with CA 1wk to 17y of age comatose after return of circulation (ROC) and treated with hypothermia were enrolled. Subjects were randomized to 24 or 72h at 33 ± 1°C and had blood samples drawn on d 1-4 and 7 post-ROC. The primary outcome was serum biomarker level at 24, 48, and 72h post-ROC (neuron specific enolase [NSE], S100b, and myelin basic protein [MBP]) between groups. Brain magnetic resonance imaging and spectroscopy was performed if clinically indicated, and lactate and N-acetylaspartate (NAA) were quantified in the basal ganglia, thalamus, and occipitoparietal cortex. Unfavorable outcome was defined as Pediatric Cerebral Performance Category (PCPC) score at 6mo of 4, 5, or 6 or increase >1. Safety outcomes were assessed. Results: There were no differences in age, duration of CPR, location of CA, or post-ROC Glasgow Coma Scale score between groups. There were no differences in NSE, S100b, or MBP levels at any time point, but there was a trend towards decreased S100b in the 72h group at 48h (0.022 ± 0.051 vs. 0.176 ± 0.306 ng/ml, p = 0.06). There were no differences in NAA or lactate levels by group in any region although mean lactate was decreased in the 72h vs. 24h group in all regions (n=9-14 subjects/region). There were no differences in mortality (7 [41%] vs. 4 [24%] deaths; 24 vs. 72 h, p=0.27), favorable outcome (7 [41%] vs. 7 [41%], p=1.00), or safety outcomes. Conclusions: Preliminary data show that serum S100b at 48h and brain MRS lactate show potential as therapeutic biomarkers and require additional validation.

AN EVALUATION OF SEDATION AND NEUROLOGIC OUTCOME IN THERAPEUTIC HYPOTHERMIA FOLLOWING CARDIAC ARREST
Cassandra Baker, Kerry Francis

Learning Objectives: Mild therapeutic hypothermia (TH) has been shown to improve favorable neurologic outcomes in patients successfully resuscitated from cardiac arrest. Due to the neurologic effects of hypothermia and prolonged elimination of sedatives, prognosis often cannot be predicted until 72h following return to normothermia and discontinuation of sedation. The aim of this study is to evaluate the relationship between neurologic outcome and sedative requirements in the 48 hour period following target temperature attainment in post-cardiac arrest patients undergoing TH. Methods: This was a retrospective review of sedative usage in the post-cardiac arrest TH population at a tertiary academic medical center. We included adult patients undergoing TH following cardiac arrest between July 1, 2011 and December 31, 2012. Patients were excluded from the study if they were pregnant, incarcerated, or lacked documentation of sedative usage in the post-cardiac arrest TH population at a tertiary academic medical center. Results: There were 109 patients who met the study inclusion criteria. Thirty-five patients were discharged with a favorable outcome. Fentanyl and midazolam were the primary sedatives used. There was no difference in mean cumulative requirements of either drug during the 48 hour period. Patients with favorable outcomes were more likely to have higher fentanyl requirements in the 24–36 hour interval than those with poor outcomes (532 mcg vs 345 mcg, p = 0.0262). In patients without seizure activity, those with favorable outcomes were more likely to have higher cumulative midazolam requirements than those with poor outcomes (81.4 mg vs 49.7 mg, p = 0.0298). These patients also had higher midazolam requirements during the 24–36 hour interval (26.2 mg vs 13.8 mg, p = 0.0374) and during the 36–48 hour interval (17.5 mg vs 6.2 mg, p = 0.0095). Conclusions: Higher sedation requirements during TH in post-cardiac arrest patients may be an early indicator of favorable neurologic outcome in patients without seizure activity.

THE CUFF PUFF: A NOVEL METHOD TO CONFIRM ENDOTRACHEAL TUBE DEPTH USING COLOR DOPPLER ULTRASOUND
Ariel Daube, Arthur Smerling, Leroy Phillips, Erin West, Lindsey Chaudoin, Lorraine Ng, David Kessler

Learning Objectives: Chest radiographs are the gold standard in the ICU for assessing endotracheal tube (ETT) depth. However, acquisition takes time and is a non-trivial source of radiation. We aim to show that ETT depth can be confirmed using the Cuff Puff: A novel ultrasound technique in which the ETT cuff is inflated/deflated with air while the trachea is visualized in color Doppler mode in the suprasternal notch. We hypothesized that the presence of a color flash, i.e. a positive Cuff Puff, indicates appropriate ETT depth. Furthermore, we believe this technique would have good interrater agreement among expert sonographers. Methods: A single adult cadaver was intubated with a 6.0mm cuffed ETT. Fiberoptic bronchoscopy was used to mark depth when the ETT tip was at the carina and at the vocal cords. A well-positioned tube was defined as terminating between 6.5cm below the vocal cords and 3cm above the carina. The ETT was then moved to random depths while a blinded sonographer performed the Cuff Puff at each depth. Test characteristics were analyzed using bronchoscopy as the gold standard. Two blinded ultrasound readers reviewed clips for interrater agreement. Results: Cuff Puff at 39 random depths were measured. Sensitivity was 0.44 (95% CI 0.20–0.70), specificity 0.91 (0.72–0.99), PPV 0.78 (0.40–0.97), NPV 0.70 (0.51–0.85), +LR 4.89 (1.20–21.15) and -LR 0.62 (0.39–0.97) for a positive Cuff Puff representing a well-positioned ETT. There was near-complete agreement among the reviewers for what constituted a positive Cuff Puff with the exception of a single clip, which resulted in a κ of 0.90 (0.72–1.00). The Cuff Puff was negative for a single non-blinded test of esophageal intubation. Conclusions: In a cadaver model, a positive Cuff Puff is a good indication that the ETT was inserted to an appropriate depth. Additionally, there is excellent agreement among reviewers about what constitutes a positive Cuff Puff. Further studies are needed to determine clinical feasibility and utility.

LONGER DURATION OF HYPOTENSION IS ASSOCIATED WITH WORSE OUTCOMES AFTER PEDIATRIC CARDIAC ARREST
Elizabeth Laverriere, Benjamin French, Sarah Sánchez, Robert Berg, Alexis Topjian

Learning Objectives: Following resuscitation from pediatric cardiac arrest, a single episode of systolic hypotension within 6hr of return of spontaneous circulation (ROSC) is associated with increased in-hospital mortality and worse neurologic outcome. We hypothesized that more severe and longer duration of post-resuscitation hypotension would be associated with worse outcomes following successful resuscitation from pediatric out-of-hospital cardiac arrest (OHCA). Methods: This retrospective cohort included children ≤ 18 yr who received ≥ 2min of CPR with ROSC ≥ 20 min, admitted to a Pediatric Intensive Care Unit (PICU) after OHCA from November 2012 to June 2015. Hourly systolic blood pressures for the first 72h following ROSC were standardized for gender and age dichotomized as hypotension (≤50%ile) vs. absence of hypotension (>50%ile). Association of the proportion of measurements of hypotension within the first 6 and 72h after admission with survival to discharge was examined using multi-variate logistic regression. Results: Sixty-one patients were eligible. Thirty-one percent (n=19) had at least one episode of hypotension. Fifty-seven percent (n=35) survived to discharge. Baseline characteristics were similar for the groups, with no significant differences in asystole/PEA (63% vs. 52%), duration of CPR

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PUTTING MORE QUALITY IN A QUALITY METRIC: TIME TO INITIATION OF CPR
Ashley Siems, Michael Spaeed, Elyse Tomanio, Anne Watson, Lillian Su

Learning Objectives: In cardiac arrest, the gold standard for the maximum time between event recognition and initiation of chest compressions is less than one minute. The time that potentially affects outcomes, however, is the time between actual onset of patient deterioration that requires compressions (event onset) and initiation of chest compressions. A focus on onset could help identify delays in recognition and subsequently have more impact on improving outcomes. We aim to establish accurate and precise determination and documentation of event onset.

Methods: This was a retrospective study in patients who received chest compressions in the pediatric ICUs at our institution between October 2012 and April 2015. Two ICU providers independently reviewed monitor data to establish time of event onset and time of initiation of chest compressions. Events requiring initiation of chest compressions were defined as 1) asystole or ventricular fibrillation, or 2) two or more of the following indications of poor perfusion or pulseless electrical activity: end tidal CO2 <15 cmH20, poor or absent pulse oximetry, flat arterial line, or blood pressure < 50% for age. These data were then compared to our paper resuscitation record. Results: The median time to initiation of chest compressions was 47 seconds (IQR 28-84s) in 58 events while the resuscitation record reported a median time of 0s (IQR 0-60s). The median difference in the time to initiation of chest compressions between monitoring data and resuscitation record was 26 seconds (IQR 0-51s) (p=0.006). According to the resuscitation record, 83% of cardiac arrests achieved the quality standard whereas only 64% of cases using our definition met this standard. There were 16 cases (28%) where traditional review missed areas for protocol adherence, induction rate, rewarming rate, and blood pressure targets.

Conclusions: These data emphasize the importance of monitoring and other data collection tools for event performance review should be modified to include more information about the actual timing of patient deterioration.

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DELAYED INVASIVE AIRWAY PLACEMENT AND CARDIAC ARREST IN PEDIATRIC ACUTE RESPIRATORY COMPRO- MISE
Hannah Stinson, Vijay Srinivasan, Alexis Topjian, Robert Surton, Vinay Nadkarni, Robert Berg, Tia Raymond

Learning Objectives: Acute respiratory compromise (ARC) is common in children, but it is unclear if obtaining a successful invasive airway on the first attempt (S) compared to a delay in invasive airway placement (D) reduces progression to cardiopulmonary arrest (CPA). We hypothesized that D compared to S is associated with progression to CPA. We defined D as those requiring > 1 attempt at tracheal intubation or the use of rescue methods (laryngeal mask airway and tracheostomy/cricothyroidectomy). Methods: We analyzed pediatric (< 18 yr) index events from the AHA Get With the Guidelines-Resuscitation registry from 2000–2012. ARC events in the delivery room or those patients with pre-existing invasive airways were excluded from analysis. Our primary outcome was ARC progression to CPA. We compared progression of ARC to CPA across S, D, and those who did not need an invasive airway (N; defined as no attempt at intubation during the ARC event) by univariate analysis (Chi-square for categorical variables/ANOVA or non-parametric equivalent for continuous variables).

Results: 2,153/5,793 children with ARC were included: 1185 had S, 268 had D, and 762 had N. 238 (11%) with ARC progressed to CPA. The median age was 0.8 yr (IQR 0.5) with 34% of events occurring in an ICU, 51% on a general ward, and 10% in the ED. Hypotension that preceded the ARC event was significantly associated with progression to CPA (22% vs 9%, p<0.0001), as was location in the ICU versus general ward (13% versus 5%, p<0.0001). D was associated with increased progression of ARC to CPA compared to S or N (15% vs 11% vs 7%, p<0.0001). The use of non-invasive ventilation prior to the ARC event was not significantly different across the three groups. Conclusions: More than 1 in 10 hospitalized children with an ARC event progress to CPA. Delay in successful invasive airway placement is associated with progression of ARC to CPA. Strategies to facilitate more “first attempt” successful invasive airway placement may help reduce the number of CPA events in these high-risk patients.

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ASSOCIATION OF PRESENCE AND TIMING OF INVASIVE AIRWAY PLACEMENT WITH OUTCOMES AFTER CARDIAC ARREST
Punkaj Gupta, Mallikarjuna Rao Rettingani, Jeffrey Gossett, Stephen Roth

Learning Objectives: Little data exist regarding the association of presence of an invasive airway before cardiac arrest or early placement of an invasive airway after cardiac arrest with outcomes in children who experience in-hospital cardiac arrest.

Methods: We conducted a retrospective review of patients aged 1 day to 18 yr who received cardiopulmonary resuscitation (CPR) for ≥ 1 minute in any of the three ICUs at a tertiary care, academic children’s hospital between 2002–2010. Specific outcomes evaluated included survival to hospital discharge, return of spontaneous circulation (ROSC), 24-hour survival, and good neurologic status at hospital discharge. We fitted multivariable logistic regression models to evaluate the association between the presence of an invasive airway prior to cardiac arrest and timing of placement of an invasive airway with these outcomes.

Results: Three hundred and ninety-one patients were included. Of these, 197 (51%) patients were already tracheally intubated before the occurrence of cardiac arrest. Median time to intubation was 6 min (Interquartile range (IQR): 2, 12) among the 194 patients tracheally intubated following cardiac arrest. We found lower survival to hospital discharge amongst patients intubated prior to cardiac arrest (intubated vs. non-intubated group, 43% versus 61%, p<0.001). After adjusting for patient and event characteristics, presence of an invasive airway prior to cardiac arrest was not associated with a significant improvement in survival to hospital discharge (OR: 0.70, 95% CI: 0.42–1.16, p=0.17), or good neurologic outcomes (OR: 0.60, 95% CI: 0.34–1.09, p=0.07). Similarly, early placement of an invasive airway after cardiac arrest was also not associated with an improvement in survival to hospital discharge (OR: 1.05, 95% CI: 0.78–1.42, p=0.73), or good neurologic outcomes (OR: 1.08, 95% CI: 0.77–1.53, p=0.65).

Conclusions: Presence of an invasive airway prior to cardiac arrest or early placement of an invasive airway after cardiac arrest is not associated with an improvement in survival to hospital discharge.

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THE IMPACT OF INTENSIVIST MANAGED TTM ON CLINICAL OUTCOMES IN A COMMUNITY HOSPITAL SETTING
Sabrina Arshed

Learning Objectives: Comatose survivors of cardiac arrest (CA) have a high risk of neurologic devastation and death. Targeted Temperature Modulation (TTM) has been shown to improve morbidity and mortality in this population. Protocols consist of rapid induction to mild hypothermia within 6 hr of return of spontaneous circulation, maintenance of the target temperature over a 24-hr period followed by a controlled return to normothermia. Methods: We compared clinical outcomes of patients who had undergone TTM in Raritan Bay Medical Center from January 2013 to July 2015. We retrospectively compared the management of CA patients before and after the implementation of an intensivist driven protocol for TTM. The Thermosuit system was used during the induction phase, and Gaymar blanket and bedside nursing controlled the temperature (32°C ± 2°C) during the maintenance and rewarming (0.25°C-0.5°C/h) phases. Primary outcomes include mortality and neurologic performance measured by cerebral performance category (CPC) scale at 0, 30, 60, and 90 days after TTM. Meaningful recovery was defined as CPC scores of 2 or less. Secondary measures included TTM rate, protocol adherence, induction rate, rewarming rate, and blood pressure targets.

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Results: 240 patients were included in this study. Four out of 134 patients (3.0%) in the pre-intensivist group (PiIG), and 31 out of 106 patients (29.3%) in the post intensivist group (PoIG), underwent TTM. The overall survival rate in PiIG was 35%, with a TTM survival rate of 25%, compared to 58.5% and 58% respectively in PoIG. PiIG patients who underwent TTM averaged a CPC of 3.9, while PoIG averaged 2.8; 0% of PiIG survivors while 66.7% of PoIG survivors were found to have meaningful recovery. A subgroup analysis of meaningfully recovered PoIG survivors showed 75% had a rewarming rate of less than or equal to 0.3°C/hr. Conclusions: The intensivist driven TTM protocol decreased mortality and increased meaningful neurologic recovery compared to the pre-intensivist protocol. Our findings also suggest higher likelihood of meaningful recovery in patients with slower re-warming rates.

194 FACTORS INFLUENCING TIME TO PLACEMENT OF CENTRAL VENOUS CATHETERS DURING CARDIAC ARRESTS IN A COMMUNITY

Neal George, Mohammad Malik, Thomas Simunich, Joshan Suri

Learning Objectives: The technical skill to place a central venous catheter (CVC) is essential for those responding to inpatient cardiac arrests. Patients with or without vascular access require CVC placement for rapid administration of vasoactive medications. Resident and attending physicians place CVCs by identification of anatomical landmarks. Time to CVC placement may be influenced by physician type, level of training and patient body habitus. This study investigated the time to CVC placement and its association with various factors in a community Level I Trauma Center during inpatient cardiac arrests. Methods: A retrospective study utilizing data derived from adult inpatient cardiac arrest respondents to the medical emergency team (MET) from January 2014 – June 2015. Collected data included time (from cardiac arrest called) to CVC placement, department (Emergency Medicine, Internal Medicine, General Surgery), level of training (resident or attending physician) of the person placing the CVC, patient BMI, and shift (defined as day 7AM-7PM and night 7PM-7AM, respectively). Results: During the 18 month study period, the MET responded to 229 cardiac arrests, of which 53 patients met inclusion criteria. The median time for CVC placement was 9.0 min (Interquartile range 7.0 min). The distribution of time to CVC placement did not differ significantly over department, level of training, or shift. When stratified by department, a statistically significant Pearson’s correlation was found between time to CVC placement and BMI for those from internal medicine participating with MET (rho=0.708, p-value=0.002). Stratification by level of training revealed a significant Pearson’s correlation between time to CVC placement and BMI for Attending physicians (rho=0.624, p-value=0.013). Conclusions: The data implies that BMI may pose a challenge and can delay CVC placement. Further study is needed to identify additional barriers that can delay CVC placement during in-patient cardiac arrests and if the observed time is sufficient delay to ultimately impact the resuscitation efforts of the MET.

195 IMPLEMENTING A COMPETENCY PROGRAM TO IMPROVE PHARMACIST PARTICIPATION IN CODE BLUE RESPONSE

Jessica Biedny, Joanne Heil, Akta Patel

Learning Objectives: Pharmacists are routinely present during cardiac arrest situations. Results: A decrease in post-competency errors was observed in regards to medication dose recommendation and cardiopulmonary resuscitation technique. Post-intervention comfort increased in regards to location of medications (p<0.031), pharmacodynamic profile of medications (p<0.031), providing medication related recommendations (p<0.002) and preparing medications during a cardiac arrest situation (p<0.031), presented as frequency and analyzed using the McNemar test. Conclusions: The implementation of a cardiopulmonary arrest competency program increased the observed competence and confidence of pharmacists during cardiac arrest situations. These results support a requirement for all pharmacists to complete the competency program prior to participation on the TJUH Cardiopulmonary Resuscitation Response Team. Further evaluation regarding the sustainability of this program is warranted due to required resources.

196 POST INTUBATION CARDIAC ARRESTS: AN INSTITUTIONAL REVIEW TO IDENTIFY A POTENTIALLY PREVENTABLE CATASTROPHE

Anuja Vyas, Dhwani Vyas, Anushirvan Minokadeh, Rebecca Soll

Learning Objectives: Over 200,000 inpatient cardiac arrests occur annually in the United States alone and survival remains poor. Cardiac arrests occurring after Rapid Sequence Intubation (RSI) are infrequent. Discovering risk factors would help identify and potentially prevent these arrests. Methods: We performed a retrospective review of all adult patients who suffered a cardiac arrest (CA) at our tertiary-level academic hospital between September 2011 and June 2015. We then analyzed all patients whose CA occurred within 10 min of emergent endotracheal intubation. Patients who were intubated prior to arrival to our institution or who were intubated after suffering a cardiac arrest were excluded. We obtained demographic and peri-arrest clinical data for these patients. Continuous data were described using mean (95% confidence interval) and categorical data using n (%). Within the group of patients who suffered cardiac arrest, several pertinent variables were tested for association with survival and return of spontaneous circulation (ROSC) using Fisher’s exact test. Results: We identified a total of 30 patients who met the predefined criteria out of a total of 396 all-cause cardiac arrests (7.5%). There was no statistically significant difference in outcomes studied (survival and ROSC) between different variables including gender, race, body mass index (BMI), time of intubation and arrest, medications received for RSI, number of intubation attempts and whether intubation was performed by either a trainee or an attending physician. The average Shock Index was 0.95 (0.86 to 1.04). 23 patients (76%) achieved return of spontaneous circulation (ROSC), and 14 (46%) patients survived to hospital discharge. Conclusions: Post Intubation Cardiac Arrest (PICA) is a rare but potentially preventable complication of endotracheal intubation, occurring more commonly in critically ill patients intubated for respiratory failure. An elevated Shock Index can be a potential marker in recognizing at-risk patients who may benefit from potential peri-intubation therapies like fluid resuscitation and vasopressors.

197 NEUROLOGIC INJURY IN PEDIATRIC ECMO PATIENTS: CHARACTERIZATION AND RISK ANALYSIS

Gangajal Kasniya, Kevin Maher, Michael Wolf, Shripaas Deshpande

Learning Objectives: Neurologic complications are a major source of morbidity and mortality for patients supported with ECMO. There is limited data regarding characteristics of neurologic injury, specific anatomic locations, incidental risk factors, time analysis, and interventions in pediatric patients. The objective of this study, therefore, was to characterize neurologic events on ECMO, identify risk factors and outcomes in a large cohort of patients. Methods: Retrospective cohort study of pediatric ECMO patients from a single tertiary care academic center. Results: We reviewed 407 pediatric ECMO patients between 2006 – 2015. Mean age was 3.6 yr and mean weight was 15.58 kg. Diagnostic category included cardiac (264/407, 65%), respiratory (150/407, 37%) and others (13/407, 3%). Overall, 84/407 (20.6%) had evidence of neurologic injury (NI). Type of NI was: hemorrhage (35/84, 41.7%), anoxic brain injury leading to brain death (30/84, 35.7%), infarction (14/84, 16.7%) and new onset seizures (5/84, 5.9%). Diagnosis was based on a CT Scan in 31/84, US in 27/84, MRI

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in 5/84 and clinical examination in 21/84 patients. Based on regression analysis, risk factors for NI included older age (p=0.05), greater weight (p=0.057), type of ECMO VA vs. VV (p=0.0009) and cannulation site - carotid vs. non-carotid (p=0.0103). Underlying diagnosis type (p=0.804) and duration on ECMO (p=0.378) were not significantly associated with NI. Patients with NI were more likely to have a lower PTT (p=0.05) but no differences in PT, INR, degree of acidosis, liver dysfunction, CVVH use or recent cardiac surgery. In multiple regression analysis, presence of NI was the only factor associated with non-survival (p=0.002). Conclusions: Neurologic injury is common (20.6%) in patients supported by ECMO. Risk factors for development of neurologic injury are older age, greater weight, VA ECMO and carotid cannulation. Neurologic injury was the single most important factor dictating survival from ECMO. Further studies will focus on validating these findings and exploring mechanisms that contribute to the neurologic injury in ECMO patients.

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THE ASSOCIATION BETWEEN MONITORING AND RRT ACTIVATION
Amelia Barwise, Charit Thongprayoon, Vitaly Haseevich, Ogjen Gajic, Brian Pickering

Learning Objectives: Rapid Response Teams (RRT) have been introduced to hospitals throughout the US to reduce serious adverse events such as cardiac arrest on the floor, by activating an “ICU without walls” to the bedside of the deteriorating patient. Monitoring of patients on the floors should alert providers about abnormal vital signs more frequently than manual vital sign measurements which take place every 4–12 hr generally on hospital floors. This study aims to explore whether monitoring of vital signs is associated with timely RRT activation. Methods: A single center retrospective study was conducted on all patients who had an RRT activated on them in 2012 at Mayo Clinic Rochester. RRT activation was classified as either delayed (greater than 1 hour) or timely (within 1 hour) based on abnormal vital signs meeting RRT criteria. A subset of the patients who were monitored before RRT activation was analyzed to see whether they had more frequent delayed or timely RRT activations, compared to the subset who were not monitored, and the subsequent outcomes noted. Results: A total of 1725 patients were included in the initial study. Of those, 610 were on monitored floors before RRT activation, 381/610 had a delayed RRT activation. The odds of having a delay were 1.45 (95% CI, 1.3–1.6) for those patients who came from monitored floors compared to patients who came from unmonitored floors. Sixty-two percent of patients from monitored floors who had an RRT activation had a delayed RRT activation. Conclusions: Monitoring should alert providers to physiological deterioration leading to earlier activation of the Rapid Response System. Contrary to what the literature has shown to date we noted that the ability to monitor patients is associated with a delay in RRT activation. This may be because the patient is receiving appropriate interventions in response to vital sign abnormalities or that providers are empowered to adopt a watch and wait approach. Monitoring does not appear to improve Afferent Limb Effectiveness.

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EFFECTIVENESS OF CARDIOPULMONARY RESUSCITATION IN ESTABLISHED ICU PATIENTS
Steven Trotter, Hussam Elkambargy, Jacklyn O’Brien

Learning Objectives: Critically ill patients are at risk for cardiac arrest requiring cardiopulmonary resuscitation (CPR). Limited data have assessed the outcome of established ICU patients requiring CPR. The purpose of this study is to determine the outcome of established ICU patients requiring CPR. Methods: A retrospective study of patients admitted to a 54 bed medical surgical ICU sustaining a cardiac arrest requiring CPR was performed. The APACHE Outcomes database was used. The following demographic data were recorded: age, gender, mortality, discharge disposition, functional status (independent, partially dependent, completely dependent) and the cerebral performance category (CPC) score at discharge. The CPC score includes four categories: 1 Conscious and alert with normal function or only slight disability, 2 Conscious and alert with moderate disability, 3 Conscious with severe disability, 4 Comatose or persistent vegetative state, 5 Brain dead or death from other causes. Results: One-hundred and fifty-two episodes of CPR occurred in 150 patients. The average age was 63 +/- 17 yr and there were 66 (43%) females and 84 (57%) males. One-hundred and eighteen (79%) patients died and 32 (21%) patients survived. Ten survivors (31%) were independent, 18 survivors (56%) were partially dependent, and 4 (12%) were completely dependent upon discharge. The CPC scores for the survivors were CPC1 9 (28%), CPC2 12 (37%), CPC3 2 (6%), CPC4 1 (3%). Conclusions: The effectiveness of CPR in established ICU patients yields a 21 percent survival rate in this retrospective analysis and an approximate 6% chance of a favorable independent outcome. Further study of this population should be done to investigate if there are predictive characteristics that may help guide physicians during discussions of levels of care with the patients and families.

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THE EFFECTS OF MINIATURIZED CHEST COMPRRESSOR ON QUALITY AND OUTCOME OF CPR IN ICU PATIENTS
Min Yang, Wanchun Tang, Xiang Yang, Lu Yin, Tianfeng Hua, Yao Zheng, Zhonghua Lu, Pinjie Zhang

Learning Objectives: Miniaturized Chest Compressor (MCC) has been demonstrated to provide high-quality chest compression with improving the rate of return of spontaneous circulation (ROSC) and survival in animal cardiopulmonary resuscitation (CPR) model. There are only few clinical studies about MCC. In the present study, we investigated the effects of MCC on quality and outcome of CPR in ICU patients by a prospective and observational study. We hypothesize that MCC improve the CPR quality by significantly increasing the diastolic arterial blood pressure (DABP) compared with manual compression. Methods: This study was conducted in an ICU of tertiary hospital in China from December, 2014 to July, 2015. The inclusion criteria were age above 18 yr, in-hospital cardiac arrest (CA) patients with arterial catheter and monitoring. The exclusion criteria included age below 18 yr, without arterial catheter and monitoring, second and third trimester of pregnancy and total duration of CPR < 3 min. Before attached the MCC device (the depth of compression = 5cm, the rate of compression = 100 time/min), the CA patients were treated with manual CPR. The BLS and ACLS procedures in this study followed 2010 AHA CPR guideline. The quality and outcome of MCC were evaluated by the DABP during manual and mechanical CPR, the rate of ROSC and survival to discharge. Results: Twenty-one cases were included in this study with 16 male patients and 5 female patients. The average age was 59.9 ± 12.6 yr. The average duration of total and manual CPR were 32.2 ± 10.6 and 3.8 ± 1.2 min separately; The DABP during MCC CPR was significantly higher compared with manual CPR (29.7 ± 11.9 vs. 22.5 ± 7.2 mmHg, p < 0.05). The rate of ROSC and survival to discharge in this study were 38.1% (8/21) and 4.8% (1/21) separately. Conclusions: MCC improve CPR quality by significantly increasing the DABP compared with manual CPR in ICU patients. The clinical effect of MCC on ROSC and survival compared with manual CPR and the other mechanical CPR device need to study further.
utilized to develop and follow progress during the development and institution period. Results: Thus far 403 interns have completed the bootcamp. The initial confidence for team training and team leadership was poor with less than 1/3 of incoming residents comfortable with their skills and training. Upon completion 76% strongly agreed with obtaining new skills and knowledge and how to apply it to the patient emergency in a multidisciplinary fashion. Conclusions: The multidisciplinary approach to team training in The Patient Emergency Improved team perception, attitude and awareness. Spread is key to any quality improvement project and the team has been successful at 2 of its academic clinical sites. Currently on going data collection and further simulation training of advanced residents is being undertaken. Further process improvement cycles need to continue to develop in order to show correlation.

202 EVALUATION OF PEDIATRIC CARDIOPULMONARY RESUSCITATION SKILL IN PEDIATRIC RESIDENT
Natchakarn Ananant, Ananti Khositserth, Harutai Kalaporn, Peeradej Kuptanon, Jurin Vaewpanich

Learning Objectives: Pediatric advance life support (PALS) courses are registered in pediatric residency training programs. Many previous studies have shown that PALS course improved cognitive knowledge but psychomotor skills have variable improvement. The learning from the mistake can possible increase both knowledge and psychomotor skills. The objective of this study was to evaluate the psychomotor skills of pediatric residents after direct and recorded video feedback.

Methods: A prospective, observational cohort study of pediatric residents from a university hospital with using the PALS 2010 guideline. We surveyed the level of pediatric resuscitation skill confidence by questionnaire. We evaluated their 8 psychomotor skills individually including airway, bag-mask ventilation, pulse check within 10 seconds, prompt starting and technique of chest compression, high quality CPR (push hard, fast, full chest recoil), tracheal intubation, intraosseous, and defibrillation. We also evaluated their mock code skills as a team using high-fidelity mannequin simulator (first course test). All participants attended the concise PALS lecture, direct and recorded video feedbacks. We reevaluated all participants 6 weeks apart in the same manner (second course test).

Results: There were 38 of 45 (79%) residents participated. All participants had moderate to high level of confidences of their CPR skills before the first test. Almost psychomotor skills, over 50% of participants had passed except the bag mask ventilation and intraosseous skills. There were poor correlation between their confidence and the first course test psychomotor skills. After course feedback, the percentage of the high quality CPR skill in the second course test was significant improved than the first course test (46% to 92%, p = 0.008). Conclusions: Direct and video recording feedbacks on pitfalls during individual CPR skills, and mock code case scenario could improve short-term psychomotor CPR skills and high quality CPR.

203 ACUTE INTERVENTIONS NEEDED BY NON-HOSPITALIZED PERSONS IN A PEDIATRIC HOSPITAL
Robert Bishop, Tensing Maa, Jeffrey Lutmer

Learning Objectives: Outpatients, visitors and employees can develop emergent medical needs while in pediatric hospitals. At our institution, Pediatric Critical Care (PCC) physicians lead the code blue (CB) team that responds to these crises. We hypothesize that adult visitors and staff derive minimal benefit from PCC involvement at CB events. Methods: Retrospective review of all CB events in non-hospitalized persons over a 16-month period in a freestanding quaternary children’s hospital. CB events were activated according to institutionally defined criteria. Activation trigger, age, interventions performed, and disposition were recorded. Pediatric (age 0 - 20 yr) and adult populations were analyzed separately. Results: There were 169 events, 125 (74%) adult and 44 (26%) pediatric. Activation triggers were cardiac 54%, neurologic 25%, respiratory 20% and trauma 1%. Respiratory and neurologic triggers were more common in children (25% and 39% respectively), versus cardiac triggers in adults (61%) (p=0.018). No one required cardiopulmonary resuscitation. Frequency of basic interventions were similar between groups (adult/child): aspirin 6%/4%, oxygen 4%/4%, albuterol 6%/7%, antiepileptic 4%/7%. Two children (5%) were intubated at the scene, 19 (43%) required admission to the hospital and 4 (9%) were admitted directly to the PICU from the CB. 76% of admitted children were in a subspecialties clinic at the time of the CB. Of 125 adults, 118 (94%) accepted care in the pediatric emergency room (ER). All survived to either ER discharge (22%) or transfer to an adult facility (72%). Conclusions: Adults comprise the majority of CB events amongst non-hospitalized individuals in a pediatric hospital, but receive only basic interventions that do not require PCC supervision. Children may be more likely to require advanced airway management. PCC physicians are a limited resource, and thought should be given to limiting their participation to pediatric CB events. Adults may receive equivalent care from a nurse-led team focused on providing basic interventions while facilitating transfer to definitive care at adult facilities.

204 AUTOMATED PULSE PRESSURE VARIATION GUIDED FLUID MANAGEMENT IN THE PEDIATRIC INTENSIVE CARE SETTING
Melissa Hines, Gary Koch, Jing Yu, Umesh Joashi, Afshaneh Pirzadeh

Learning Objectives: Several adult studies have shown that pulse pressure variation (PPV) more accurately predicts fluid response in mechanically ventilated patients with different pathologies including intraoperative and postoperative status and sepsis compared to static measures, such as central venous pressure (CVP). While there are many studies evaluating the use of PPV in adults, there are very few studies evaluating use of PPV in the pediatric patient population for guidance of fluid resuscitation. Methods: We are currently recruiting 75 prospective subjects and comparing to 75 historic, matched control subjects for a total of 150 subjects. Inclusion criteria include admission to the PICU, presence of an arterial line, and conventional positive pressure ventilation. Enrolled patients are given fluid based on PPV in addition to standard factors (vital sign changes, urine output, clinical exam, labs). If the subject has a change in vital signs such as tachycardia or hypotension and the PPV is greater than or equal to 13%, then a fluid bolus is recommended. If PPV is less than 13%, then a vasopressor is recommended. Primary endpoint is total amount of fluid (cc/kg/day) given over 48 hr after enrollment. Secondary endpoints are time in the PICU, time on vasopressors, and time ventilated. Results: We have 25 patients with 26 enrollments. The first 12 subjects enrolled have been matched. Preliminary data for these 12 subjects was analyzed using matched pairs t-test. Mean fluid given to the prospective group was 135.4 cc/kg/day (95% CI 87.8–183.1) and 143.6 cc/kg/day (95% CI 107.9–179.4) in the retrospective group (t-score 1.18, p-value 0.26). Enrollment will continue through December 2015. Conclusions: In our preliminary analysis, the use of PPV has led to physician management change with a trend towards decreased fluid resuscitation of critically ill pediatric patients. As enrollment continues, we hope to show statistical significance in the streamlining of fluid management leading to decreased morbidity associated with inadequate fluid resuscitation or fluid overload.

205 ASSOCIATION OF BMI WITH SURVIVAL DISCHARGE AMONG ECPR PATIENTS IN IN-HOSPITAL CARDIAC ARREST
Eunni Gil, Jeong Hoon Yang, Jeongwon Heo, Mi KYOUNG HONG, Chi Ryang Chung, Chi-Min Park, Gee Young Suh

Learning Objectives: Body mass index (BMI) may influence the quality of cardiopulmonary resuscitation (CPR) and may influence prognosis after extracorporeal cardiopulmonary resuscitation (ECPR). The aim of this study was to review the direct effect of obesity on outcome after in-hospital ECPR. Methods: From Jan. 2004 to Dec. 2013, in-hospital cardiac arrest patients who had ECPR in a single center were reviewed retrospectively. We assessed the association between BMI according to the WHO classification (underweight, BMI < 18.5; normal 18.5–24.9; overweight 25–29.9; obese ≥ 30) and survival discharge after ECPR. Results: Analysis was carried out on a total of 200 adult patients (39.5% female). Patients had a median age of 62.5 yr (range 18–89) and a median BMI of 23.20 (15.1–35.3). Survival discharge was 31.5%. There was no significant difference in survival discharge between the BMI groups (underweight 35.7%, normal 31.4%, overweight 30.2% and obese 26.7%). Conclusions:
Increased BMI was not a risk factor for hospital mortality after cardiac arrest who required support with VA ECMO. Therefore, obesity should not be regarded as a contraindication to initiation of ECPR.

206 CRITICAL CARE WITHOUT WALLS – IMPACT OF A PEDIATRIC EMERGENCY TEAM ON PATIENT OUTCOMES
Gnanam Ram, Tahir Rehmatullah
Learning Objectives: Cardiopulmonary arrest in children is often a gradual process, preceded by a critical period of physiologic instability, during which time life-saving interventions can decrease mortality and morbidity. In a first such study from INDIA, we report the impact of a Pediatric Emergency Team (PET) on patient outcomes. We hypothesized that introduction of PET would improve patient outcomes. Methods: This study, conducted at Manipal Hospital was a retrospective audit before and after introduction of PET. The preintervention period was from October 2011 to March 2013 (Phase 1) and the postintervention period from April 2013 to October 2014 (Phase 2). Children admitted to the wards were considered participants. The following outcomes were compared—number of patients having cardiopulmonary arrest in the ward, the number transferred to the PICU, the number needing intubation on Day 1 of transfer and the mortality of patients transferred in. The team comprised of PICU consultants, fellows and 2 PALS trained nurses. A list of “At Risk” children admitted to the ward was generated and seen frequently by the team. A PET Chart highlighting the warning signs and symptoms of various illnesses was prepared and filled in by the Pediatric ward nurses. If any of the warning signs were present, the team would be alerted and necessary interventions done by the team. Results: Mortality was significantly higher during phase 1 at 6.2% compared to phase 2, with no mortality (p < 0.01). During phase 1, 17.9% of patients transferred to the PICU were intubated on Day 1, compared to 5.8% during phase 2 (95% CI 0.04–0.20; p value = 0.005). Cardiopulmonary arrests did not differ between the 2 phases (1 in 10088 in phase 1; vs 11.145 of 10088 in phase 2; 1.43%) patients had to be transferred to the PICU from wards during phase 1 against 103 of 7737 patients (1.33%) during phase 2. (95% CI 0.24–0.45; p value = 0.55). Conclusions: In a first such study from India, we demonstrated the feasibility of implementing a Pediatric equivalent of the Medical Emergency team - PET, that has the potential for reducing the mortality and improving outcomes in children admitted to a tertiary hospital.

207 THE VALUE OF DEBRIEFING AFTER RAPID RESPONSE TEAM ACTIVATIONS AT A TERTIARY-CARE CHILDREN’S HOSPITAL
Linda Aponte-Patel, Arash Salavatibar, Fazioz Pamela, Anita Sen
Learning Objectives: With the advent of rapid response teams (RRTs), acute floor events for many hospitals have evolved from cardiac arrests into earlier RRT activations. While many institutions commonly debrief after arrests in the PICU, debriefing after floor RRT activations is not routine. Our study investigated attitudes, interest, and experience with debriefing after pediatric RRT activations. Methods: In order to assess the perceptions of both current and ideal debriefing practices after RRT activations, all pediatric residents, PICU fellows and nurses, and respiratory therapists at a tertiary care 200-bed children’s hospital, were invited to participate in an anonymous survey in February 2015. Multiple-choice questions were reported using description statistics and free-text was analyzed using qualitative methodology. Feedback regarding individual RRT activations was obtained by requesting a real-time feedback form from pediatric residents for each RRT activation from July 2014 to June 2015. Results: Overall survey response rate was 52% (78/149 invited participants). Debriefings after RRT activations were described as occurring “never or rarely” by 74% of all providers. 89% of all providers “strongly agreed or agreed” that there was a benefit to debriefing after RRT activations. Free-text themes included debriefings being viewed as educational opportunities and ideally including all team members. From July 2014 to June 2015, a total of 300 RRT activations occurred, with 54% being immediately transferred to the PICU. Based on the real-time feedback form (response rate of 88% per acute event), debriefing occurred after 25% of RRT activations. The most common participants included interns, residents and bedside nurses. Topics most frequently discussed were patient management and anticipation/timing of RRT activation. Conclusions: Informal debriefing after RRT activations is already occurring in our hospital, despite perceptions that it occurs rarely or never. There is strong interest in having a more consistent debriefing program to enhance learning after acute floor events.

208 ADVANCED LIFE SUPPORT KNOWLEDGE AMONG AMBULANCE OFFICER (PARAMEDIC) STUDENTS IN HUNGARY
Balint Banfai, Adam Elias, Tamás Nagy, Ernő Pék, Krisztina Deutsch, Balázs Radnai, Jozsef Betlehem
Learning Objectives: Lack of resuscitation knowledge of health care professionals may be a contributing factor to poor outcomes of cardiac arrest victims. Our aim was to investigate the advanced life support (ALS) knowledge of ambulance officer/paramedic students in Hungary. Methods: There were involved 97 students (N=97) in the cross-sectional study who were the third and fourth grade of the paramedic education at the universities. The data were recorded with a self-fill-in questionnaire. The research has been executed at three locations where ambulance officer/paramedic education is in Hungary: University of Pecs Faculty of Health Sciences, Semmelweis University Faculty of Health Sciences, University of Debrecen Faculty of Health Care. The statistical analysis was made with SPSS 22.0 and SPSS 22.0 statistical software. For analysis descriptive statistics, Chi-square- test, t-test, ANOVA and correlation analysis were used. Results: were considered significant in case of p<=0.05. Results: Average scores of the students was 67.79%. There was not significant difference between women and men (p=0.125; p=0.725). Lower age improved significantly overall scores (r=-0.295; p=0.003). Full-time students completed the test significantly better than the part-time students (F=8.549; p=0.004). There was not significant difference between the students from different locations (p=0.254). In case of chest compression-airway management- and ventilation issues achieved significantly better results the students who previously participated in real resuscitation situations (F=8.223 p=0.005). If this real experience was in the last two mounts the results were better (p=0.05). Ratio of correct answers by energy value of defibrillation was only 50.5%. Conclusions: Advanced life support knowledge of paramedic students could be better. It would be appropriate to increase the number of resuscitation courses and to tighten the exams. Real life practice can improve the resuscitation knowledge. This study examined only the theoretical ALS knowledge so it would be reasoned to examine the students practical skills.

209 ESTIMATION OF THE INCIDENCE RATE AND CUMULATIVE INCIDENCE OF ROSC DURING RESUSCITATION IN THE ER
Jong Dae Park, Kyuseok Kim
Learning Objectives: Current guidelines does not provide a definite rule for termination of resuscitation for out-of-hospital cardiac arrest (OHCA) patients, especially those being resuscitated in emergency room (ER). It maybe impossible to determine at which time point further resuscitation become absolutely futile because there still might be a chance of successful resuscitation. We thought a reference data on cumulative incidences of ROSC during an ongoing resuscitation might be useful when a physician discusses termination of resuscitation attempt with family members. Methods: This is a single-center retrospective study of adult (aged≥18) OHCA patients resuscitated in ER. Utstein-template elements and initial blood gas analysis results were assessed from chart reviews. We performed a Fine and Gray regression analysis to handle the issue and made a scoring system to group the patients according to their chance of getting ROSC. We also estimated the incidence rate and cumulative incidence of ROSC during resuscitation. Results: 939 patients without prehospital ROSC were analyzed. Fine and Gray regression analysis showed that time to BLS from detection of cardiac arrest, total duration of prehospital resuscitation, EMS-witnessed cardiac arrest, bystander-witnessed cardiac arrest and initial PaO2 level were significantly associated with the incidence of ROSC. We developed a scoring system based on the coefficients of the model. The formula was -3.4×time to BLS from detection -2.2×total duration of prehospital resuscitation + 156×EMS-witnessed cardiac arrest + 129×bystander witnessed cardiac arrest -62×prevus cardiac etiology
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DOES CODE BLUE SIMULATION TRAINING DURING INTERN ORIENTATION IMPROVE COMFORT LEVEL AND ANXIETY?

Adam Mora, Ginger Tsai-Nguyen, Cristie Columbus

Learning Objectives: Many teaching hospitals expect interns to participate in code blue as early as day one of internship. Code blue simulation training during intern orientation may help assess their comfort levels and provide insight to their perspective of their readiness. Methods: All 17 incoming interns to Baylor University Medical Center participated in intern orientation in June 2015. Code blue simulation training was done trained in a 3G SimMan lab. Assessments regarding comfort levels were complete pre and post training. Results: All 17 interns participated in the training (10 Categorical, 7 Non-categorical). All had previous simulation training during medical school, but only 82% had formal code blue simulation training with 35 having specific and formalized training as a code captain. They rated their comfort level participating in a code pre post training as: 0%:0% not at all comfortable, 29%:41% slightly, 71%:35% moderately, 0%:59% very and 0%:6% extremely. Their comfort level in being a code captain pre post training was: 53%:6% not at all comfortable, 29%:41% slightly, 18%:47% moderately, 0%:6% very and 0%:6% extremely. Their anxiety at participating in a code on a day of one internship pre post training was: 0%:0% none, 12%:23% minimal, 53%:59% moderate, 17%:18% high, 18%:0% very high. Their anxiety for being a code captain on day one prepost training was: 9%:0% none, 6%:0% minimal, 23%:41% moderate, 18%:41% high and 53%:18% very high. Post training, 94% thought simulation training improved their perceived comfort levels and 6% thought it remained the same with 6% reporting a worsened anxiety level, 24% having it remain the same and 81% having an improved anxiety level. All thought simulation training in code execution made them aware of issues they previously had not appreciated. Conclusions: Teaching hospitals should provide simulation training in code blues during intern orientation. It improves perceived comfort levels and eases anxiety in code blue participation and even in being a code captain. It makes interns aware of issues not previously anticipated prior to simulation training.

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NEUROMUSCULAR BLOCKERS FOR SHIVERING PREVENTION DURING THERAPEUTIC HYPOTHERMIA POST CARDIAC ARREST

Basant Sanuth, Katherine Wang

Learning Objectives: The International Liaison Committee in Resuscitation recommends sedation and analgesia for shivering during therapeutic hypothermia (TH). For refractory shivering despite deep sedation, bolus doses of neuromuscular blockers (NMBs) are recommended. Methods: A study was conducted at MSH in the MICU/CCU from January to December, 2014. The primary objective was to review NMB use in preventing shivering during TH induction in cardiac arrest patients. The secondary objective was to evaluate functional outcomes post cardiac arrest. Results: Forty-one patients met the inclusion criteria, 25 (61%) in the TH and 16 (39%) in the non-TH groups. The average age of patients was 57 yr. The median time to return of spontaneous circulation was 26 and 14 min in the TH and non-TH groups, respectively. The average baseline temperature was 36.7 ºC. The average time to targeted temperature was 5.3 hr. NMBs were used in 11 patients (46%) and none in the TH and non-TH groups, respectively. The most commonly used NMBs were continuous infusion of cisatracurium in 45% and vecuronium of 55% of patients. For the primary objective, 9 patients (36%) and 1 patient (6%) had seizures in the TH group during or at the end of TH and in the non-TH group, respectively. The secondary outcome of functional outcome was measured using Modified Rankin Scale (mRS). After excluding expired patients, the average mRS score was 3.7 and 5 in the TH and non-TH groups, respectively. Overall mortality was seen in 23 patients (56%). A higher mortality rate was seen in the TH patients, 15 patients (60%) compared to 8 patients (50%) in the non-TH patients. In the TH group, 3 patients (30%) were discharged to home, 6 patients (60%) skilled nursing facility and 1 patient (10%) to other hospital compared to 8 patients (100%) discharged to a skilled nursing facility. Conclusions: An increased number of seizures and mortality was noted in TH group. This data is confounded by longer downtimes and use of continuous infusion NMBs in the group. In patients that survived, the mRS was lower in the TH compared to the non-TH group.

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CARDIAC ARREST IN SKILLED NURSING FACILITIES: NO SURVIVORS QUESTIONS UTILITY OF ATTEMPTS

Dave Milzman, Juliette Saussy, Garret Blumberg, Norine McGrath, Lindsay Weiner, Don Einck, Danny milzman

Learning Objectives: Prior studies have detailed low survival following cardiac arrests in SNF skill nursing facility (AmGer, 1995), and Canadian study found Advance Directives reduce cost and utilization without affecting mortality. (Molloy JAMA 2000) Survival was only associated with V Fib as initial rhythm. This study will review a decade of patients with CardArrest in SNFs in a large metro area and utility of those resuscitative efforts. Methods: Retrospective, consecutive study of all non-traumatic cardiac arrests in Consecutive, Study Of All Non-traumatic Cardiac Arrets In DC Over 4 Years. Arrest Characteristics Included Initial Rhythm, Location, Demographics And Outcome. There was a law that allowed for advanced directives to be followed at time of EMS arrival. CARES registry and DC FEMS records are used formal data collection. All patients taken to DC ED were included. Waiver was obtained as no HIPPA sensitive data were analyzed. Results: 4,006 DC residents suffered a cardiac arrest in the decade 2004–2014 with a 20% ROSC to the ED and an overall survival rate 4% walked out of hospital. Mean Age: 65.0 yr; 53.5 % Male. Presenting rhythm: Ventricular Fibrillation Nursing Home 3.5% VS. 47% in Public Setting (p = 0.02 and Astyole Nursing Home 91% VS. 26% in Public Setting (p < 0.01). For the 534 SNF patients, ROSC All CPRs: 9% VS. SNF: 3% p < 0.05. Discharge Alive: All CPRs: 2.9% VS. SNF: 0% p < 0.01. Advanced Directives used: All CPRs: 5% VS. SNF: 0.8%, p < 0.01. Conclusions: This city-wide study describes a gross misuse of EMS resources and great need for SNF to improve discussions with patients and families on realistic outcomes and advanced directives implementation. Cost-Benefit Analysis Requires that Implementation of Change is Overdue. There is No Real Survival from Cardiac Arrest in Nursing Homes. Further research inside to see if there are any subsets that may benefit from EMS or other prehospital intervention.

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INTERN SIMULATION TRAINING IN CODE BLUE EXECUTION IMPROVES IDENTIFICATION OF CODE TEAM MEMBERS

Adam Mora, Ginger Tsai-Nguyen, Cristie Columbus

Learning Objectives: Many teaching hospitals require intern participation during code blue. Recognition of team members by new participants such as interns is vital to successful code blue execution. Methods: All 17 incoming interns to Baylor University Medical Center participated in a 3G SimMan lab in June 2015 during Intern orientation. Multiple code blue scenarios were executed using our institutions standard code blue execution with team members positioned at their designated areas. Assessments regarding simulation training and identification of key code blue team members were made pre and post training. Results: All 17 interns participated in the training (10 Categorical, 7 Non-categorical). All had previous simulation training during their medical school education and had found it to be a valuable teaching method in medical education. Interns were shown a typical code blue diagram which included key code blue team members in their assigned positions typical of our institution’s protocolized code blue execution. They were asked to identify key team members pre and post training. Accurate identification prepost was: Code Captain- 65%;100%; Recorder-65%;100%; Airway Physician/CRNA- 65%;100%; Member of Chest Compression Team- 82%;100%; Crash Cart Nurse- 82%;100%; Respiratory Therapist- 65%;100%. They rated their pre-training comfort levels with identifying members of a code
Learning Objectives: Cardiac Arrest leads to very high mortality rates, and worse neurologic outcomes in those who survive. In the past decade, studies have proven that therapeutic hypothermia (TH) with a goal temperature of 32–34°C improves neurologic function by decreasing cellular metabolism. It has been shown that TH improves neurologic outcomes in patients who experience cardiac arrest prompting incorporation of a reminder in the hospital’s code blue sheet.

Conclusions: The tool correctly identified the expected reference standard with an inter-rater agreement of 96.81% and a Kappa (Standard Error) = 0.94 (0.09) and a Receiver Operating Curve (95% CI) = 0.97 (0.94–0.99). Analysis of the individual 15 items comprising the tool demonstrated strong agreement with the reference standard, with ROCs ranging from 0.80–0.98. Conclusions: This direct observation assessment tool for CVC insertion demonstrates excellent performance in assessment of central line placement in a wide range of pediatric patients.

Research Snapshot Presentations: Education

THE PECARN HEAD TRAUMA RULE: VALIDATING A CLINICAL DECISION TOOL
Jennifer Garnett, Ilana Harwayne-Gidansky, Mary Ward, Kristen Cristelli, Son McLaren, Kevin Ching

Learning Objectives: The PECARN (Pediatric Emergency Care Applied Research Network) head trauma clinical prediction rules are a validated means for stratifying the risk of traumatic brain injury in children. However, implementation of this rule varies. Simulation is widely used in medical education, but studies showing effects on patient outcomes are limited. Structured Clinical Observations (SCOs) are valid training tools to evaluate resident development and to compare various teaching methods. We evaluated the effect of simulation on learning the PECARN clinical prediction rule using SCOs and its effect on patient care. Here we validate the SCO study instrument used to assess knowledge acquisition. Methods: The SCO underwent review by a core group of residents, Emergency Department (ED) and ICU attending physicians, followed by 3 iterative qualitative and quantitative reviews in 1–2 month PDSA cycles to achieve consensus. SCOs were collected throughout the academic year whenever residents encountered children with a chief complaint of head trauma in the ED. Standardized T-scores (mean=50, SD=10) were calculated for each score. A paired t-test was used to compare the first SCO T-score for each individual to a SCO T-score completed by each individual later in the study. A Pearson correlation was calculated to test for stability in individual differences. Results: 59/80 residents (73%) completed at least one SCO; 40/80 (50%) completed multiple SCOs. Comparing SCO scores over time showed a significant increase in accuracy. The second SCO score accuracy was significantly higher than first SCO t(39) = 2.08, p<.05, indicating that learning did occur between the administration of the SCOs. Correlation between the 2 SCO scores was not significant r(40)=.004, indicating that there were no effects of baseline knowledge on subsequent scores. Conclusions: The SCO developed here appears to be a valid instrument for evaluating knowledge acquisition, as evidenced by the significant increase over time, with potential to be used in clinical cases to standardize and improve patient care. Further study on broader applications is ongoing.

CENTRAL VENOUS LINE PLACEMENT ASSESSMENT TOOL VALIDATION IN PEDIATRIC CRITICAL CARE MEDICINE
Geoffrey Fleming, Richard Mink, David Turner, For The Educators In Pediatric Intensive Care Medicine

Learning Objectives: Procedures are a crucial element of education in Pediatric Critical Care Medicine (PCCM). To date, no validated tool exists to assist with directly observed assessment of a learner’s proficiency at central venous catheter (CVC) insertion in critically ill pediatric patients. The objective of this study was to create and validate a direct observation tool for assessment of CVC insertion among PCCM trainees. Methods: The Education in Pediatric Intensive Care (EPIC) investigators, used the modified Delphi technique to create a 15 item observation tool that included 1 global rating and 14 task specific skill assessments of kinesthetic and cognitive components of CVC placement. Five scripted simulated scenarios of CVC placement were created and filmed, each representing variations in child age, procedural indication, catheter site, and number of errors per scenario. Scenarios were hosted on a dedicated website, and study respondents recruited by email completed the observation tool in real-time while watching the scenarios. The scenario scripts were considered the reference standard for determination of inter-rater reliability and validity. Results: Forty-nine PCCM faculty responded and generated 188 scenario observations, of which, 150 (79.8%) were by participants who scored at least 4 of the 5 scenarios. The tool correctly identified the expected reference standard with an inter-rater agreement of 96.81% and a Kappa (Standard Error) = 0.94 (0.07) and a Receiver Operating Curve (95% CI) = 0.97 (0.94–0.99). Analysis of the individual 15 items comprising the tool demonstrated strong agreement with the reference standard, with ROCs ranging from 0.80–0.98. Conclusions: This direct observation assessment tool for CVC insertion demonstrates excellent performance in assessment of central line placement in a wide range of pediatric patients.
Kruskal-Wallis test was used to test the difference between groups by yr of experience. Results: Results were analyzed for 118 respondents (41 fellows, 66 PL, 11 TMD), 89 completed all scenarios. TMDs were more concordant when variables focused on intrinsic patient factors-clinical situations than extrinsic transport factors. TMDs were more likely to escalate and less likely to de-escalate the transport team composition than other respondents. In 4 scenarios (procedure requirement, cardiac disease, MC “gut feeling” and team mobilization time) pediatric intensivists with 1-3 yr postgraduate experience were more likely to agree with TMD than those with 3-10 yr experience (p<0.05). Conclusions: Our study suggests there is discordance in clinical reasoning for transport team dispatch within critical care experience groups with the exception of certain intrinsic patient factors-clinical situations. Factors associated with these differences require further study. There is a need for fellow curriculum and faculty training to ensure standardization of pediatric interfacility transport.

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INCORPORATING AN INNOVATIVE, MULTIDISCIPLINARY ICU COURSE INTO AN INTEGRATED MEDICAL SCHOOL CURRICULUM
Tracy McGrane, Meredith Pugh, Raeanna Adams, Arna Banerjee

Learning Objectives: Regardless of one’s specialty choice, most physicians are required to care for critically ill patients during residency training. We were challenged to incorporate substantive basic science into a foundational critical care course and accommodate a large number of students spread amongst 6 ICUs whilst maintaining a meaningful clinical experience. We created a unique interdisciplinary course, comprised of medical, surgical, pediatric and anesthesia intensivists to collaboratively teach the students. The primary goal of our course was to deepen student’s understanding of the physiology and pharmacology principles inherent in critically ill patients. We aimed to do this by providing hands-on care of critically ill patients in diverse ICUs across our medical center, high-fidelity simulation, and learner-targeted education. Methods: We structured a 4-week course, taught 3 times a year to 3rd and 4th year medical students, to include a week of simulation based modified FCCS curriculum, one week engaged in ICU clinical care, and two weeks comprised of core problem based learning discussions allowing students to delve in to relevant basic science, palliative care didactics, radiobiology didactics, and workshops. All students attended daily hour-long core ICU didactic sessions, as well as a daily journal club. Results: The course, taken by 62 students to date, has received favorable reviews with clinical relevance being rated the highest (4.7). Due to high demand, we were asked to offer an additional session to allow more students to experience our course and was made a prerequisite for traditional ICU sub-1 rotations. Fifty question FCCS post test results for each iteration: 41.7 median (SD3.4), 40.3 (3.2), and 43.4 (2.3). Final exam questions were from vetted question banks. Median and interquartile ranges were as follows: 75.7 (73.8–78.5), 80.7 (83.7–86.3), and 77.5 (72.5–77.5). All students passed the course. Conclusions: We were able to create an innovative, multidisciplinary critical care course, which integrates basic science with meaningful clinical care whilst accommodating a large number of medical students.

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THE DOLLAR SIGN PROJECT: AN INNOVATIVE DRUG COST-AWARENESS TOOL FOR MEDICAL PROVIDERS
Marcelo Malaleoiti, Jason Ott, Thomas Moran, Michael Kelleher

Learning Objectives: Hospital drug costs are a large area of concern and remain an area for improvement. Providers may not be fully aware of the actual cost of drugs prescribed. Having drug cost information readily available may help decision making when choosing between therapeutically equivalent drugs of different costs. We created a readily-available drug cost legend at the point of electronic order entry to try to improve cost awareness and impact prescribing practices. Methods: A prospective, single center, observational study evaluated prescribing habit changes and awareness after implementation of an electronic drug cost legend. The legend was included aside the drug ordered at the point of order entry. In addition to the legend, a chart of alternative drugs in the same class that differ in cost was created. This information does not have any direct electronic effects on the usual ordering methods. Users were surveyed on the tool and its affect on ordering habits and drug awareness. An analysis of cost data for selected drugs prescribed before this tool was launched will be compared to cost utilization data after the intervention to assess for any differences. Results: 130 respondents responded: Attendings, 58%; Fellows, 6%; Residents, 13%; APNs, 23%. Over half noticed the cost legend. 66% felt that it influenced their ordering, while 60% indicated inadequate knowledge about drug costs. The overwhelming majority (93%) felt that cost information should be available to them, 71% said it would affect their prescribing, and 12% admitted changing their ordering because of the tool. Conclusions: Providers feel that an electronic drug cost legend influences their ordering, report a knowledge deficit about drug costs, and that they want to know more about costs. The majority of this study group want drug cost information transparency, reporting it would affect their prescribing habits. However, only a small % of prescribers feel that this information changed their practice. Overall, the response to the new program has been positive, and the financial impact of this tool on ordering behavior continues to be reviewed.

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END-OF-LIFE EDUCATION: RESIDENT REFLECTIONS FROM THE 3 WISHES PROJECT
John Centofanti, Marilyn Swinton, Joanna Dionne, Ahmed Barefah, Anne Boyle, Anne Woods, Melissa Shears, Deborah Cook

Learning Objectives: During residency training, palliative care education may not be as well profiled as knowledge and skill acquisition in other areas. Objectives of this study were to describe residents’ experiences with end-of-life (EOL) education prior to and during their rotation in the ICU, and to understand the influence of a project on personalizing the dying process. Methods: In a 21 bed medical-surgical ICU we enrolled dying patients, their families and 1-3 of their clinicians in the 3 Wishes Project (3W), eliciting and honoring a set of 3 wishes to bring peace to the final days of a patient’s life and ease the grieving process for families. We conducted semi-structured interviews with 35 residents who cared for 50 dying patients, to learn about their experiences and perspectives. Interviews were recorded, transcribed verbatim, and analyzed using a qualitative descriptive approach. Results: Residents were aged 28.6(5.3–4.1) yr from 3 core programs: internal medicine (24.7,7%), anesthesia (8,24.2%) and laboratory medicine (1,3%), in postgraduate yr 1–3; all consented to participate. Three categories and associated themes emerged. (1)EOL Care is a Challenging & Crucial Component of Training in that a)EOL education is inadequate, b)personal connection with dying patients is difficult in the ICU, and c)EOL skills are valued by residents. (2)The 3W Reframes the Dying Process by a)humanizing this aspect of practice, b)identifying the central role of family engagement, c)increasing emotional awareness, and d)showing how care for patients shifts, not stops. (3)The 3W Offers Experiential Education by a)facilitating role-modeling, b)normalizing EOL dialogue, c)empowering residents to care in a tangible way, and d)encouraging reflection. Conclusions: Residents in the ICU desire more effective EOL education. The 3W reframed the dying process for trainees and provided many forms of experiential education. Practice-based rather than classroom-based programs may facilitate learning and engage training physicians in developing their EOL skills, which could translate into future practice settings.

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CRITICAL CARE PHARMACY RESIDENT RESEARCH PUBLICATION: RESIDENCY DIRECTORS PERCEPTIONS AND PRACTICES
Joseph Swanson, Hira Shafeeq, Drayton Hammond, Li Chenghui, John Devlin, CPP-Clinical Pharmacy and Pharmacology Section

Learning Objectives: Many postgraduate year 2 (PGY2) critical care pharmacy residents never publish their required primary research project (PRP). Given the influence of PGY2 residency directors (RDs) on PRP publication success, we sought to characterize the perceptions and practices of RDs surrounding the publication of their resident’s PRPs. Methods: A validated online survey was administered to RDs asking them to describe their residency program and the number of PRPs published by their 2011/2012 graduates to date. Program, RD, and research mentor factors, as well as RD perceptions were examined using a stepwise selection procedure. A multinomial logistic regression was performed to identify factors and perceptions associated with the number of PRPs published. Results: Survey response was 100% (55 RDs). Programs had a mean ±
SD of 2.7 ± 1.4 PGY2 graduates across 2011/2012 with 1 ± 1.2 PRP publications for these graduates to date. Most programs were located at an academic medical center (75%), and the RD’s primary employer was the hospital (79%). The RD was the primary research mentor 79% of the time. Univariate analysis identified a relationship between the number of PRPs published to date and the age of the program (p=0.03). The PGY2 funding source (p=0.04), the RD’s employer (p<0.01), both the primary research mentor’s publication history (p<0.01) and research training (p<0.01), and the perception among the RDs that PRP publication is important to their employer (p<0.01). Factors independently associated with publication of ≥ 2 PRPs (vs. 0) included the number of residents (Relative Risk Ratio [RZR]: 6.06; p=0.004) and the number of prior research mentor publications (RZR: 3.56; p=0.02). The RD perception that publishing the PRP is valued by their employer was independently associated with either 1 (vs. 0) (RZR: 5.04; p=0.039) or ≥ 2 (vs. 0) (RZR: 8.40; p=0.003) PRPs published. 

Conclusions: Publication of the PGY2 research project is associated with the number of residents in the program, the publication history of the research mentor, and the value that the RD feels their employer places on PRP publication.

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ENHANCED SIMULATION PROVIDES EFFECTIVE INTER-PROFESSIONAL PEDIATRIC RESUSCITATION TRAINING
Priscilla Yu, Nicholas Jackson, Robert Kelly

Learning Objectives: Given the low incidence of pediatric cardiac arrest, health care providers often feel uncomfortable with their cardiopulmonary resuscitation skills. In 2012, high-fidelity mobile simulation was used to teach Pediatric Advanced Life Support (PALS) skills to pediatric residents at our institution. Although residents’ comfort level (CL) improved in basic life support skills, procedures, and medication dosing, CL in interpreting rhythms and defibrillator use were not significantly improved. Our hypotheses were that the addition of a lecture to our simulation session would result in increased CL with arrhythmia management and that our enhanced session would also improve nurses’ CL with pediatric resuscitation skills. Methods: In September 2014, pediatric and family medicine residents began participating in an IRB-approved prospective study which included a short arrhythmia lecture incorporated into a high-fidelity mobile simulation session. We also included bedside nurses in these sessions. Pre- and post-session surveys were administered to obtain participant CL and knowledge regarding arrhythmias. Results: Sixty-five subjects participated (35 residents, 30 nurses). After their first mobile simulation session, residents’ CL increased in chest compressions (P=0.006), bag-mask ventilation (P=0.035), following PALS protocol (P<0.019), interpreting rhythms (P=0.004), and defibrillator use (P=0.033). After their first mobile simulation session, nurses’ CL increased in chest compressions (P=0.01), bag-mask ventilation (P=0.028), interpreting rhythms (P=0.002), defibrillator use (P=0.016), and peripheral IV placement (P=0.05). For both residents and nurses, there was no significant change in arrhythmia knowledge assessed by multiple-choice exams. Conclusions: Incorporation of a lecture into a simulation session appears to enhance resuscitation CL. In addition, the improvement in nurses’ CL supports the extension of our inter-professional curriculum to other medical professionals. Future studies should address how arrhythmia proficiency can be achieved and measured using such enhanced simulation education.

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PATIENT EXPERIENCE AND FAMILY PARTICIPATION IN MORNING ROUNDS
Daniel Hagg, Hannah Lobingier, Kelsey Priest, Nancy McCully, Marge Willis

Learning Objectives: The Medical Intensive Care Unit (MICU) audits AM rounds for daily management of performance. Metrics include average time per patient per day, interprofessional participation, and families’ involvement in rounds. As part of a larger patient experience initiative in the MICU, family’s invitation and participation in AM rounds were tracked over a nine month period during which several interventions were implemented to encourage the care team to invite families to rounds. Methods: Pre health research volunteers observe and audit MICU daily AM rounds, gathering and analyzing data that then is presented back to the care team in a daily dashboard. One of the metrics being tracked is whether or not patients family members were invited to participate in the round. An invitation is only applicable when family is present during AM rounds. Data was gathered over a three-month period during which written education was given to the care team to remind them about the importance of inviting families to rounds, and attendings received daily feedback on a dashboard posted on the MICU. Beginning in quarter one of 2015, the MICU quality team in coordination with nursing, rolled out education to nursing staff about inviting patients families to rounds and educational materials to give families. Research volunteers continued to track families’ involvement in rounds to determine whether the interventions impacted involvement. Results: Three months of baseline data gathered in quarter four of 2014 showed that patients families were invited to rounds on 68% of the time. After intervention in January of 2015, the invitation metric increased to 87% for quarter one and continued to increase in quarter two, at 93%. Conclusions: Educating all members of the care team and the posting of daily feedback about the inviting families to participate in AM rounds increased this invitation to 93%. Next steps for this project will be determining whether the increase of families being invited to rounds increased patient experience scores for the MICU.

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CRITICAL CARE PHARMACY RESIDENT RESEARCH PROJECT PUBLICATION: PRACTICES AND PERCEPTIONS OF GRADUATES
Hira Shahad, Drayton Hammond, Joseph Swanson, Li Chenghui, John Devlin, CPP-Clinical Pharmacy and Pharmacology Section

Learning Objectives: While PGY2 critical care pharmacy residents are required to complete a practice-related research project, many are never published. We sought to characterize the practices and perceptions of recent PGY2 critical care pharmacy (CPP) residents surrounding the publication of their PGY2 primary research project (PRP). Methods: A validated survey, electronically distributed to 2011 and 2012 graduates of PGY2 CPP residency programs, asked about the publication status of their PRP and collected data on factors and resident perceptions that might influence PRP publication success. These factors and perceptions were compared between residents who had published their PRP vs. those who...
had not and analyzed using logistic regression. **Results:** Among 124 graduates surveyed (31% male, median age 30 yr), 94 (76%) responded. Among the 26% of CCP residents who had published their PRP project to date, 67% were first authors and 50% were successful on the first submission. A third (36%) still planned to publish their PRP. Among the 38% not planning to publish, most (74%) perceived their PRP was not publishable due to low quality and/or impact. A number of factors (≥1 publication during PGY2, e.g., PGY1 project [p = 0.006], presentation of PRP at a national conference [p = 0.01], use of non-physician clinician collaborators [p = 0.05] and research training during PGY2 [p = 0.05]) and perceptions (self-motivation to publish [p < 0.001], post-PGY2 mentor support [p = 0.006], PRP publication important to post-PGY2 employer [p = 0.009] and adequate training [p = 0.01]) differed between published and non-published CCP graduates. Two factors (≥1 publication during PGY2 [OR = 3.70, p = 0.006] and presentation of the PRP at a national conference [OR = 4.47, p = 0.03]) and two perceptions (self-motivation to publish [OR 8.05, p = 0.008] and post-PGY2 mentor support [OR 3.30, p = 0.03]) were independently associated with PRP publication success. **Conclusions:** A quarter of PGY2 CCP residents publish their PRP. The factors and perceptions associated with CCP PRP publication success should inform future efforts focused on increasing PRP publication rates.

**NEEDS ASSESSMENT FOR FACULTY DEVELOPMENT OF PEDIATRIC CRITICAL CARE MEDICINE EDUCATORS**

Meredith Bone, Karen Marcelle, Richard Mink, Angela Caza, Stephanie Storgon, David Turner

**Learning Objectives:** Pediatric Critical Care Medicine (PCCM) faculty are vital educators as they teach learners of different stages in the management of critically ill children. However, faculty development programs for maintaining and enhancing teaching skills may be lacking. We undertook the present study to determine the needs, preferences and motivating factors of PCCM faculty with respect to education about supervising and teaching medical trainees. **Methods:** A modified Delphi technique was used to create a survey of PCCM attending physicians who supervise fellows and other trainees. Vignettes in the survey focused on autonomy, professionalism, leadership during rounds, teaching to multiple levels of learners, and providing and receiving feedback. Respondents rated their need for training on these topics, preferred education modalities, and potential motivating factors. An online survey was distributed by email to 545 PCCM faculty. **Results:** The 220 respondents reported a median of 8 yr as teaching faculty (IQR 4–16) in programs with a median of 9 (IQR 6–12) fellows. Nearly 60% received instruction about teaching skills during fellowship and 64% attended sessions as faculty. The highest priorities for educational topics included: innovations in clinical teaching (67%), giving feedback (57%) and assessing learners (49%). The most commonly preferred faculty development modalities were a brief discussion with a valued colleague, a 10 minute video, and a regular conference series. The most frequently cited motivating factors were educational offerings being part of a regularly attended conference, being readily available when needed, and promoted by a boss. Only 20% agreed that improving their teaching skills was a low priority. **Conclusions:** Most PCCM faculty reported they would benefit from and prioritize faculty development opportunities aimed at improving their knowledge and skills about teaching. Preferred methods and motivating factors highlight the importance of efficiency in content delivery. These data serve as a first step toward development of curricula to address these important educational skills.

**COMPONENT THERAPY: PERCEPTION IS QUITE DIFFERENT FROM REALITY**

Lewi Kaplan, Mark Bove, Steve Allen, Jose Pascual L., Corrina Oxford, Brian Smith, Philip Walker, Niels Martin

**Learning Objectives:** To determine: 1) what clinicians perceived as the age of blood transfused to their patients compared to the actual age of the transfused components, and 2) whether clinicians would have agreed to the transfusion if they knew the actual component age. **Methods:** Methods: All transfused packed red blood cell (PRBC) units were tracked in a patient information free database parsed by the preparation method and component age at transfusion (Sept 1, 2013–June 30, 2015). Clinicians (surgical and medical non-ICU MDs and APPs) at a single VAMC were individually queried regarding their perception of the age of the units they transfused to their patients (< 5 d, 5–10 d, 10–21 d, > 21 d of PRBC age). The same clinicians were then presented with the actual PRBC age at transfusion, and queried as to whether they would have proceeded with the decision to transfuse the units in question, and whether they believed that component age was important in that decision-making. **Results:** Results: Over 46 mo, 2243 PRBC units were transfused with a mean age of 25±8.8d (mode = 28d); 99% of PRBC were prepared using a 42-day method. Only 5.3% of PRBC were < 10d old, and only 0.71% were < 5d old at use. Clinicians (n=82) perceptions were that PRBC were as follows: PRBC age < 5d: 4(4.9%), 5-10d: 8(9.8%), 10-21d: 64 (78.8%), > 21d: 6 (7.3%); all intervals were significantly different from 10-21d (p < 0.001). The overwhelming majority would have agreed to transfusion if they knew the PRBC age (76/81; 93.8%; < 0.001 vs 5/81 refuse transfusion). PRBC was considered important by only 4/82 clinicians (4.9%; p < 0.001 vs PRBC age unimportant). **Conclusions:** Clinicians perception fails to match reality with regard to the age of transfused PRBC. Despite current evidence linking age of transfused components with complications, queried non-intensivist clinicians remain either unaware or unconvinced of the importance of PRBC age with regard to safety and complication mitigation.
new Cornell Assessment of Pediatric Delirium (CAPD), children can now be assessed with a validated tool. We sought to assess nurses’ general knowledge and screening of delirium using a survey during CAPD roll out. Hypothesis: Knowledge will improve for the staff of our 14-bed (600 admissions/s) PCICU with directed education. Methods: Verbal consent was obtained. 51 nurses completed a 10-question knowledge assessment. 6 questions focused on general knowledge, 4 focused on delirium assessment. Internal validity was established with 3 PCICU nurses. Surveys were completed before and 6 mo after delirium education. Results: Nurses’ overall knowledge of delirium and screening techniques improved after education and CAPD roll out. Mean ± SD (of 10 points) scores increased (6.6 ± 1.6 to 7.7 ± 1.2, before and after respectively, p<0.01). When analyzed separately, only knowledge regarding delirium screening techniques improved significantly (2.84±0.65 before and 3.5 ± 0.55 after, p<0.01).

Nurses’ general knowledge regarding delirium did not significantly improve (3.74 ± 1.22 before and 4.15 ± 1.2 after, p=NS).

Conclusions: Improved understanding and detection of delirium in PCICU children will enhance patient care and outcomes. Education is key to detection. These data suggest that educational opportunities remain in general knowledge. Andragogy®, a well-established theory of adult learning, stresses that education be founded in learner’s experiences and be problem-centered. Accordingly, our efforts have been modified to stress case-based learning on general knowledge for nurses, who are at the frontline of delirium care. 1Traube et al. PCCM. 2014. 42(3): 656. 2Knowles, M. S. (1968). Andragogy, not Pedagogy. Adult Leadership, 16:350.

230 ESTABLISHING PROCEDURAL COMPETENCE FOR TRAINEES IN THE BURN ICU USING A NOVEL TOOL
Ian McInnis, Laura Kraemer, John Melvin, Scott Phillips, Jimmy Rodriguez, Ian Driscoll, Booker King, Jeremy Pamplin

Learning Objectives: Proficiency in the performance of invasive procedures in the ICU is highly variable among physician trainees. Factors such as year of training and number of procedures performed do not always adequately represent procedural skill. Since ICU procedures are associated with the risk of significant complications, it is important to be able to quickly and reliably ascertain a trainee’s competence to safely perform them. Methods: This process improvement project was conducted in a 16 bed Burn ICU (BICU) within a referral burn center co-located with a 450 bed level 1 trauma center. New trainees in the BICU were given a punch card which listed 7 invasive BICU procedures. BICU attending physicians used this card to indicate a trainee’s level of competence (not independent, independent, teacher) with respect to a given procedure based upon direct observation. BICU staff physicians and nurses were surveyed about their perceptions of trainee procedural supervision and competence before and after implementation of this tool. Results: A total of 58 surveys were completed by BICU staff (13 attending physicians and 45 nurses). More BICU staff felt that physician trainees were adequately supervised after implementation of the study tool (45% vs 82%, P < 0.05). Significantly fewer staff relied on trainee self-reporting for assessing procedural competence (46% vs 77%, P < 0.05). There was no difference in staff perception of procedural safety after implementation. All staff surveyed reported using the tool.

Conclusions: A simple tool that allows BICU staff to quickly assess a trainee’s competence to perform important ICU procedures improved the perception of trainee supervision amongst BICU staff. Implementation of this tool has the potential to improve patient outcomes by improving trainee supervision and ultimately procedural competence. Future study should determine if this process improves outcomes.

231 A NOVEL METHOD OF EVALUATING PEER-TO-PEER PERFORMANCE OF CRITICAL CARE FELLOWS USING DEA ANALYSIS
Avinash Kumar, Vikram Tiwari

Learning Objectives: Factors that contribute to the success of individual fellows within a critical care fellowship have not been well studied. Most programs currently place significant emphasis on summative evaluations to assess whether fellows are meeting ACGME milestones. We used data envelopment analysis (DEA) to evaluate peer comparison and assess what aspects of the educational program and work characteristics contribute to their success in our program. Methods: DEA is a non-parametric, operations research technique that uses linear programming to calculate and efficiency score based on the relative usage of resources in producing an output. After IRB approval, the retrospective fellowship data from 2013–2015 academic yr was evaluated. Objective assessment required the development of a composite score for each fellow based on multiple inputs. The outputs included the didactic sessions attended, the ratio of procedures performed to the clinical duty works hr, the percentage attempts of an elective “question of the day” program, and the outputs were the 3 digit MCCKAP score and quarterly evaluations of fellows. Results: The final DEA output is an efficiency score for each fellow, ranging from 0 to 1, with a score of 1 implying a most efficient unit. Of the 15 fellows, 3 had a score of 1, 2 scored very close to 1 (0.98), 8 had a score between 0.53–0.71 and 1 had a score of 0.261. Fellows with DEA < 1.0 (implying an inefficient unit) – did so because they used higher level of resources than their peers to produce a much lower performance (on MCCKAP and final evaluations).

Conclusions: DEA is a feasible method of objectively evaluating peer performance in a critical care fellowship and can also potentially be a tool to forecast the level of effort needed by a trainee to achieve the same as their top performing peers.

232 REMOTE SIMULATION TRAINING WITH CERTAIN CHECKLIST IN 11 COUNTRIES
Shao Min, Rahul Kashyap, Lisbeth Garcia Arguello, Harsheen Kaur, Manasi Hulyalkar, Amelia Barwise, Ogjeni Gajić, Yue Dong

Learning Objectives: To determine the feasibility of web-based remote simulation training for ICU clinicians using CERTAIN (Checklist for Early Recognition and Treatment of Acute Illness and Injury) to evaluate and manage acutely ill patients. Methods: We conducted train-the-trainer sessions in 14 hospitals based in 11 countries between 2/2014 and 6/2015. Clinicians first took part in a baseline simulation session to assess their performance using three clinical resuscitation scenarios. After watching online curriculum, learners had structured hands-on training done remotely using video conference with recording capabilities. After this training, the learners were re-evaluated in similar clinical scenarios to assess for an improvement in their clinical performance. Their performance were scored using a validated instrument by two independent trained reviewers. Learners also completed satisfaction survey regarding training experiences. Results: A total of 15 subjects completed both baseline and post education sessions. A significant difference was seen between completion of 14 critical tasks before and after training with CERTAIN (from 57% to 80%). There was no significant difference in mean task completion time. Cardiac Assessment was increased by 16sec, Evaluation of Vitals Sign was decreased by 15sec, lab test Order was increased by 25sec, oxygen start was increased by 10sec before and after CERTAIN training (p=NS). The post-training survey indicated that 92% clinicians felt better prepared for an emergency scenario using the CERTAIN model. Total 77% clinicians considered those remote scenarios were realistic. Moreover, 92% physicians thought that CERTAIN software was easy to use, and that they could get useful knowledge from CERTAIN training. Conclusions: We observed an improvement in clinical skill and increased satisfaction after remote simulation training. This can enable a wide dissemination of the CERTAIN resuscitation framework to international ICU clinicians.

233 ACADEMIC PRODUCTIVITY OF ACGME-ACCREDITED CRITICAL CARE FELLOWSHIP PROGRAM DIRECTORS
Brenda Faby, Terrie Vasilepoulos, Peggy White, Deborah Calley

Learning Objectives: Academic productivity is an expectation for directors of Accreditation Council for Graduate Medical Education (ACGME)-accredited subspecialty programs in critical care (CC) medicine. Within the adult CC ACGME-accredited programs, we hypothesized that the academic rank and scholarly activity of adult CC program directors would differ between the specialties of pulmonary, surgery, and anesthesiology as the length of their CC fellowship programs vary from 1 year for surgery and anesthesiology to 3 yr for pulmonary CC. Methods: This study received IRB exemption from the University of Florida. Data were obtained from publicly available websites on program
directors from all institutions that had surgery, anesthesia, and pulmonary ACGME-accredited subspecialty CC training programs. Information gathered included year of board certification and appointment to program director, academic rank, National Institutes of Health funding history, PubMed citations, geographic area, and gender. Results: Surgery program directors had more total publications, recent publications, and last author publications when compared to program directors in pulmonary and anesthesia adult CC programs. These differences, especially in comparison to anesthesia program directors, were also present when examining difference within academic ranks. In multivariate analyses, specialty area was a significant predictor for academic productivity after controlling for gender, academic rank, year certified, yr as program director, and region. Conclusions: This study demonstrates that one’s specialty area in CC is an independent predictor of academic productivity, with surgery having the highest productivity. For some metrics, such as total and last author publications, surgery had more publications than both anesthesia and pulmonary, whereas there was no difference between the latter groups. This suggests that observed differences in academic productivity among specialties is not primarily due to length of fellowship but to other aspects of specialty-specific research training.

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A DEGREE COURSE IN CRITICAL CARE FOR UNDERGRADUATE MEDICAL STUDENTS—THE STUDENT VIEW
John Kinsella, Joanne McPeake, Tara Quasim
Learning Objectives: In the UK medical students are not required to undertake a primary university degree prior to entering medical school. At Glasgow University we introduced an intercalated BSc.Med.Sci in Critical Care and Perioperative Medicine in 2012, limited to 8 students per year with highly competitive entry criteria. The course is heavily oversubscribed. Critical care is ranked first of the options by the students and is ranked first in terms of academic performance. Hypothesis: Analysis of student feedback would reveal themes explaining why the course is attractive and has good outcomes. Methods: The course involves core medical sciences, statistics, the specialist course in critical care and perioperative medicine and a research project. At the end of the course all students are invited to provide anonymous written feedback, students are identifiable as to which specialty course they undertook. We collated all the feedback for 3 yr from the students about the specialty course and the research project. The qualitative comments were analyzed using Thematic Analysis. Results: The feedback from the undertaking the Critical Care course over the first 3 yr was collected. Feedback on the specific critical care components was extracted. Students discussed three predominant themes within their feedback: the utility of a specialist critical care course; the importance of learning in a research active environment and the use of clinical academics as research supervisors. The important sub themes included the clinical relevance, the combination of clinical and scientific knowledge and the transferable application of theory learnt. The supervisors from anesthesia and critical care were passionate about the topic, flexible and supportive. Conclusions: The course content, relevance and enthusiasm of the clinical academics appear to be the perceived strengths of the critical care degree course. The first cohort of students entered clinical practice in 2015 and their subsequent clinical and academic progress will be followed to see if there is lasting benefit from this degree course.

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CAN THE SPIKES TOOL ASSESS FAMILY MEETINGS IN EOL DONATION AFTER CARDIAC DEATH (DCD) SIMULATIONS?
Sandy Swoboda, Clint Burns, Pamela Lipsett
Learning Objectives: The ICU team is faced with family meetings and EOL discussions that involve delivering bad news, but team member performance is rarely evaluated. We utilized sim training for ICU teams to improve EOL discussion and teamwork around DCD. To focus further training paradigms we used the SPIKES protocol, a validated tool to deliver bad news to evaluate communication in sim videos. SPIKES addresses six steps: Setting, Perception, Information, Knowledge, Emotions and Summary. Methods: A sim curriculum using standard actors was developed for ICU teams to encounter family members in 2 parts: 1) a random hallway encounter with the family’s request to withdraw life support and 2) a formal family meeting to address EOL care and decisions regarding DCD. Two sim training sessions occurred 8 mo apart, each session 1.5 hr long. Video recordings were evaluated using the SPIKES protocol and descriptive data reported. Results: Over 81% of trainees had previous sim experience and 92% had previous EOL discussions. SPIKES protocol was applied to trainees who attended both sessions (2 Attendings and 4 Fellows). When compared to faculty faced with a family encounter in the hallway, fellows were less likely to confirm the family’s understanding or family dynamics, assess feedback, avoid medical jargon and showed less empathetic responses (p<.05). Overall, trainees improved from T1 to T2 in Perception (family understanding of status), ability to discuss bad news), Invitation (discuss a strategy for delivering news), Knowledge (avoiding medical jargon and assessing family understanding) and Emotion (more empathetic) p<.05. Trainees did not improve in addressing the Setting or Summarizing the encounters. Conclusions: Retrospective application of the SPIKES protocol to EOL sim videos objectively measures outcomes. In our model simulation, we failed to show participants the importance of the Setting and Summarization in both encounters. However, the model clearly demonstrated improvement in the P-I-K-E portion, and allows us to document and provide effective feedback to trainees focusing further training efforts.

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CONCEPTUALIZATION AND EXPLORATION OF VOLUNTEER PHYSICIAN ENGAGEMENT IN A NATIONAL SIMULATION PROGRAM
Aimee Sarti, Stephanie Sutherland, Angele Landriault, Kirk DesRosier, Susan Brien, Pierre Cardinal
Learning Objectives: Physician volunteers are essential to health care delivery and medical education. Despite growing needs to optimize engagement, there is a paucity of data on how to improve and maintain engagement. Conceptual clarity on physician volunteer engagement is lacking in the medical literature. The objective of this investigation was to develop and explore a conceptual framework to describe the elements, which influence physician volunteer engagement. The context for this study was the Acute Critical Events Simulation (ACES) program, which has successfully evolved into a national educational program, driven by physician volunteers. Methods: Mixed-method design. A conceptual framework was constructed based on an extensive literature review and expert consultation. Secondary analysis was undertaken on fifteen semi-structured interviews conducted from 2012 to 2014 with participants, including program directors and health care professionals across Canada. An additional fifteen interviews were conducted to achieve thematic saturation (Total N = 30). Data was analyzed iteratively and inductive coding techniques applied. Results: From 2010 to 2014 the program recruited 73 volunteer health care professionals (physicians, R, nurses) who contributed to the creation of educational materials and/or served as instructors. The majority were physicians. From the physician volunteer data, eleven themes emerged. The most prominent themes included volunteer recruitment, retention, recognition, and educator network. Captured within these interrelated themes were the framework elements, including the synergistic effects of emotional, cognitive, and reciprocal engagement. Behavioral engagement was driven by these factors along with a cue to action, which led to contributions to the ACES program. Conclusions: This investigation provides a preliminary framework and supportive evidence towards understanding the complex construct of physician volunteer engagement. The need for this research is particularly important in present day, where growing fiscal constraints create challenges for medical education to do more with less.

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CURRICULUM CONTENT IN CRITICAL CARE: DEVELOPING A PROPOSAL BASED ON CONSENSUS OF EXPERTS
Miguel Coral Pabon, Catarine Fernandez, Vítor Hugo Nieto
Learning Objectives: We have tried to identify and standardize the basic concepts needed to include in the curriculum of residents of critical care medicine in Latin America, as a complementary step toward competency-based education in critical care. Methods: We use the Delphi method to develop expert consensus through international surveys conducted anonymously by electronic e-mail. We set out to recruit 25 Colombian experts in three main areas (residents educators, critical care researchers and community intensivists) to participate in the
consensus panel. Candidates were defined as participants when they completed at least one of the questionnaires of any of the three Delphi consensus rounds. The authors gathered and classified the resulting items and determined whether elements should be included or excluded from the next round according to predetermined criteria. To generate descriptive statistics was used Excel 2011. Results: A total of 117 potential panelists were invited to participate in the consensus panel, twenty-five of which participated (twenty-three residents educators, twenty-four intensivists and eighteen researchers). Five community intensivists agreed to participate but did not return any of the Delphi questionnaires. The three consensus rounds were completed over a period of 3 mo. Panelists generated a total of 356 curricular contents, divided into twelve main chapters. 274 met the consensus predefined criteria for inclusion in the final draft of the curricula. The consensus was able to differentiate the main contents and additional contents for each chapter. Agreement among panelists on the items included was high.

Conclusions: There is an increase in the number of training programs in critical care in Latin America. Each one needs a curriculum according to their own institutional educational plan. The curriculum content described in this study provide an important basis for the development of a competency-based curriculum for teaching critical care medicine in the region.

**238 EFFECT OF SIMULATION TRAINING ON INTUBATION PRACTICES OF FELLOWS IN A TRAINING PROGRAM**

Phani Kantamneni, Mourad Sennusi, Aanchal Kapoor, Sudhir Krishnan, Abhijit Duggal, Deborah Rathz, Rendell Ashton, Eduardo Mires-Ledesma

Learning Objectives: Airway management techniques are essential skills in the management of critically ill patients. Simulation training has gained increased popularity as an educational tool. We hypothesize that the use of comprehensive airway simulation training would lead to improvement in first-pass success and appropriate use of induction agents and paralytics for intubation. Methods: A comprehensive simulation airway course was introduced at the beginning of the academic year (2013–14) for all incoming fellows. A retrospective chart review was performed comparing intubation practices between first year fellows who received simulation training and first year fellows during the previous academic year who did not receive any simulation training. We used t-test and ANOVA for continuous variables and Fisher exact test for categorical variables. Results: A total of 235 intubations were performed by the simulation-trained fellows and 227 were performed by the simulation-naive fellows. The mean age was 57.3 vs 59.8 in the trained versus naive groups respectively. Although there was no statistically significant difference in rates of first pass intubation, when the study period was divided into quarters, the third quarter (Jan-Apr) achieved a statistically significant difference (p<0.016). This effect however did not sustain into the fourth quarter. Use of paralytics increased from 25.9% in the simulation-naive group to 53.3% in the simulation trained group (p=0.0001). The weight based dosing of induction agents used was more appropriate in the simulation-trained group and a sustained effect was noted at 12 mo (p=0.04). Conclusions: Simulation training showed improved use of paralytics, appropriate weight based dosing of induction agents and a trend towards successful first pass intubation. Although simulation training has become a greatly utilized educational tool, the frequency at which it should be delivered to reinforce learning and affect intubation practices amongst fellows is still unclear.

**239 CURRENT USE OF INVASIVE AND NONINVASIVE MONITORS IN ACADEMIC PEDIATRIC INTENSIVE CARE UNITS**

Awni Al-Subu, George Oforto-Atambo, Kyle Behder, David Turner

Learning Objectives: Cardiorespiratory monitoring is essential in the care of critically ill patients, & a number of invasive techniques are implemented for monitoring of important parameters, but these approaches pose potential risks & complications. In attempt to minimize these risks, there is growing interest in the use of noninvasive technology for cardiopulmonary monitoring. Hypothesis: To assess the current use of noninvasive monitoring compared to traditional invasive monitoring in Pediatric Critical Care Medicine (PCCM) fellowship-training programs. Methods: A web-based survey was distributed to PCCM program directors (PDs) at the 64 accredited FTP Questions focused on demographics, utilization of invasive & non-invasive monitoring for specific patient populations & disease states, & fellow education regarding different monitoring technologies. Results: Forty-four (60%) PDs responded to the survey. Capnography was the most commonly reported non-invasive monitoring technology. NIRS was utilized more frequently in post-operative cardiac patients than for other populations (p<0.001). Invasive monitoring with arterial & central venous catheters is used almost uniformly. Other invasive monitoring is used sparingly, including Swan-Ganz (SG) & pulse index continuous cardiac output catheters. The restricted use of SG catheter utilization has also led to decreased number of these catheters placements by fellows, with 98% of PDs reporting placement of 1 or less SG catheters during training, which are significantly fewer than arterial & central venous catheters (p<0.001). There were minimal differences in reported use of monitoring technologies based on either number of ICU beds or size of FTP. Conclusions: Academic PICUs utilize a range of both invasive & noninvasive monitoring techniques. While the use of noninvasive monitors has become routine in some contexts, utilization remains variable across a wide range of critically ill children. Further investigation is needed to define the standard of care for the use of noninvasive monitors as practitioners attempt to optimize care while minimizing risks and complications.

**240 DENY THE UTI: TARGETING CATHETER PREVENTION FOR ZERO INFECTION**

Elise Kumar

Learning Objectives: Catheter-associated urinary tract infections (CAUTIs) are the most common hospital-acquired infection, accounting for more than 1 million cases annually. CAUTI is associated with an almost 3 fold higher risk of death to the patient, as well as increased health care costs: one analysis showed that each episode of CAUTI increases costs by more than $2800. CAUTIs were among the first hospital-acquired conditions selected for non-payment by Medicare and Medicaid Services and have been further targeted for complete elimination as a ‘never event’, with a national goal to reduce CAUTI by 25% and reduce urinary catheter use by 50%. Basic and specific practices to prevent CAUTIs have been applied in different institutions, but reducing rates of CAUTIs and Foley catheter days remains challenging in the ICU. Methods: We systematically searched for strategies aiming to reduce CAUTIs. Implementation of education sessions conducted on a Net Learning module, as well as attending a classroom lecture. Didactic station was included for CAUTI prevention, for all RNs and Nursing assistants in Nursing competencies. New Bard Foley kit planned with step by step insertion/practice steps in conjunction with re-enforcing education, Point prevalence study after new kit implemented. Monthly education and assessment of catheter indications and a Foley Catheter Bundle that have guidelines for Foley insertion best practice competency and urinary catheter best practice algorithm. Results: During the year 2014 we noted an upward trend in CAUTIs, with an incidence of 2.26 and 2.12 (for 3rd and 4th quarter) per 1000 catheter days, a rate that is approximately a little lower than the national standard. Past a 7 month period (Jan 2013- Jul 2015) after intervention, the incidence was 1.0 per 1000 catheter days. This represents a 50% reduction in the CAUTI rate, and the difference is not statistically different (P=0.21). Conclusions: Significant CAUTI reduction was not observed in the ICU. Aggressive measures needed to decrease utilization, maintenance and reduce CAUTI rates. Steady focus is on working for ZERO infections.

**241 ADVANCED PRACTICE PROVIDERS IN CRITICAL CARE: AN INNOVATIVE TRAINING MODEL TO IMPROVE COMPETENCY**

Caroli Harkness, Lindsay Couchon, Marina Trevianni, David Indarawis, Tonja Hartes, Alicia Mohn, Philip Efron, Justin West

Learning Objectives: The role of the Advanced Practice Provider (APP) has evolved over the past two decades to include acute and critical care settings. One-year fellowships have been developed to ensure well-educated and competent providers across the U.S. Unfortunately, many APPs are unable to delay starting their career for an additional year of specialized training. Therefore, the University of Florida surgical intensive care unit (SICU) has created an on-the-job training...
A BRIEF INTERVENTION FOR PROVIDERS TO DETECT PNEUMOTHORAX IN THE ICU USING ULTRASOUND
Despa Patel, Jean Wheeler, Karen Krechmery, Lyndsay Head, Joel Zivot

Learning Objectives: Pneumothorax in the ICU can be a life-threatening event if it is not diagnosed and treated in a timely manner. There are often significant delays from the time a chest x-ray order is placed until the film is taken, uploaded, and read by radiology. Compared to plain films, ultrasound (US) has been shown to be more sensitive in the detection of pneumothorax. In addition, US has limited radiation, minimal cost, can be rapidly performed, and can be interpreted at bedside by the clinician. Critical care providers vary in the amount of training they receive in lung US. Purpose: To determine if the comfort and knowledge level of nurse practitioners/physician assistants (NP/PAs) in the use of US to detect pneumothorax can be increased by a short intervention. Methods: Teaching intervention for NP/PAs was targeted for evening shift change in order to reach as many persons as possible. Subjects took a pre-test which asked them about their overall comfort level and formal training in US as well as their knowledge questions on lung US. An EM/CCM physician with formal training in US gave a 10–15 minute presentation on the basics of using US to detect a pneumothorax. This was followed by a hands-on demonstration using a volunteer to show normal lung sliding. Finally, a post-test was administered. The intervention lasted about 30 min. Results: Fourteen NP/PAs participated. Their ey in clinical practice ranged from 36 yr to less than one year. Initial comfort with lung US was based on a scale of 1 to 5 (1 is not comfortable at all, 5 is very comfortable). Providers’ subjective rating of this increased from an average of 2.4 to 3.1 after the intervention (p<0.001, paired t test). Test scores increased from 1.8 on the pre-test to 3.4 on the post-test (p<0.001). There was no significant correlation between change in comfort level and change in test score (r=0.267 p=0.355, Pearson correlation). Conclusions: Our study shows that a short, targeted intervention can improve knowledge and comfort in using US to detect pneumothorax. This has the potential to improve patient care and decrease cost in the ICU.

CHECKLIST FOR EARLY RECOGNITION AND TREATMENT OF ACUTE ILLNESS: EVOLUTION OF CONTENT MANAGEMENT
Lisbeth Garcia Arguello, Amelia Barwise, Manasi Hulyalkar, Rahul Kashyap, Yue Dong, Ognjen Gajic, Christopher Schmickl

Learning Objectives: The Checklist for Early Recognition and Treatment of Acute Illness (CERTAIN) is an international collaboration project with the goal of standardizing the approach to the evaluation and treatment of critically ill patients in accordance with best-practice principles worldwide. It uses various platforms including software, mobile applications and a booklet. CERTAIN consists of a series of checklists with clinical decision support (CDS), providing point-of-care key information about common syndromes, procedures and medications in a flash card format. One of the challenges is to develop a content management system that facilitates frequent peer-review to keep content up-to-date, and allows rapid updates of content across different platforms. Methods: Initially MS word™ and emails/dropbox™ were used to create, store, and share content for peer-review. To accelerate the revision and updating process by the international group of experts, Google doc platform was used to share the information. Time to complete the peer-review process for 10 cards before and after the transition was documented. Data was summarized as median days (IQR). Results: The initial approach was technologically simple, and allowed usage of standardized templates, however, a growing inventory of “cards” rendered this approach increasingly inefficient and unreliable. Google™ docs provided a centralized platform streamlining the peer-review process. The transition from “email-based-revision” to “Google doc-based-revision” did not affect the completion time of the peer review process (20 [5–35] vs 13.5 [4–24] days; p=0.68). Authors and reviewers considered the new process as a quicker and more accessible alternative although the requirement for a unique G-mail account may pose a significant barrier. Conclusions: Existing content management platforms are suboptimal for efficient and up-to-date, peer reviewed knowledge management in a rapidly evolving field of critical care medicine.

SURVEY OF PEDIATRIC CRITICAL CARE TRAINING NEEDS FOR THE GENERAL PEDIATRICIAN
Maria Enrícone, Elizabeth McClain

Learning Objectives: Identify perceptions and characterize the pediatric critical care competencies utilized by pediatricians through self-report. Methods: A needs assessment was developed that identified perceptions and characterized critical care competencies utilized by practicing pediatricians. It was constructed in SurveyMonkey® software. A total of 39 responses were collected. Non-parametric inferential statistics. Measurements: Demographic data regarding type of practice (general, N=43), pediatrics board certification (N=42), current BLS (N=36), PALS (N=34), APLS (N=7) certifications, and location (rural, N=12, urban/suburban, N=15, hospital based, N=16) was obtained. A 5 point rating scale assessed the pediatricians comfort (rating 1-uncomfortable to 5=very comfortable) with the evaluation and management of common pediatric critical care processes and technical skills. Frequency of use of procedural skills was obtained. Results: Pediatricians were moderately to very comfortable recognizing respiratory failure (92.7%), septic shock (83.6%), and hypovolemic shock (85.5%). Reported comfort rating of moderate to very comfortable reduced in recognizing cardiogenic shock (52.8%) and increased intracranial pressure (ICP) (52.7%). Reduced comfort level was identified in management of critically ill children, with increased ICP(14.0% comfortable; 29.1% uncomfortable), determination of ventilator settings (14.6% comfortable; 45.5% uncomfortable). Self-reported procedure skills, demonstrated medium statistically significant positive associations. Perceived competence increased with the frequency of performance of procedures, most not performing any procedures in the last 6 mo. For CVIL, 60% felt incompetent to perform the procedure and only 1 person had performed a CVIL in last 6 mo. Most felt competent to lead a resuscitation but 59% (N=16) had not lead a resuscitation in 6 mo. Conclusions: General pediatricians are not performing critical skills and feel limited competence. They have decreased comfort with evaluation and management of increased ICP and cardiogenic shock.
to measure SA during CA/RR scenarios. **Methods:** Thirteen Critical Care Fellows were randomized to receive Simulation Based Training (SBT, n=7) or Lecture Based Training (LBT, n=6) in Situation Awareness and management of CA/RR scenarios. Each group then underwent 8 testing cases of High Fidelity Simulation CA/RR scenarios, with the team leaders’ Situation Awareness evaluated by a trained observer using the subjective SABAR (SA Behaviorally Anchored Rating) scale. The scenario was interrupted at standard times to allow the participants to fill out the objective SAGAT (SA Global Assessment Technique) scale. **Results:** Overall, it was found that there was no statistically significant correlation between the SABAR (subjective) and SAGAT (objective) scores for all of the sessions combined (r=0.14, p=0.52). Furthermore, within each of the individual sessions, there was no statistically significant correlation seen: for the LBT testing session (r=0.18, p=0.67), for the SBT training session (r=0.07, p=0.88). However, for the SBT testing session the correlation was stronger (r=0.59, p=0.13). **Conclusions:** In this study, there was no statistically significant correlation found between objective and subjective measurements of SA during CA/RR scenarios. However, there was a stronger correlation observed as more training was performed. Further research is required to evaluate the most accurate scale for measurement of SA, and what changes can be made to improve the correlation between subjective and objective measurements of SA. Although subjective scales can observe behaviors, objective measurement of SA is still the gold standard.

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**FIRST AID TRAINING FOR KINDERGARTEN AND PRIMARY SCHOOL CHILDREN**

Balázs Bandi, Zsofia Veronika Stocker, Emese Pek, Balázs Radnai, Krisztiina Deutsch, Jozsef Betlehem

**Learning Objectives:** According to statistical data various accidents are one of the most common causes of death in childhood. Our aim was to evaluate the effects of a first aid training for kindergarten children and primary school children. **Methods:** 73 children (N=73) visiting kindergarten (n=32) and primary school (n=41) were involved in the study (at the age of 6–14 yr). Locations of the investigation: Nagyatád, Berzseny, Pécs (Hungary). The most frequently occurring injuries were performed in different situations with playing: call an ambulance, burn/scald, bleeding, wound management, recovery position, BLS (only for older primary school children). After the education children were tested about their skills and one month later re-tested. The tests measured the problem solving skills and basic knowledge about different first aid requiring scenarios. **Results:** Comparing the two measurement the overall points increased to the second test: in kindergarten from 19.28 (SD=2.61) to 20.59 (SD=2.61), in primary school from 26 (SD=3.74) to 29 (SD=3.86). The difference by kindergarten children was not significant (p=0.049) but by the schoolchildren was significant (p=0.05). Considering the degrees of burn there was significant difference between eighth graders (13–14 yr old) and fourth graders (10–11 yr old) (p=0.031). Eighth grades achieved significantly better results in case of bleeding control (p=0.02) than fourth graders. In terms of the genders there was not significant difference in cardiopulmonary resuscitation skills: chest compression (p=0.441), ventilation (p=0.404). **Conclusions:** Kindergarten and primary school children can learn first aid. Age correlates with performance but the basic concepts can learn the preschoolers as well. Training in early childhood can develop the helping aptitude so the first aid education should start in the kindergarten.

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**THE PICU PASSPORT: AN INNOVATIVE APPROACH TO STREAMLINING PEDIATRIC RESIDENT LEARNING IN THE PICU**

Adrian Zurca, Conrad Krawiec, Daniel Meckeone, Adil Solaiman, Brandon Smith, Gary Ceneviva

**Learning Objectives:** Upon completion of training, pediatric residents are expected to be able to recognize and provide initial stabilization for critically ill children. Given the relative rarity of critically ill children outside of the PICU, pediatric residents receive most of their exposure to critical care during their PICU rotations. However, given seasonal variations in disease presentations and the ebbs and flow of patient care, residents’ experiences during their PICU rotation vary even within the same institution. This may lead to different learning opportunities, with some residents receiving little to no exposure to certain important topics during their PICU rotation. **Methods:** The authors reviewed both the Accreditation Council for Graduate Medical Education program requirements for graduate medical education in pediatrics as well as the content outline published by the American Board of Pediatrics for the General Pediatrics certification examination. Considering resident exposures during other rotations, 22 topics were chosen as being most important to be taught by PICU faculty. Of the 22 topics, 11 were designated core topics and the other 11 were designated supplementary topics. **Results:** Residents were provided a “PICU Passport” at the beginning of their 4-week PICU rotation, during which each resident was expected to cover all 11 core topics and 5/11 supplementary topics from a PICU faculty member. Completed Passports were due back to the pediatric chief residents. PICU faculty members were provided for each topic, and were asked to cover requested topics either during rounds, small-group discussions, or in 1-on-1 discussions. Feedback will be sought from residents via pre and post-rotation surveys, as well as from faculty 6 mo after implementation. **Conclusions:** The PICU Passport targets specific topics to be covered during the PICU rotation, helping pediatric residents achieve a standard and baseline exposure to certain high-yield topics. The Passport also assists PICU faculty streamline teaching time to individual residents’ learning needs.

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**THE FOAM EFFECT: USE OF SMARTPHONE-CREATED VIDEOS TO STANDARDIZE RESIDENT ORIENTATION AND EDUCATION**

Richard Savel, Dorian Alexander, Michael Kantrowitz, Dena Borgia, Christa Lenzi, Uma Edupuganti, Gerard Betro, Yihak Kupfer

**Learning Objectives:** Free-open-access medical education (FOAM) is taking medicine by storm, and has gained significant traction over the last 2 yr. Given the progressively restrictive work hr of house officers, it is becoming more difficult to find time for orientation and teaching of CCM trainees. As smartphones provide easy access to both creation and viewing of HD video, our hypothesis was that such videos could be created, and their reception by the trainees would be positive. **Methods:** Using a smartphone (iPhone6, Apple Inc.) with a digital condenser microphone (iRig HD, IK Multimedia) and tripod, we recorded videos on the following topics: trainee orientation, basic CCM education, mechanical ventilation, recent data on sepsis resuscitation, and a broad approach to evidence-based critical care. These videos were then edited and posted to YouTube using free software (iMovie, Apple Inc.). Trainees were given the web link to the video playlist prior to starting their ICU rotation with appropriate instruction. We then performed a 6-question feedback survey using a 5-point Likert scale, focusing on accessibility, relevance, and satisfaction. **Results:** After being digitally available on the internet for approximately 60 days, these videos have been viewed a total of 6258 times. Of the 10 trainee responders, 90% found these videos easy to access and relevant. Ninety percent found the orientation video moderately to extremely useful. One hundred percent found the education videos to be moderately to extremely useful, as well as demonstrating interest in seeing more such videos, and regarding overall satisfaction with the videos. **Conclusions:** We were able to successfully record, edit and post both orientation and educational videos for trainees in a surgical ICU. Our local feedback from our trainees was extremely positive. In addition, given our mode of distribution, our videos have been viewed by trainees at the regional, national, and international level: the FOAM effect in full force. We believe this is a viable model for asynchronous education in the critical care environment moving forward.

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**IMPACT OF FCCS TRAINED ADVANCED PRACTICE PROVIDER ICU NIGHT COVERAGE IN A LONG-TERM CARE FACILITY**

Gustavo Ferrer, Fanny Tse, Jose Ramirez, Roxana Karimzadeh, Tara Rowland, Marlow Hernandez

**Learning Objectives:** This was a retrospective qualitative study of patients treated at an 80 bed LTAC with a 9-bed ICU between Jan 2014 and June 2014. The

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250 EVALUATION OF PHARMACY-NURSING COLLABORATIVE EDUCATION ON THE CRITICAL CARE PAIN OBSERVATION-AL TOOL
Huan Nguyen, Mindy Bellomy-Muth, Christina Ho, Dianna Nguyen, Jennifer Rafalski, Maged Tanios

Learning Objectives: Several studies have reported that implementation of the Critical-Care Pain Observation Tool (CPOT) in the ICU lead to improved pain assessment and management practices in mechanically-ventilated patients. Implementation strategies in prior studies consisted of 90 minute training sessions utilizing videos, pocket cards, and posters. We developed a similar educational process for the implementation of CPOT at a medical institution. The aim of this study was to assess the effectiveness of pharmacy-nursing collaborative education on the CPOT procedure for ICU health providers. Methods: A pre-post survey cohort study was conducted on ICU health providers at an acute care medical institution. Two teaching methods were utilized: 1) small group, with live demonstration and 2) lecture, with video demonstration. Surveys were given before and after teaching to assess CPOT knowledge and attitude towards pain assessment. Descriptive statistics were used for the analysis of the data. Results: 64 subjects participated: 23 in the small group and 41 in the lecture group. The Mean pots-test score for the two teaching methods were comparable for the small group and lecture group (0.84 +/- 0.23 vs 0.78 +/- 0.27 p=0.78, respectively). Mean post-test score increased significantly from pre-test score in both groups (small group: 0.49 +/- 0.32 vs 0.84 +/- 0.23, lecture group: 0.60 +/- 0.32 vs 0.78 +/-0.27, p=0.001). Both groups had a significant increase in mean attitude score in confidence to assess pain for non-verbal patients (small group: 5.5 vs. 3.9, lecture group: 3.9 vs 4.3, p=0.05). Conclusions: ICU medical providers that received pharmacy-nursing collaborative education showed improvements in CPOT knowledge and attitude towards performing pain assessment for non-verbal patients.

251 IMPLEMENTING IN-SITU SIMULATION TO ENHANCE TEAM PERFORMANCE IN POST CARDIAC SURGERY RESUSCITATION
Bhargavi Gali, Glen Au, Caitlyn Thompson

Learning Objectives: Specific life support algorithms have been developed for post-cardiac surgical patients that are different than standard ACLS. In-situ simulation can address knowledge gaps in understanding these algorithms while enhancing team communication and performance in cardiac surgical ICU. Methods: In-situ simulation sessions utilizing SimMan 3G were conducted in a large medical center’s cardiac surgical ICU. 17 training sessions occurred in patient care rooms in 2014 and 2015. Multidisciplinary ICU team members took part in the in-situ simulations which consisted of 4 parts: 1) review goals; 2) emergency scenario (team-building skills and team dynamics); 3) instructor led debriefing session; 4) identification of new issues that could prevent effective intervention in future arrests. Learning took place with participation and debriefing. Immediately post-simulation participants had the opportunity to discuss what went well and identify areas for improvement. Following debriefing each participant was sent a survey to provide feedback on simulation and educational experience enhancements. Results: During the first year, in-situ simulations were held in the ICU 1-4 times/month. Debriefing sessions included 90% of participants who shared that the in-situ sessions provided a positive learning environment allowing them to better understand the resuscitation process and team role delineation. Debriefing after the scenarios supported team learning through the shared experience and discussion. Surveys revealed 75% of participants felt the learning goals were clear prior to participation. 100% felt the debriefing session was beneficial to enhance learning. 92% found the experience outstanding or good. New insight was shared with the ICU’s emergency response workgroup as part of quality improvement. Conclusions: The goal of in-situ simulation training is ultimately to improve patient safety and outcomes. In-situ simulation enhanced understanding of post-cardiac surgery life support algorithms and team dynamics. Debriefing sessions provided the most learning from scenarios.

Research Snapshot Presentations: Endocrine

252 VITAMIN D STATUS IS ASSOCIATED WITH DISCHARGE DISPOSITION IN CRITICALLY ILL SURGICAL PATIENTS
Karolina Brook, Carlos Camargo, Jr., MD, DrPH, Kenneth Christopher, Sadeq Quraishi

Learning Objectives: Discharge disposition after critical illness is increasingly recognized as a valuable patient-centered outcome. Vitamin D status is associated with important outcomes in ICU patients, including length of stay (LOS) and mortality. This study investigated whether vitamin D status on ICU admission is associated with discharge disposition. Methods: Ongoing prospective cohort study of vitamin D status in critical illness recruited from two surgical ICUs at a single teaching hospital in Boston. Plasma 25-hydroxyvitamin D (25OHD) levels were measured within 24 hr of ICU admission. Discharge disposition was dichotomized as non-home or home. Locally weighted scatterplot smoothing (LOWESS) was used to graph the relationship between 25OHD levels and discharge disposition. Logistic regression analyses investigated the association between 25OHD level and discharge disposition, controlling for age, sex, race, body mass index, socioeconomic status, APACHE II score, and hospital LOS. Results: 300 patients comprised the analytic cohort. Mean 25OHD level was 19 (SD 8) ng/mL and 41% of patients had a non-home discharge disposition. LOWESS analysis demonstrated an inverse linear relationship between vitamin D status and non-home discharge disposition to 25OHD levels around 10 ng/mL, with rapid flattening of the curve between levels of 10–20 ng/mL. 25OHD level at the outset of critical illness was inversely associated with non-home discharge disposition (adjusted OR, 0.88; 95% CI, 0.82–0.95). Patients with 25OHD levels <20ng/mL had an almost 3-fold risk of a non-home discharge disposition compared to patients with levels >20 ng/mL (48% vs 29%, respectively; adjusted OR, 2.74; 95%CI, 1.23–6.14). Conclusions: Vitamin D status may be a modifiable risk factor for non-home discharge disposition in surgical ICU patients. Future studies should investigate if vitamin D supplementation in surgical ICU patients can improve outcomes, including frequency of discharge to home.

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EFFECT OF NUTRITIONAL STATUS OF CHILDREN WITH CONGENITAL HEART DISEASE ON POST-OPERATIVE OUTCOME
Mahmoud Elbarbary, Noura Al-Rabiah, Akhter Mehmood, Sameh Ismail, Gilsan Shaath, Mohamed Kabbani, Omar Hijazi, Riyadh Abu Sulaiman

Learning Objectives: Children with congenital heart disease (CHD) frequently get malnourished due to many factors including hypermetabolic state, inadequate caloric intake, malabsorption, genetic factors and fluid restriction as part of hemodynamic intervention. This nutritional status may affect the early postoperative outcome after pediatric cardiac surgery. Methods: Prospective observational cohort study included all pediatric cardiac surgery patients over 2yr. Nutritional status assessed preoperatively according to Waterlow classification and calculated prognostic nutritional index (PNI). The following end points were recorded: patients NPO days, number of days to achieve Recommended Daily Allowance (RDA), weight gain/loss during ICU stay, ICU mortality, PICU length of stay, hospital length of stay, ventilation hr and rate of infection. Results: 85 children were evaluated. At admission 36.4% (31/85) of the patients were severely malnourished. The usual intake was < 50 % of RDA at admission in 37.6% and was associated with severe malnutrition (P = 0.0001). Mean of the PNI was worse in the infected patients compared to the non-infected (P = 0.017). Comparing severely malnourished (n = 31) to rest of our study population (n = 54), the mean length of hospital stay was 22.8 ± 25.9 days vs 14.7 ± 7.7 days; (95% CI -6.84 – 17.37 P = 0.038). Length of ICU stay was 13.27 ± 37.26 vs 7 ± 6.67 days, (95% CI -4.36 –16.89 P = 0.014). Patients with severe malnutrition were kept NPO longer postoperatively with mean 3.4 ± 5.6 days vs 1.82 ± 1.45 days,(95% CI -0.05 – 3.21 P = 0.03). Delay in feeding postoperatively was associated with higher risk of infection (P = 0.03). No statistically significant relation between mortality or ventilation hr in ICU and the malnutrition category of the patients Conclusions: Children with CHD were significantly malnourished preoperatively and had further loss in weight postoperatively. Delayed postop feeding was associated with higher rate of infection. Management by “specialized pediatric nutritionist”during outpatient visits and during hospital stay may optimize the nutritional status perioperatively.

LONGITUDINAL CHANGES IN VITAMIN D STATUS OF CRITICALLY ILL SURGICAL INTENSIVE CARE UNIT PATIENTS
Connie Wang, Livnat Blum, Caitlin McCarthy, Sadeq Quraishi

Learning Objectives: Increasing evidence suggests that vitamin D status at the onset of care is associated with important clinical outcomes in critically ill patients. Since most vitamin D-related ICU studies involve single point assessments, it is unclear whether vitamin D status changes significantly during acute critical illness. Therefore, our goal was to perform a comprehensive, longitudinal assessment of vitamin D status in critically ill surgical patients. Methods: We performed a prospective cohort study to assess how vitamin D status changed over the first week of critical illness in surgical ICU patients. We assessed plasma for: 1) total circulating 25-hydroxyvitamin D (25OHD); 2) vitamin D binding protein (DBP), and 3) albumin levels on days 1 (baseline), 3, 5, and 7 of ICU admission. Bioavailable 25OHD was calculated based on established formulea using 25OHD, DBP, and albumin levels at each time point. Changes in 25OHD and bioavailable 25OHD were compared to their respective baseline levels for each time point. Analysis of variance (ANOVA) using Bonferroni correction (alpha=0.017) was used to compare the change in biomarker levels over time. Results: 200 patients comprised the analytic cohort. Mean 25OHD level and APACHE II score were 17 (SD 8) ng/mL and 18 (SD 9). Change in 25OHD levels was 2 (SD 19) %, 9 (SD 24) %, and 11 (SD 28) %; F =4.41, p=0.013. On the other hand, change in bioavailable 25OHD was -1 (SD 34) %, -5 (SD 38) %, and -16 (SD 31)%; F= 5.03; p=0.007. Conclusions: Our results suggest that while total circulating 25OHD levels may increase slightly over the first week of critical illness, bioavailable 25OHD levels drop significantly due to dramatic changes in DBP and albumin levels over the course of critical illness. These data suggest that 25OHD may not be a good surrogate for total body vitamin D status in critically ill patients. Future studies are needed to determine whether the changes in bioavailable 25OHD levels are associated with important clinical outcomes.

CURRENT NUTRITION PRACTICES IN THE ICU: RESULTS OF AN INTERNATIONAL QUALITY IMPROVEMENT INITIATIVE
Daren Heyland, Margot Lemieux, Xuran Jiang

Learning Objectives: Numerous barriers to adequate feeding exist resulting in variable and suboptimal nutrition delivery. Insights can be gained by identifying sites that achieve a high degree of compliance with nutrition guidelines. The purpose of this study was to describe current nutrition practices in Intensive Care Units (ICUs), describe variability in ICU nutrition performance, and to identify the ‘Best of the Best’ ICUs with respect to nutrition practices. Methods: We conducted an international, prospective, observational, cohort study conducted September 2014-June 2015. Participating sites enrolled mechanically ventilated adult patients that stayed in the ICU for at least 72hr. Data on nutrition practices was collected from ICU admission to ICU discharge or a maximum of 12 days. Relative to the Canadian Clinical Practice Guidelines (CPG), we report average, best, and worst site performance on key nutrition practices. Previously reported nutrition performance indicators (NPIs) were used to identify the ‘Best of the Best’ nutrition performing sites. Results: 183 adult ICUs from 19 countries contributed 3859 patients to this analysis. Average time to start of EN was 38.2hr (site average range: 4.9–157.4 hr). The average use of motility agents and small bowel feeding in patients with high gastric residual volumes was 65.2% (site average range: 0–100%) and 12.4% (site average range: 0–100%) respectively. The proportion of blood glucose levels greater than 180 mg/dl was 15.4% (site range: 2.9–41.2%). Average nutritional adequacy was 48.0% (site average range 7.8–93.6%) for energy and 44.8% (site average range 7.0–99.0%) for protein. Using the NPIs, we were able to identify top and recognize top performing ICUs around the world. Conclusions: Large gaps exist between the evidence based recommendations and actual practice in ICUs, and consequently nutrition therapy is sub-optimal. We have identified top performing ICUs and ‘best achievable’ practices which can serve as targets for future quality improvement initiatives.
Learning Objectives: The 2012 Surviving Sepsis guidelines suggest that “inappropriately low random cortisol” (< 18 µg/dL) during shock is indicative for hydrocortisone. However, several studies suggest that cosyntropin response, rather than random cortisol, correlate better with outcomes. Application of these recommendations risks exposing patients without adrenal insufficiency, but with low cortisol levels, to hydrocortisone. Methods: This was a secondary analysis of a prospective observational cohort of pediatric acute respiratory distress syndrome (PARDS) enrolled between 7/2011 and 6/2015 at the Children’s Hospital of Philadelphia. Children with PARDS and shock (vasopressors) were identified, and random cortisol levels prior to potential hydrocortisone initiation were abstracted. The cohort was dichotomized to cortisol < 18 µg/dL and ≥ 18 µg/dL, and demographics, hydrocortisone use, and outcomes compared using non-parametric statistics. We hypothesized that random cortisol was correlated with severity of illness, and that cortisol < 18 µg/dL would identify a less ill population. Results: Of 357 children with PARDS, 155 (44%) had vasopressors initiated with a random cortisol level drawn prior to potential hydrocortisone use. Patients with cortisol < 18 µg/dL had lower Pediatric Risk of Mortality III (PRISM III), fewer organ failures, and lower vasopressor scores (all rank-sum p<0.05). Patients with cortisol ≥ 18 µg/dL had lower mortality (6%) relative to ≥ 18 µg/dL (12%, Fisher exact p=0.207). In neither cohort was benefit seen with hydrocortisone, with fewer ventilator-free days seen in children with cortisol ≥ 18 µg/dL on hydrocortisone (p=0.007). Results were comparable when we dichotomized according to cortisol ≥ 10 µg/dL or ≥ 10 µg/dL (per the American College of Critical Care Medicine recommendations). Conclusions: In PARDS with shock, low cortisol levels correlate with lower PRISM III, fewer organ failures, and lower vasopressor scores. A strategy of hydrocortisone replacement for cortisol < 18 µg/dL does not seem to target a population likely to benefit from hydrocortisone therapy.

Learning Objectives: Parenteral nutrition (PN) use is associated with increased mortality in critically children. This increased mortality may be mediated by intestinal barrier dysfunction, which occurs when PN is delivered in the absence of enteral nutrition (EN). We do not know if early PN provided with EN worsens intestinal barrier function. Methods: Single-Center Pilot Randomized Controlled Trial of Early (day 1) versus Standard Timing of PN (day 5) to supplement early EN, for children admitted to Diamond Children’s Medical Center, Tucson, AZ with Acute Respiratory Distress Syndrome (ARDS) from Aug 2012-December 2014. Block randomization, stratified by age and BMI z score to early or standard care PN. All patients had EN initiated and advanced according to our unit early EN guideline. For patients in the early PN arm, PN began within 4hr of randomization and was titrated to deliver 100–120% of measured resting energy expenditure, in combination with advancing EN. We examined repeated plasma biomarkers to reflect intestinal barrier function (FABP2, epithelial integrity; citrulline, functional enterocyte mass; claudin 3, tight junction integrity) over the first week of PICU hospitalization. Results: We enrolled 8 study subjects. Median age 2.9y, (range 0.4-1.3y). All patients had elevated FABP2 and Claudin 3 concentrations at time of randomization, indicative of poor intestinal epithelial and tight junction integrity, respectively. Patients in the early PN arm had improved (lower) FABP2 (p=0.01) and claudin 3 (p=0.02) concentrations at 72hr as compared to patients in the standard care arm, an effect which persisted throughout the 7-day study period. While not significant, we identified a trend for improved (higher) citrulline concentrations in the early PN group (p=0.09). Conclusions: Patients randomized to early PN to supplement early EN have improved intestinal epithelial and tight junction integrity over the first week of PICU hospitalization. Larger studies are needed to determine if improved intestinal barrier function improves clinical outcomes for critically ill infants and children.

Learning Objectives: Obese patients receive nutrition later in their critical illness than patients of lower weight; however, it is unknown if body mass index (BMI) impacts the relationship between time to initiation of feeding and clinical outcomes. Methods: Using data from 1000 mechanically ventilated patients with established acute lung injury in the Fluid and Catheter Treatment Trial, we examined the relationship between time to the initiation of enteral feeding and mortality. 60-day in-hospital mortality was the primary outcome. Enteral volume was prospectively collected daily in all patients and receipt of greater than or equal to 100mL was defined as receiving enteral nutrition. Using multi-variable analysis, including an interaction term between BMI and receipt of enteral nutrition, we compared patients who received enteral nutrition in the first 48hr after enrollment to those who did not. Results: Patient groups were analyzed according to the presence or absence of enteral nutrition within the first 48hr after study enrollment; the two groups were similar at baseline. In multivariable logistic regression accounting for age, gender, race, BMI, albumin, and presence of diabetes, HIV, malignancy, or shock at enrollment, there was no association between receipt of enteral nutrition in the first 48hr and mortality in patients of any BMI (p value for main effect = 0.144, p value for interaction between BMI and enteral feeding = 0.336). In similar multivariable analysis, there was no statistically significant impact on 60-day mortality when evaluating the association between baseline BMI and the time to initiation of enteral feeding (p value for interaction between BMI and enteral feeding = 0.194). Conclusions: We found no association between time to initiation of enteral feeding and mortality in ventilated ARDS patients, regardless of weight.

Learning Objectives: Traumatic brain injury (TBI) is the leading cause of death in North America. TBI patients may have energy requirements as high as 120% to 250% above their basal energy expenditure estimate from the Harris-Benedict equation. Indirect calorimetry continues to be the gold standard for assessing the energy expenditure of severe TBI. Our objective was to compare the measured by using indirect calorimetry (IC) with predictive equation penne state (2003b). Methods: This single-center, prospective, observational study evaluated the correlation of a predictive equation with the IC in patient with severe TBI. Resting energy expenditure (REE) was measured by IC in all patients as a standard procedure (Enghrön Pro ventilator) and simultaneously calculated by qualified nutritionists according to the equation. Data collected included: age, gender, length of stay, gravity according to different scores on admission (APACHE II, SOFA, and GCS). Wilcoxon test was used for the analysis of quantitative variables with a significance rated at P ≤ 0.05, Spearman correlation test was used for the analysis between the REE. Results: 22 patients with severe TBI (GCS ≤ 8) were included in the analysis, mean age was 30.5 ± 14 yr old and 90.9% were male. The mean APACHE II (17.9 ± 6.5), SOFA (6.86 ± 2.9), GCS (5 ± 1.2), mean REE by using indirect calorimetry were 1680.36 ± 543.7 vs 1697.55 ± 305.9 of Penn State equation (p value < 0.31). A moderate correlation was found between the 2 methods (r=0.581) with a p value of 0.05. Conclusions: Indirect calorimetry (IC) is considered to be the standard method for estimating energy requirements in traumatic brain injury patients, if not available the IC we conclude that the Penn State equation (2003) could be used to predict resting metabolic rate in patients with TBI.

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ENTERAL NUTRITION AND ANTACIDS IN THE PICU—IMPACT ON THE RISK OF VENTILATOR-ASSOCIATED PNEUMONIA
Ben Albert, David Zurakowski, Lori Bechar, Gregory Priebe, Christopher Duggan, Daren Heyland, Nilesh Mehta

Learning Objectives: The impact of enteral nutrition (EN) on the risk of ventilator-associated pneumonia (VAP) is unclear. We aimed to describe the incidence and risk factors associated with VAP in an international cohort of mechanically ventilated children, focusing in particular on nutrition-related therapies. Methods: The database was generated from a prospective, multicenter study of children mechanically ventilated > 48 hr. Demographics, illness severity, nutrient intake, and antacid use were recorded. Multivariable logistic regression was used to determine risk factors and a predictive model for VAP. Results: Data from 59 PICUs in 15 countries, including 1245 subjects (45% female, 42% surgical, 58% from the U.S.), with a median (IQR) age of 1.7 (0.4–7.0) yr were analyzed. The incidence of VAP was 6.4% (n=80). EN was initiated in 985 (79%) patients, within 48 hr in 592 (60%), via postpyloric route in 354 (36%) patients, and for a median duration of 10 (7–10) days. Acid-blocking agents were used in 763 (61%) patients. After adjusting for EN days, illness severity, and site; VAP was significantly associated with mechanical ventilation > 10 days (OR 3.73 CI: 2.16, 6.45; P < 0.001), PICU length of stay > 10 days (OR 1.81 CI: 1.07, 2.08; P = 0.03) and use of acid-blockade (OR 2.03 CI: 1.14, 3.61; P = 0.02). A model using a combination of these variables showed a significantly incremental increase in the probability of VAP; ranging from 2% when none were present to 20% when all 3 variables were present. Enteral route (P = 0.52), duration of EN (P = 0.16), severity of illness (P = 0.24), and diagnostic category (P = 0.32) were not associated with VAP. Conclusions: The risk of developing VAP was significantly higher in children with longer mechanical ventilation, PICU stay, and acid-blockade therapy in our cohort. There was no association between VAP risk and the timing of initiation, route or duration of EN delivery. Therefore, EN should be optimized in this cohort. The significant association between acid-blockade and the increased risk of VAP in our cohort should be explored in future trials.

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MANAGEMENT OF DIABETIC KETOACIDOSIS/HYPERGLYCEMIC HYPEROSMOLAR STATE IN PATIENTS ON HEMODIALYSIS
Caitlin Schapaugh, Ana Negrete, Joanna Hudson, Jagannath Saikumar, Christopher Finch, Mehmet Kocak, Pan Hu, Megan Van Berkel

Learning Objectives: Management strategies for diabetic ketoadicosis/hyperglycemic hyperosmolar (DKA/HHS) are well established in patients with normal kidney function; however, many key treatment principles may not apply in a patient with end stage renal disease (ESRD). The purpose of this study was to evaluate treatment practices and outcomes of DKA/HHS in patients with ESRD compared to patients without significant renal impairment. Methods: This was a multicenter, single system, retrospective review of adult patients presenting to the emergency department with DKA/HHS admitted over a 3 year period that evaluated treatment practices and outcomes of DKA/HHS in patients with ESRD and DKA/HHS are at a significantly increased risk for hypoglycemic events, indicating reductions in insulin dosages may be necessary. Larger and independent prospective trials need to be completed to further evaluate the optimal treatment of patients with ESRD and DKA/HHS.

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TIME IN BG RANGE 70–140 MG/DL IS ASSOCIATED WITH SURVIVAL IN NON-DIABETIC MEDICAL ICU PATIENTS
Morgan Kellogg, James Krinsley

Learning Objectives: Time in targeted blood glucose (BG) range (TIR) 70–140 mg/dl has been shown to be independently associated with increased survival in a heterogeneous cohort of non-diabetic (NON) ICU patients (Crit Care 2015;19:179). We hypothesized that this finding would extend across all diagnostic categories in a medical cohort. Methods: We conducted a retrospective single-site review, abstracting information from the unit’s comprehensive database, of 3,201 (NON, n=2,388, diabetic (DM), n=813) consecutive admissions to the medical service of the 16 bed ICU in our university-affiliated hospital (MICU) between 12/30/06 and 9/14/14 with ICU LOS > 24 hr. BG target was 90–120 mg/dl during this period. We stratified the groups by TIR (HI, TIR ≥80%) and admitting diagnosis category: Cardiac (CARD), n=633, Respiratory (RESP) n=582, Gastrointestinal (GI), n=210, Neurologic (NEURO), n=316, Septic (S), n=309 and Miscellaneous (MISC), n=338. We performed multivariable regression including APACHE IV predicted mortality (APM), ICU LOS and HI TIR to evaluate the correlations with mortality. Results: The median age of NON and DM was 68 vs 70 (p=0.0046). Mean APM was 25.9% vs 29.5% (p<0.0001) and mortality was 19.4% vs 21.3% (p=NS). For the entire cohort of NON, HI TIR was independently associated with reduced mortality: OR (95% CI) 0.58 (0.44–0.75) p<0.0001. For every 10% increase in TIR there was a 10.15% increase in odds of survival. Subset analysis, NON:OR (95% CI) for mortality NEURO 0.42 (0.19–0.96) p=0.0396 CARD 0.52 (0.29–0.91) p=0.0203 RESP 0.59 (0.38–0.92) p=0.0194 S 0.75 (0.43–1.30) p-NS GI 0.76 (0.26–2.25) p-NS MISC 0.57 (0.17–1.80) p-NS In contrast, HI TIR was not independently associated with reduced mortality for the entire cohort of DM, or any subset. Conclusions: HI TIR 70–140 mg/dl was independently associated with increased survival in a large cohort of NON MICU patients. These robust findings extended to each diagnostic category and suggest that improving TIR 70–140 mg/dl in NON MICU patients may decrease mortality. The appropriate BG target in critically ill DM MICU patients remains uncertain.

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STRESS DOSE HYDROCORTISONE USE IN PEDIATRIC SEPTIC SHOCK VARIES AND IS ASSOCIATED WITH POOR OUTCOMES
Blake Nichols, Sarah Ginsburg, Sherri Kubis, Jennifer Hewlton, Andrew Paladino, Nadir Yehya, Vijay Srinivasan

Learning Objectives: Guidelines recommend to consider stress dose hydrocortisone (SDH) in vasopressor dependent pediatric septic shock (VP-PPS) if random serum total cortisol level < 18 mcg/dl. (STC<18). We hypothesized that SDH use in VP-PPS with STC<18 is associated with improved outcomes. Methods: IRB approved retrospective review of consecutive children (1mo-18yr) admitted in 2013 to a tertiary PICU with VP-PPS and STC (prior to SDH, if any). Demographics, illness severity, interventions, outcomes, and SDH data were collected. Primary outcome was ICU survival. Secondary outcomes were ICU length of stay (LOS), hospital LOS, ventilator free days at 28 days (VFD) and vasopressor free days at 28 days (VPFD). Univariate analysis with Wilcoxon rank sum/ Chi-square. Results: 70 VP-PPS subjects with STC were enrolled with 10% ICU mortality. 30 (43%) had STC>18 and 42 (60%) received SDH. Median STC was similar in both SDH and no SDH groups (21.1 vs. 18.7 mcg/dl, p=0.69). Overall, STC>18 was sicker than STC<18 (median PRISM3 14.5 vs. 9, p=0.03) with more vasopressor infusions (median 2 vs. 1, p=0.001). While 57% (17/30) with STC<18 got SDH, 63% (25/40) with STC>18 got SDH. In STC<18, ICU survival was similar between SDH and no SDH groups (92% vs. 94%, p=1) with comparable illness severity (median PRISM3, 9 vs. 11, p=0.44). In STC>18, SDH group compared to no SDH group had more ICU LOS (median days 11 vs. 2, p=0.002), more hospital LOS (median days 19 vs. 6, p=0.003) and fewer VFD (median 22 vs. 28, p=0.03). In STC>18, SDH group trended to less
survival than no SDH group (80% vs. 100%, p=0.14) with more illness severity (median PRISM3, 19 vs. 8, p=0.001) and more vasopressor infusions (median 2 vs. 1, p=0.002). In STC>18, SDH group compared to no SDH group had fewer VFD (median 20 vs. 25, p=0.04) and fewer VFED (median 24 vs. 25, p=0.01).

Conclusions: Clinician practice with regard to SDH in VP-PSS varies widely, and STC > 18 mcg/dL may signal resistance to vasopressor therapy prompting SDH therapy in spite of elevated STC levels. SDH in VP-PSS with both STC < 18 mcg/dL and STC > 18 mcg/dL was associated with worse morbidity.

265 COMPARISON OF WEIGHT-BASED CALORIC FORMULA WITH INDIRECT CALORIMETRY IN CARDIOTHORACIC ICU PATIENTS

Aaron Douglas, Diane Nowak, Desiree Gordillo, Gail Cresci, Nadeem Rahman, Bethany Bensel, Christin Bury, Steven Hata

Learning Objectives: International nutritional guidelines support targeted energy goals for ICU patients to improve outcomes. Aside from indirect calorimetry, the optimal method to quantify caloric requirements is yet to be determined. Simplified weight-based formulae have been proposed by SCCM and ASPEN (2009). Validation studies of weight-based guidelines by indirect calorimetry seem fundamental to guide therapy within different patient samples. We hypothesized that there are significant differences between indirect calorimetry (IC) resting energy expenditure (REE) and two weight-based caloric need formulae for mechanically ventilated, cardiothoracic surgical (CTS) ICU patients. Methods: This was a single-center, retrospective cohort study with a prospectively designed protocol, including 75 consecutive CTS patients undergoing IC largely for difficult weaning from mechanical ventilation. We compared IC REE with weight-based models of 25 kcal/kg/day (CAL25) and 30 kcal/kg/day (CAL30). Agreement was assessed by Bland-Altman analyses and Lin’s concordance correlation coefficient (CCC) statistics. Results: Daily mean caloric estimations were 2053 +/- 411 (CAL25) and 2464 +/- 494 (CAL30) calories with IC mean of 2378 +/- 592 calories. Compared with IC, weight based Bland-Altman 95% CI levels of agreement broadly ranged from -976 to 1625 at 25 kcal/kg/day and -1470 to 1299 at 30 kcal/kg/day. Importantly, Lin’s CCC were 0.13 (95% CI -0.05, 0.30) at 25 kcal/kg/day and 0.16 (0.06, 0.37) at 30 kcal/kg/day, supporting poor levels of agreement with indirect calorimetry. Furthermore, in contrast to IC, a 20% caloric deficient would occur in 59% of patients for CAL25 and 20% for CAL30. Conclusions: Within this cohort of mechanically ventilated, cardiothoracic ICU patients, weight-based daily caloric estimations appear associated with poor levels of agreement with indirect calorimetry. This variability in caloric needs prescription practices potentially lead to underfeeding and increased risk and severity of ICU malnutrition.

266 THE RELATIONSHIP OF THE SEVERITY OF SEPSIS TO INSULIN RESISTANCE AND DYSGLYCEMIA

Janis Gnanasekaran, Raquel Ong, James Kinsley

Learning Objectives: Dysglycemia is common in critically ill patients (pt) and studies have implicated its association with increased mortality. The relationship of the severity of sepsis to insulin resistance and dysglycemia has not been well investigated. We hypothesized that insulin resistance and dysglycemia increase with the severity of sepsis. Methods: This retrospective analysis of prospectively collected data abstracted from the Stamford Hospital ICU database evaluated 178 pt, 48 with diabetes, admitted with sepsis to the ICU between 1/1/10 and 12/31/13, with blood glucose (BG, mg/dL) target 90–120. Insulin requirements and nutritional support were abstracted over 24 hour periods for the first 5 days of the ICU stay. Pt were characterized by degree of sepsis according to Surviving Sepsis guidelines (sepsis n=58, severe sepsis n=40, septic shock n=100), and stratified by diabetic (DM or NON) and nutritional status (receiving PO diet or enteral tube feeds at any time in the first 5 days (FED), or NPO). No pt received TPN. Pt with sepsis or severe sepsis (S1) were compared to those with septic shock (S2). Glucose metrics included Mean BG, CV (coefficient of variation, %) and % pt with hypoglycemia < 70 or > 40 mg/dL. Results: Pt with S1 and S2 had similar glucose metrics. NON Mean 113 vs 116 NON CV 18.7 vs 20.4 NON hypo<70 34.9 vs 41.1 NON hypo>40 4.8 vs 4.4 DM Mean 128 vs 141 DM CV 24.5 vs 26.7 DM hypo<70 43.8 vs 40.6 DM hypo>40 0.0 vs 3.1 Mean (mg/dL) and CV (%) – median value of per-patient means. Hypo (% of patients). All comparisons p=NS. Insulin requirements (units/24hr) were higher for S2 than for S1 among NON. FED: Mean 4.3 vs 15.0; Median 2.0 vs. 3.9 (p=0.02) NPO: Mean 2.6 vs 6.0; Median 0.8 vs 2.4 (p=0.17) The smaller number of DM precluded subset analysis. Conclusions: Insulin requirement was greater in nondiabetics with septic shock than in nondiabetics with sepsis or severe sepsis despite similar glucose metrics. To our knowledge, this is the first investigation that has shown that, at least in nondiabetics, insulin resistance increases with increasing severity of sepsis.

267 TRANSITION FROM INTRAVENOUS TO SUBCUTANEOUS INSULIN IN CRITICALLY ILL ADULT PATIENTS

Megan Dowling, Todd Walther, Serena Harris, Jessica Whitten, Andrew Fritschle Hilliard

Learning Objectives: Glycemic control decreases morbidity and mortality in critically ill patients. However, limited guidance exists regarding the transition from intravenous (IV) to subcutaneous insulin therapy. A validated protocol for transition is necessary since glycemic variability, hyperglycemia, and hypoglycemia adversely impact patient outcomes. Methods: The objective was to determine the safest and most effective method to transition critically ill adults from IV to subcutaneous insulin. This single-center, retrospective, observational study included adults admitted to the burn, medical, or surgical/trauma ICUs from January 1, 2011 to September 30, 2014. Patients were stratified into groups according to their initial dose of subcutaneous insulin as a percentage of the prior 24-hour IV requirements. The primary endpoint was the percentage of blood glucose (BG) concentrations within target range (70–150 mg/dL) 48 hr following transition. Secondary endpoints included incidence of hypoglycemia (< 70 mg/dL), severe hypoglycemia (< 40 mg/dL), hyperglycemia (> 150 mg/dL), severe hyperglycemia (> 200 mg/dL), and glucose variability (change in mean absolute BG per hour). Results: One hundred patients with 1394 BG concentrations were included. The stratified groups were well matched with no significant differences in demographics. Transition of glycemic control was associated with increased insulin requirements, shorter duration of mechanical ventilation, and shorter length of hospital stay, although there was a weak association. Although there was an association between having a shorter duration of time until full feeds were reached and shorter duration of mechanical ventilation, this was a weak association.
in demographics or confounders. The 50–59% group achieved the highest rate of BG concentrations in goal range (68%) (P < 0.001). The 0–49% group, which was the transition method utilized most often, resulted in the lowest rate of goal achievement (46%). The rate of hypoglycemia was highest in the ≥ 80% group (6.9%), whereas the 50–59% and 60–69% group had no incidence (P > 0.015). The rate of hyperglycemia was highest in the 0–49% group (50%) and lowest in the 50–59% group (32%) (P < 0.001). Conclusions: Converting to 50–59% of the prior 24-hour IV insulin requirements was the safest and most effective transition method. A dosing protocol will be implemented to transition to 50–70% subcutaneous insulin. Follow-up data will be reviewed to assess the protocol’s safety and efficacy.

402 INDIRECT CALORIMETRY IS SUPERIOR TO PREDICTIVE EQUATIONS FOR ICU PATIENTS WITH PROLONGED STAY

Mary McCarthy, Cristin Mount, Janet Fabling, Christopher Poprawski

Learning Objectives: A scientific approach to assessing the dynamic and unpredictable metabolic needs of the ICU patient involves indirect calorimetry (IC). Considered the gold standard for measuring resting energy expenditure (REE), IC accurately determines caloric needs and can detect important changes in metabolic status with interval testing. The aim of this project was to examine agreement between MREE and three common predictive equations in a cohort of ICU patients on two occasions (T1, T2). Methods: We performed an IRB-approved subset analysis from a larger study of critically ill adults hospitalized between January 2010 and July 2015. Patients underwent IC testing once a week per ICU protocol. REE using the American College of Chest Physicians (ACCP) equation (25 kcal/kg/d), Mifflin St. Jeor (MSJ) equation (stratified by gender), and 30 kcal/kg/d was calculated. Bland-Altman analysis was used to assess limits of agreement (LOA, kcal/d) and bias (95% CI). Intervals that exclude 0 indicate statistically significant bias. Differences greater than 10% or 250 kcal from MREE were considered clinically unacceptable. Results: A total of 132 IC reports for 66 patients were available for review and analysis. Demographics reported as mean (sd) were: males (n=41) age 65 (19) y, APACHE II 22, BMI 29.5 (8.1), MREE at T1=2015 (748) kcal/d and T2=1908 (611) kcal/d; and females (n=25) age 60 (17) y, APACHE II 21 and BMI 28.9 (8.4), with lower MREE at T1=1705 (484) kcal/d and T2=1660 (439) kcal/d. Overall, Bland-Altman analysis showed highly diverging LOA across all predictive equations for both genders. In males, MSJ T1 Bias -367 (-558 to -177) and T2 Bias -260 (-408 to -113), ACCP at T2 Bias 549 (142 to 539). In females, MSJ at T1 Bias -424 (-580 to -260) and T2 Bias -388 (-544 to -232), ACCP at T1 Bias 268 (44 to 92). Using 30 kcal/kg/d significantly overestimated REE in both genders at T1 and T2 (data not shown). Conclusions: IC is superior to predictive equations for long-term ICU patients; interval testing is key to detect dynamic energy needs and adjust nutrition recommendations to promote favorable metabolic outcomes.

270 BIOMARKERS OF NUTRITION DO NOT CORRELATE WITH NUTRIENT DELIVERY OR OUTCOMES IN SURGICAL ICU PATIENTS

Daniel Yeh, Sadeq Quraishi, Emily Johnson, Tara Harrison, Haytham Kaafarani, Jarone Lee, Peter Fagenholz, George Velmahos

Learning Objectives: Albumin and pre-albumin are commonly thought to be markers of nutritional status, which may be significantly influenced by systemic inflammation during critical illness. The utility of these biomarkers has not been extensively described in surgical ICU patients. Serial albumin, pre-albumin, and C-reactive protein (CRP) levels were measured. Pearson correlation was used to assess the relationship between initial values of albumin, pre-albumin, and CRP as well as to assess the correlation between changes in albumin and pre-albumin with change in CRP and cumulative nutrient deficit. Regression analyses were performed to investigate the association of initial albumin and pre-albumin with ICU length of stay (LOS), hospital LOS, 28d ventilator free days (VFD), and discharge disposition, while controlling for age, sex, body mass index, and acute physiology and chronic health evaluation (APACHE) II score. Results: A total of 53 subjects had serial albumin, prealbumin, and CRP labs drawn and were included in the analysis. Initial albumin and pre-albumin levels were correlated (r=0.341, p<0.01). However, not only was there no significant correlation between initial CRP and initial albumin (r=-0.231,p=0.09) or prealbumin (r=-0.114,p=0.468), but also changes in CRP were not correlated with changes in albumin (r=-0.470,p=0.09) or prealbumin (r=-0.452,p=0.140). Moreover, changes in albumin (Δ0.088, p=0.309) or prealbumin (Δ0.044,p=0.824) were not correlated with cumulative nutrient deficit, nor with clinically important outcomes. Initial albumin, prealbumin, and CRP levels were also not predictive of clinical outcomes. Conclusions: Traditional biomarkers of nutritional status and adequacy of nutrient delivery may be inaccurate in critically ill surgical patients. Future studies need to identify nutritional markers in this cohort which are predictive of important clinical outcomes.
71% by day 7. With institution of an early EN guideline, we achieved an increase in goal calories at day 3 to a mean of 58.7% of goal. Patients who began EN within 48 hr had lower incidence of feeding intolerance than patients who started EN on day 3 or later (p<0.001). More patients who began EN on PICU day 1 reached goal calories within 48 hr of EN initiation (p=0.005) than those who started after day 3 of PICU stay. More feeding intolerance was seen in patients who have enteral feedings initiated later in their hospital course. Conclusions: Use of the quality improvement process identified risk factors for delayed achievement of calorie goals. Feeding intolerance was increased when feeds were initiated later. Use of a guideline improved our calorie delivery for mechanically ventilated patients.

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CORRELATION OF ULTRASOUND ASSESSED GASTRIC ANTRUM AREA WITH ASPIRATED TUBE FEED VOLUME

Vibhu Sharma, Deepthi Gudivada, Pu Chan, Renaud Gueret, John Balitiz

Learning Objectives: Gastric Residual Volume (GRV) assessment continues to be recommended by National and International Societies. National and International experts continue to recommend assessment of GRV as well (personal communication Norma Metheny, RN, St Louis University School of Nursing, Elle G et al Nutrition in Clinical Practice February 2015 Page 69). Correlation of aspirated tube feed (TF) and Gastric Antrum Cross Sectional Area (GACSA) in critically ill patients has not been reported.

Methods: 21 critically ill patients tube fed and confirmed to have the tip of the gastric tube in the stomach on xray were studied over their ICU stay. A curvilinear probe in the epigastrium was used to acquire 57 images using Aorta as a landmark and 57 using IVC as landmark concurrently. Limited by sonographer availability, ultrasound assessment was done at 30 degrees head up / supine and prior to each assessment of GRV (usually Q6) by nursing staff, blinding sonographer to aspirated GV. GACSA was determined by assessing anteroposterior (AP) and craniocaudal (CC) diameters of the antrum using the formula 3.14xAPxCC/4. Results: Gastric antrum(GA) visualization was more frequent using aorta as landmark compared with IVC (79% visualized versus 59%). When visualized easily, Aortic and IVC GACSA were closely correlated (R2 0.98, p<0.0001). Both GACSA using IVC as landmark (R2 0.92, p<0.0001) and Aorta as landmark (R2 0.86, p<0.0001) correlated with aspirated volume. CC diameter of the GA using aorta as landmark correlated with aspirated volume, and increased linearly with increasing GRV. A CC diameter of 13 centimeters using the aorta as landmark predicted a GV of 250 ml, and 17 cm, a GV of 500ml. A linear correlation between CC diameter of the GA and aspirated GV was found (R square 0.78 p=0.001). Conclusions: We validate assessment of GRV/GV in tube fed critically ill patients. GA CC diameter of 13 cm may be used as a cut off for 250 ml GRV. Gastric ultrasound can completely replace cumbersome aspirated GRV assessment.

CC diameter of the Gastric Antrum alone correlates with aspirated GRV.

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IMBALANCES IN ENERGY DELIVERY AND OUTCOMES IN CRITICALLY ILL CHILDREN WITH BLOODSTREAM INFECTIONS

Sarah Ginsburg, Prasana Kapavarapu, Sharon Irving, Lauren Marsillio, Maria Macearenas, Vijay Srinivasan

Learning Objectives: Underfeeding and overfeeding are common in critically ill children and associated with poor outcomes. We examined patterns of energy delivery in critically ill children with catheter associated bloodstream infections (CABSI) on PN, and hypothesized that imbalances in energy delivery are associated with poor outcomes. We examined patterns of energy delivery in critically ill children with catheter associated bloodstream infections (CABSI) on PN, and hypothesized that imbalances in energy delivery are associated with poor outcomes. We examined patterns of energy delivery in critically ill children with catheter associated bloodstream infections (CABSI) on PN, and hypothesized that imbalances in energy delivery are associated with poor outcomes. We examined patterns of energy delivery in critically ill children with catheter associated bloodstream infections (CABSI) on PN, and hypothesized that imbalances in energy delivery are associated with poor outcomes.

Methods: IRB-approved retrospective review of consecutive children (1mo-21yr) with CABSI on PN admitted in 2008–2012 to the PICU/CICU in a tertiary children’s center. Demographics, illness severity, interventions, anthropometry, nutrition and outcomes data were collected. Based on % energy prescription delivered (WHO/RDA equation), we defined severe underfeeding (SUF):<50%, mild to moderate underfeeding (MUF):50–80%, and normal to overfeeding (NOF):>80%. Primary outcome was ICU mortality. Secondary outcomes were ICU length of stay (LOS) and hospital LOS. Analysis by ANOVA (or Kruskal-Wallis for non-parametric tests). Results: 61 patients with CABSI on PN were enrolled (30% ICU mortality). 12 (20%) had BMI-age z scores >2. Energy delivery by group was SUF: 17 (28%), MUF: 28 (46%) and NOF: 16 (26%). Median % energy delivery by group was SUF: 41.3 vs MUF: 60.4 vs NOF: 99.6 (p<0.001). SUF (compared to MUF and NOF) was sicker (median PELOD: 21 vs 10.5 vs 11, p<0.01) with more vasopressors (100% vs 89% vs 63%, p=0.007) and more co-infections (71% vs 36% vs 19%, p=0.008). NOF (compared to SUF and MUF) had less NPO days (median: 0 vs 2 vs 2.5, p=0.04) but more PN days (median: 19 vs 7 vs 8.5, p=0.02) with higher median blood glucose (mg/dl: 111 vs 91 vs 98.5, p=0.02). There were no differences in ICU mortality (SUF: 35%, MUF: 29%, NOF: 25%, p=0.82), but NOF (compared to SUF and MUF) had greater ICU LOS (median days: 66 vs 29 vs 33.5, p=0.04) and greater hospital LOS (median days: 105 vs 82 vs 51.5, p<0.01). Conclusions: Imbalances in energy delivery are common in critically ill children with CABSI on PN. Underfeeding is associated with lower morbidity. Studies are needed to examine the impact of permissive underfeeding in this population.

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HYPOGLYCEMIC EVENT RATES WITH TWO DIFFERENT INSULIN PROTOCOLS IN ADULT INTENSIVE CARE UNIT PATIENTS

Katharine Nault, Kristen Ditch, Elizabeth Isaac, Jeffrey Fong

Learning Objectives: The benefit of intensive insulin therapy (ITT) defined as blood glucose (BG) 80–110 mg/dL in the critically ill population is unclear and is associated with hypoglycemia. Our institution developed a nurse-driven glycemic protocol in critically ill adult ICU patients that targeted a BG of 80–140 mg/dL (the former protocol) using intravenous and subcutaneous insulin. The former protocol was revised to a BG target of 100–140 mg/dL (the current protocol) to decrease hypoglycemia. We compared the hypoglycemic event rate between the former protocol and the current protocol in seven adult ICUs.

Methods: A retrospective, IRB approved review was conducted of all adult ICU patients who experienced hypoglycemia (BG <60 mg/dL). Data was collected between October-December, 2012 for the former protocol and between October-December, 2014 for the current protocol. Hypoglycemic event rates and protocol adherence were compared between the two protocols. Results: A total of 292 hypoglycemic events occurred on the former protocol and 88 occurred on the current protocol. Patients that experienced hypoglycemia on the current protocol were more likely to have insulin dependent diabetes (39 vs 26%, p=0.0007), be on hemodialysis (22 v 6%, p=0.0001) or have sepsis (40 vs 27%, p=0.04). The overall hypoglycemic event rate on the former protocol was 3.6 hypoglycemic events per 100 patient-days versus 1.0 on the current protocol (p=0.01). A decrease in hypoglycemic event rates remained statistically significant across all medical, surgical, neurosciences and cardiac units. There was no difference in complete adherence to the protocol between the two groups, with 22% on the former protocol vs 16% on the current protocol (p=0.2). Conclusion: The current glycemic protocol was associated with a statistically significant decrease in hypoglycemic events.

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SYSTEMATIC REVIEW OF OPPORTUNISTIC RADIOLOGIC SCREENING FOR FRAILTY IN HOSPITALIZED OLDER ADULTS

Stephen Kaplan, Joel Gross, Steven Mitchell, Lisa Taitmans, Iay Bentov, Saman Arabbi, May Reed, Tam Pham

Learning Objectives: Frailty is characterized by functional decline and predisposition to disability and disease. Current frailty assessment tools such as survey-based indices and DEXA are not practical in the ICU. Osteopenia and sarcopenia are radiologic indicators of frailty that may be used for screening. Moreover, imaging obtained for other purposes can be analyzed opportunistically. We performed a systematic review of pertinent radiologic methods to detect osteopenia and sarcopenia for potential opportunistic application in the ICU setting.

Methods: We queried PubMed and CINAHL databases for publications addressing: 1) frailty or representative comorbid conditions (osteopenia/osteoporosis or sarcopenia); and 2) CT, MRI, or US. We screened abstracts for full text review and included all applicable articles in the qualitative synthesis. Results: Of 1423 unique abstracts screened, we performed 310 full-text reviews. 40 articles assessed osteopenia; 203 evaluated sarcopenia. Osteopenia assessment was via CT (34), MRI (1), or US (5). CT (141) was the most common tool for sarcopenia, measuring total abdominal muscle cross section (66), psoas (25), thigh (44), and/
or other areas (13). 36 studies utilized MRI, whereas 26 used US. The latter tar-geted thigh (19), lower legs (8), and/or other areas (8). Only 4 articles specifically addressed radiologic frailty assessment in ICU patients. 57% of patients classified as “normally-nourished” via the Subjective Global Assessment had concurrent sarcopenia on radiologic screening. Sarcopenia independently predicted higher morbidity, ventilator- and ICU-free days, and mortality. Conclusions: Screening for frailty in older ICU patients is important given its known associations with worse short- and long-term outcomes. Currently, a high degree of variability exists in radiologic assessment of osteopenia and sarcopenia as markers for frailty, with few articles specifically targeting ICU patients. Once validated, CT, MRI, and/or US could be routinely employed in a low-cost, opportunistic fashion that will assist with prognosis and management of the critically ill older patient.

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IMPROVED GLYCEMIC CONTROL WITH COLLABORATIVE TARGETED INTERVENTIONS IN A MEDICAL ICU
Michael Siritaturas, Rebeca Haltlon, Janice Zimmerman

Learning Objectives: Safely maintaining glycemic control (GC) targets in the ICU remain a challenge to achieve. Integration of systematic changes can aid in improving GC. Two changes were implemented at Houston Methodist Hospital ICUs for the prevention and treatment of hyperglycemia including an enhanced insulin infusion order set in September 2013 and a new basal-bolus insulin order set in January 2013. Despite these changes, unit specific GC metrics did not improve greatly on a month-to-month basis in any of the ICUs. Methods: A collaborative, multidisciplinary effort between pharmacists, intensivists and nurse practitioners in the MICU was initiated in January 2014. These efforts included setting unit specific targets for GC improvements, distribution of monthly progress updates on GC metrics, increased prescriber education on the benefits of implementing the new insulin order sets, and daily targeted GC interventions by clinical pharmacists during multidisciplinary rounds. Glycemic control values were analyzed and reported by percent of total glucose measurements in the month. These measurements were based on glucose readings below, within, and above pre-determined GC values (i.e., less than 70 mg/dL, 70–180 mg/dL, greater than 180 mg/dL, etc.). Results: Prior to the MICU-specific interventions, the percentage of blood glucose (BG) values 70–180 mg/dL in 2012 and 2013 was 68.3% and 67.5%, respectively. Hypoglycemia rates (BG < 70 mg/dL) were 2.4% and 1.7%. Post intervention implementation, the percentage of BG values 70–180 mg/dL increased to 73.6% in 2014 and remained at 73.6% in 2015 year-to-date (YTD), a 9% relative increase within target range compared to 2013. Hypoglycemia rates remained low at 1.7% in 2014 and 1.6% in 2015 YTD, a 33% relative decrease from 2012. Conclusions: Multiple collaborative interventions including setting GC targets with monthly progress updates, prescriber-directed education, and targeted GC interventions by clinical pharmacists during rounds demonstrated an improvement in meeting GC metrics while also maintaining low rates of hypoglycemia.

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THE STUDY OF ENDOTHELIAL DYSFUNCTION AND POSSIBLE MECHANISMS INDUCED BY ACUTE GLUCOSE FLUCTuations
Jun Guo, Bo Wang, Yan Kang

Learning Objectives: ‘Glycemic variability’ also named glucose fluctuations is an important determinant of mortality in ICU patients. This study was to characterize the injury on endothelium induced by acute glucose fluctuations (AGF), and research the related mechanism. Methods: Human umbilical vein endothelial cells (HUVECs) and C57BL/6 mice (SPF) were studied under the AGF. Four groups were designed at first in vitro, and each one received the following fresh media every 4h:1)CTR group (5mM); 2)SHG group (25mM); 3) AGF groups (AGF 5/16mM, AGF2 5/25mM). The cells function, proliferation, apoptosis, and autophagy were analyzed. Further, the miRNAs chip was done in CTR, AGF groups, and related miRNAs were tested by RT-PCR. At last, the mimics and inhibitors of the relative miRNAs were transfected in cells, and observed the influence on the cells functions. C57BL/6 mice were chosen for observing the influence of AGF around wound on wound healing after treatment for day 0, 4, 7, 10 and 14 in vivo. Results: 1) Compared with CTR, the proliferation of other groups were declined sharply, and AGF2 group was the lowest. 2) The ability of angiogenesis was sharply differences. At 4h, CTR group was observed, but others not. At 8h, SHG and AGF1 groups were formed, but AGF2 group was little. Alternatively, both the wound healing and cell migration test had the same trend in vivo and vitro. 3) Apoptosis was detected, and no differences was found in those groups. 4) Autophagy was induced except in CTR group, accompanied with declined of P62/β-actin, increased of LC3II/I and autophagy vacuoles. miR1273g-3p was evidenced up-regulation according to the miRNAs chip and RT-PCR retest. After the mimics and inhibitors transfected into cells with AGF, the inhibitors improved the proliferation and migration of HUVECs. Conclusions: AGF can induce more serious injury in HUVECs and mice. Increased autophagy level and miR1273g-3p up-regulation were also observed. Transfected the inhibitors of miR1273g-3p could improve the dysfunction to some extent. However, the relationship of miR1273g-3p and autophagy induced by AGF should be studied in future.

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IMPLEMENTING ELECTROMAGNETIC FEEDING TUBE PLACEMENT: A COMMUNITY HOSPITALS EXPERIENCE
Kurtis Windemuth, Nachal Bhangal, Kimberlee Alvari, Evbira Ballar, Lamiya Sheikh, Carmencita Aburarez-Acasoii

Learning Objectives: Research and SCCM/ASPEN professional guidelines support feeding critically ill patients within 24–48 hr of critical care admission as a method to improve outcomes. Reasons to improve early enteral nutrition include: maintaining gut integrity, modulating stress and the systemic immune response, and attenuating disease severity. Monitoring of quality data demonstrated that timely enteral nutrition initiation occurred inconsistently. Problems contributing to the delay in timely initiation of feeding included issues with tube insertion and delay of x-ray confirmation for placement. Methods: A review of evidence-based practice was done, with a focus on type and methodology of feeding tube placement with the goal to achieve timely nutrition (defined as within 24–48 hr post-admission) and minimize resource utilization. In January of 2014, a decision was made to implement an electromagnetic enteral feeding system (Cortrak) to reduce and eliminate the need for x-ray confirmation. The implementation plan included identification of super users, given intensive education on the importance of timely nutrition and training on the device. Results: In the three mo prior to implementation of the initiative, among 29 eligible patients, less than 30% of patients had timely tube feeding. Within the month of implementation (February 2014), among Cortrak patients (n=9) there was a 46.7% increase in timely tube feeding (R.K. 1.49; 95% C.I. 0.82–2.72). This was sustained and improved upon with 100% of Cortrak patients achieving timely nutrition by August of 2014. There was a decrease in percentage of eligible patients requiring at least one x-ray related to tube placement (from 86% pre-implementation (mean of 1.5 x-rays per patient) to 53.6% post-implementation (mean of 0.86 per patient)); not significant within a 95% C.I. (p=0.36). Conclusions: The implementation of electromagnetic feeding, education and increased awareness of critical care nutrition guidelines resulted in significant improvement in timely feeding. Future research will examine the impact on efficiency, effectiveness and costs.

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CAN WE TRUST THEM? ACCURACY OF ICU NURSES IN ASSESSING ELECTROMAGNETIC FEEDING TUBE PLACEMENT
Kristen Ronesmus, Tammy Kopelman, Amy Howell, James Bogert, Karole Davis, Paola Pieri, Sydney Vail

Learning Objectives: The CORTRAK device (CD) is an FDA approved electromagnetic sensor-guided enteral access system utilized by nursing to assist in bedside feeding tube placement (FTP). Despite CD usage, standard of care requires radiographic confirmation of FTP prior to initiation of enteral nutrition and medication administration. The purpose of this study was to determine the ability of the bedside surgical intensive care unit (SICU) nurse to interpret the CD real time graphical mapping of the feeding tube path. Methods: This prospective study was conducted over 23 mo on patients admitted to the SICU of a tertiary care center who required FTP by SICU nurses. Training on the CD included observation of 1 FTP, bedside coaching on 1 FTP, and 2 observed successful FTPs. For study purposes, SICU nurses documented their judgment of feeding tube tip location and printed the CD real time graphic display after FTP and prior to obtaining radiographic confirmation. Using radiographic interpretation of location of FTP as ground truth, the device was validated. Results: Among 29 eligible patients, less than 30% of patients had timely tube feeding. Within the month of implementation (February 2014), among Cortrak patients (n=9) there was a 46.7% increase in timely tube feeding (R.K. 1.49; 95% C.I. 0.82–2.72). This was sustained and improved upon with 100% of Cortrak patients achieving timely nutrition by August of 2014. There was a decrease in percentage of eligible patients requiring at least one x-ray related to tube placement (from 86% pre-implementation (mean of 1.5 x-rays per patient) to 53.6% post-implementation (mean of 0.86 per patient)); not significant within a 95% C.I. (p=0.36). Conclusions: The implementation of electromagnetic feeding, education and increased awareness of critical care nutrition guidelines resulted in significant improvement in timely feeding. Future research will examine the impact on efficiency, effectiveness and costs.

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281 IMPACT OF INJECTABLE PHOSPHATE NATIONAL SHORTAGE ON MECHANICAL VENTILATION

Amanda Radisic, James Curtis, Ian Butler

Learning Objectives: Hypophosphatemia is associated with acute respiratory failure and failure-to-wean from mechanical ventilation (MV). In response to a national shortage of intravenous (IV) phosphate products, our facility restricted use of IV phosphate to the following criteria: replacement in continuous renal replacement therapy, any patient with a serum phosphorus below 1.5 mg/dL, patients with a serum phosphorus of 1.5 to 2 mg/dL where no oral or enteral medications are prescribed. The potential negative impact of this strategy in patients is unclear as there is concern that critically ill patients do not adequately absorb oral supplementation to sufficiently replenish phosphate stores. Methods: A single center, retrospective study was performed to assess the effects of IV phosphate restrictions on the duration of MV and need for re-intubation in critically ill patients by comparing outcomes in a group of patients admitted prior to and following the protocol implementation. We included adult patients who required MV for at least 48 hr and excluded those who required intubation for airway protection, admitted from an outside facility receiving MV or with a tracheostomy, had chronic respiratory failure, diabetic ketoacidosis, or required MV for greater than 28 days. Results: 1,235 patients required MV and were assessed for eligibility. Of these, 241 patients were included in the final analysis with 138 patients in the unrestricted IV phosphate group (RPG) and 103 patients in the restricted IV phosphate group (URPG). The median MV-free hr in URPG was 498 hr compared to 536 hr in RPG (p=0.968). The median serum phosphorus concentration in URPG vs. RPG was 3.3 vs. 3.2 mg/dL, respectively. There was no significant difference in the hospital or ICU length of stay, mortality, or need for re-intubation. Conclusions: There is no difference in the MV-free hr by restricting the use of IV phosphate supplementation. Oral phosphate replacement is a safe and effective alternative to IV phosphate products.

282 SIGNIFICANCE OF LACTIC ACIDOSIS AND GLUCOSE LEVELS IN DIABETIC KETOACIDOSIS

Amanda Radisic, James Curtis, Ian Butler

Learning Objectives: The prevalence and clinical significance of lactic acidosis (LA) in diabetic ketoacidosis (DKA) have recently been studied; there is little work relating specifically LA to glucose levels in patients with DKA. The objective of this study was to compare the presenting glucose levels and glucose levels over the first 48 hr of hospitalization between DKA patients with and without LA. Methods: Retrospective analysis of data collected on all DKA patients admitted to the ICU in a 254 bed suburban hospital between 5/2014 and 7/2015. We screened 45 patients and identified 17 with complete data (demographics, LA measurement, and 48 hour glucose measurements). Patients were divided into two groups defined a priori based on an absence or presence of LA ≥ 2.5. We hypothesized that patients with LA would have higher initial glucose levels. Results: 17 patients with DKA admitted to the ICU were included. Of the 17, 7 (46.7%) had LA (lactate, ≥2.5 mmol/L) and 8 (53.3%) of the 17 had a normal lactate (<2.5 mmol/L). The following did not differ between the LA group (LG, n=7) and non-elevated lactate group (NLG, n=10): age (32.1 vs. 34.6, p=0.73), male gender (37% vs. 43%, p=0.85). Within the LG, the mean presenting glucose (MPG) value was 733 mg/dL (IQR, 588–949). Within the NLG, the MPG value was 505 mg/dL (IQR, 360–598). The difference in initial presenting glucose levels between the cohorts was significant (p<0.01). A comparison of average glucose levels within the cohorts was performed at 6 hour intervals over the first 48 hr post hospitalization and no significant difference in glucose levels was found during this period (p=0.52). Conclusions: Patients who presented with LA and DKA had higher initial glucose levels than those with DKA alone. This supports the theory that LA in DKA may occur primarily due to altered glucose metabolism rather than global hyperfusion. There was no difference in ICU LOS or glucose levels between cohorts over the next 48 hr of hospitalization. A major limitation was the small patient population; only 17 patients had lactate included in their blood chemistry analyses.

283 EARLY NUTRITIONAL INADEQUACY IS ASSOCIATED WITH WORSE OUTCOMES IN CHRONIC CRITICAL ILLNESS

Daniel Yeh, Iva Fuentes, Sadeq Qaasib, Jarone Lee, Haytham Kaafarani, Kathryn Butler, Peter Fagenholm, George Velmahos

Learning Objectives: Recent studies suggest that aggressive nutrient delivery may not benefit ICU patients with low severity of illness. We hypothesize that early nutritional deficit may be more important for patients with chronic critical illness. Methods: This was a retrospective analysis of an ongoing prospective study of adult surgical ICU patients. Subjects were characterized as short ICU (<14d) or long ICU (≥14d) groups. Cumulative nutritional deficit (caloric and protein) over the first 3 days of ICU admission was calculated. To investigate whether early nutrient deficit was associated with ICU length of stay (LOS), hospital LOS, 28d ventilator-free days (VFD), and discharge disposition in each group, we performed regression analyses, while controlling for age, sex, body mass index, and acute physiology and chronic health evaluation (APACHE) II score. A p value of <0.05 was considered statistically significant. Results: 213 subjects were included. While the short ICU (n=118) and long ICU (n=95) groups were similar in age, APACHE II score, caloric/protein prescription, and rate of enteral nutrition initiation within 48h of admission, long ICU patients were less commonly male (19% vs. 36%, p<0.01) and had a higher BMI (29 ± 7 vs. 26 ± 6, p<0.01). Caloric and protein deficits were higher in the long ICU group vs. short ICU group (2200cal [IQR 1360–5845] vs. 1564 [IQR 667–2181], p<0.01, and 116.8g [IQR 56.6–213.4] vs. 75.1g [IQR 20.8–149.0], p<0.01). Regression analyses showed that for short ICU patients, nutritional deficit was not significantly associated with any assessed outcomes, except 28d VFD. However, for long ICU patients, caloric and protein deficits were significantly independently associated with ICU LOS, hospital LOS, 28d VFD, mortality, and unfavorable discharge disposition. Conclusions: Cumulative nutritional deficit in the first 3 days after ICU admission are more strongly associated with chronic outcomes in patients requiring longer ICU stays vs. those with shorter ICU stays. Future efforts should focus on optimizing nutrient delivery in patients at risk for prolonged critical illness.

284 DESCRIBING PARENTERAL NUTRITION PRESCRIBING PATTERNS IN THE SURGICAL ICU OF A LEVEL 1 TRAUMA CENTER

Ashley Delprist, Emily Butzer, Christina Choriwat, Kathleen Crim, Ashley Mayer, Fatema Shirin, Kathy Taylor

Learning Objectives: While enteral nutrition is the preferred route for feeding in the critically ill ventilated patient, there are situations in which the use of parenteral nutrition (PN) is required. Given the high risks associated with the use of PN in the critically ill, the American Society of Parenteral and Enteral Nutrition (ASPEN) and the Society of Critical Care Medicine (SCCM) have published practice guidelines to help direct evidence-based use of PN. While the use of PN has been associated with increased complications, the appropriate use of PN can be beneficial and may even improve outcomes. The purpose of this project is to determine compliance of PN use with the ASPEN/SCCM guidelines in the surgical intensive care unit (SICU) of a level 1 trauma center. Methods: As part of an ongoing quality improvement project, information on ICU patients ventilated within the first 24h of admission was collected beginning in September of 2012. That information includes admission date, enteral nutrition start date, whether...
PN was initiated, and the indication for the use of PN. Utilizing our electronic medical record, those medical record numbers were then used to determine the admitting team. Only those patients admitted by the SICU team and who were initiated on PN during their ICU stay were included in data analysis. Results: A total of 102 ventilated SICU patients were started on PN during their ICU stay. Of those, 29 (28.4%) were started on or after day 7 of ICU care. The average total duration of PN therapy was 13.6 days. There were 16 patients (15.7%) who received PN therapy for less than 5 days. Those most common reasons for the use of PN were GI complications (including, but not limited to, short gut and bowel discontinuity), TBI with assumed ileus and the use of vasopressor therapy. Conclusions: The initiation of PN in most SICU patients was due to major GI procedures and/or complications. Arguments can be made to support the use of PN in those patients, we found many reasons for PN therapy that do not fit within the recommended guidelines.

285 FACTORS IMPEDING ENTERAL NUTRITION DELIVERY IN CRITICALLY ILL TRAUMA PATIENTS: A PROSPECTIVE STUDY
Gaurav Sachdev, Kehaulani Clark, Andrea Sorvello, Taylor Soloff, Peter Fischer, A. Christmas, Ronald Sing, Toan Huynh

Learning Objectives: Numerous factors impede the delivery of goal nutritional support to critically ill patients on enteral nutrition (EN). This study was undertaken to assess the frequency of any factors that affect delivery of EN in the critically ill trauma population. We hypothesized that a significant proportion of (EN) interruption results from clinical procedures and tube dislodgement.

Methods: This prospective observational study evaluated patients from September 2013 to April 2015. Exclusion criteria were hemodynamic instability, intra-abdominal injury requiring operation, intensive-care unit (ICU) length of stay < 72 hr, noninvasive positive pressure ventilation, and surgical restriction head-of-bed > 30°. Data recorded were daily EN goal, daily EN delivered, and reasons for interruption of EN. Results: We evaluated 251 patients over a 20-month period representing 2264 patient days of EN. Patients received, on average, 67.88% of the goal EN volume. EN interruption occurred on 366 (16.17%) patient days in the study period. Over the study period, 126 (5.57%) EN patient days were interrupted by procedures, 41 (1.81%) by tube dislodgement, 24 (1.06%) by emesis, 31 (1.37%) by gastric residuals < 500 mL, and 23 (1.02%) by gastric residuals > 500 mL. Conclusions: Clinical procedures, tube dislodgement, and inappropriate interruption for low gastric residuals can greatly impede delivery of nutritional support. A multi-professional approach focusing on education and improving compliance may help to reduce these interruptions and improve delivery of EN in critically ill trauma patients.

286 HYPOGLYCEMIA IS COMMON AMONG YOUNG CHILDREN PRESENTING WITH METABOLIC ACIDOSIS
Ali Ahmad, Jessica Asencio, Kirstin Henley, Ajay Gupta, Balagangadhar Totapally

Learning Objectives: Metabolic acidosis in children can present with varying degrees of severity, duration, and etiology. Minor illness can lead to hyperglycemia and ketosis in young children due to poor metabolic reserve. We investigated etiology and type of metabolic acidosis and prevalence of hypoglycemia in young children. Methods: We conducted a retrospective chart review of all young children (1–71 mo) presenting with metabolic acidosis (serum bicarbonate <16 mEq/L) over a 15-month period after local IRB approval. First lab values either in ER or in hospital were used for analysis. We also reviewed the admission/discharge diagnoses, electrolyte panels, anion gap (AG), blood gas values, etc, surgical intervention, length of stay (LOS), and mortality. Hypoglycemia was defined as blood sugar <60 mg/dL. Gap acidosis was defined as AG >14 mEq/L. Results: A total of 105 children admitted with metabolic acidosis during the study period. Most (82%) had gap acidosis even among children with acute gastroenteritis (AGE; 81%). Females were 57% and most common diagnoses were AGE (41%) or vomiting with dehydration (15%). Median age was 20 (IQR 10–50) mo. Mean bicarbonate, chloride, AG, and BUN were 13±2, 107±6, 20±5, and 15±9 respectively. Hypoglycemia was present in 28%, surgical intervention was needed in 12% and overall mortality rate was 2%. Hypoglycemia was most frequent among children with vomiting (50%) followed by AGE (32%). Most (99%) children with hypoglycemia who were tested were positive for urine ketones. Children with acidosis and hypoglycemia tend to be younger (18 vs 20 mo; p<0.01) more likely to have diagnoses of vomiting or AGE (67% vs 24%; p<0.01) and have a shorter LOS (5 vs 5 days; p=0.05) and no mortality. Conclusions: Hypoglycemia is common among young children presenting with metabolic acidosis. Gap acidosis is the most frequent type of acidosis even in children with AGE; starvation ketosis is most likely explanation. Ketotic hypoglycemia should be considered in any young child presenting with gap acidosis.

287 DIABETES IS ASSOCIATED WITH INCREASED DYSGLYCEMIA AND MORTALITY IN PATIENTS WITH SEPSIS
Jansi Gnanasekaran, Raquel Ong, James Krinsley

Learning Objectives: A limited literature describes dysglycemia–hypoglycemia, hyperglycemia and increased glucose variability (GV)–in patients admitted to the ICU with sepsis, and the differences between those with (DM) and without (NON) diabetes are even less well defined. Methods: This is a retrospective analysis of prospectively collected data abstracted from the Stanford Hospital ICU database, examining 178 patients (130 NON, 48 DM) admitted with sepsis to the Stanford Hospital ICU from 1/1/10 and 12/31/13, with blood glucose (BG) target 90–120 mg/dL. Patients were stratified by severity of sepsis based on Surviving Sepsis Guidelines. Glucose metrics included mean BG, % of patients with hyperglycemia (minimum BG > 70 or <90 mg/dL) or severe hyperglycemia (maximum BG > 180 mg/dL); GV (CV %, coefficient of variation). Results: The mean APACHE IV predicted mortality % and the observed hospital mortality % of NON and DM were 35.3 vs 41.8 p=NS and 23.7 vs 44.6 p=0.03. The observed/predicted mortality ratios were 0.67 and 1.07. Comparison of NON and DM: Mean # of BG tests/24 hr: 8.1 vs 12.7 Mean BG (mg/dL), median) 114 vs 139 p=0.001 CV (%), median) 19.4 vs 25.4 p=0.001 % with minimum BG < 70 mg/dL 37.7 vs 41.7 p=NS % with minimum BG > 40 mg/dL 4.6 vs 2.1 p=NS % with maximum BG > 180 mg/dL 33.9 vs 79.2 p<0.0001. Mortality was not associated with severity of dysglycemia for NON or for DM. Severity of sepsis was not associated with worsened dysglycemia for NON or for DM. Conclusions: In this cohort of patients admitted to the ICU with sepsis, DM had higher mean BG and higher GV than did NON, with similar rates of hypoglycemia. The high degree of glycemic control in the cohorts likely blunted the expected relationship between dysglycemia and mortality as well as that between the severity of sepsis and hypoglycemia. Severity adjusted mortality was higher for DM than for NON. Future investigations of dysglycemia and sepsis should stratify patients by diabetic status, consider the need for different BG targets and explore explanations for the worse outcomes in diabetics.

288 THE OTHER ROLE OF HBA1C ON ICU ADMISSION IN CRITICALLY ILLNESS PATIENTS
Hidenobu Kamohara, Junji Yamashita, Kentaro Tokunaga, Manabu Hayata, Katsuyuki Sagishima, Yoshihiro Kinoshi

Learning Objectives: Unregulated hyperglycemia affected clinical outcome with infection complication. Hba1C was examined for long marker of diabetes mellitus (DM), and high amounts of Hba1C before operation was related to poor outcome. In the situation of acute illness disease, there were no information and condition about patients. Hba1c could help to diagnosis for treated type, border type or newly occurrence about DM patients on the day of acute illness. But few clinical study was reported about Hba1c on ICU admission day. Methods: This was a retrospective study conducted at Kumamoto university, Kumamoto, Japan. Informed consent was obtained from each patients. Patients was included if they were >18 yr of age, and treated in ICU at Kumamoto university hospital. Patients were excluded if they were <18 yr of age, and receiving supportive or palliative treatment and no data about Hba1c or blood glucose (BG) on ICU admission. Patients who had had hypoglycemia (BG > 180) was treated by insulin therapy; standard glycemic control. Statistical analysis was used by JMP computer soft system. Results: All 1101 patients were registered between April 2011 and March 2014. Finally 692 patients was included for the present study. Three group was separated by amounts of Hba1c, high group (178 pts, Hba1c > 6.2), normal group (465 pts, Hba1c 4.6–6.2), low group (49 pts, Hba1c < 4.6). High age, hyperglycemia, high BMI

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and not scheduled admission was observed statistically significant in high group. DM patients or Insulin use was higher in high HbA1c group. Each HbA1c group were not related to the mortality, Low 3 (61%), Normal 28 (6%), high 19 (10.7%), P=0.126. In normal HbA1c group, insulin use was associated with the mortality (Insulin: 17 (17.7%), Not use; 11 (3%), P<0.0001). Insulin use in other group was not significant factor for the mortality. Conclusions: Insulin use for hyperglycemia would be a prognosis marker in normal amount of HbA1c on the admission day. That could indicated serious condition including glucose tolerance disorder was treated by early considerable therapy in non DM critically ill patients.

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A RANDOMIZED TRIAL OF ENTERAL GLUTAMINE IN BURN PATIENTS: RESULTS OF A MULTICENTER PILOT STUDY
Daren Heyland, Paul Wichmeyer, Lucy Wibbenmeyer, Bruce Friedman, Jonathan Pollack, Nathan Kemalyan, Marc Jeschke, Dominique Garrel

Learning Objectives: Glutamine may be of therapeutic value in treating burn injuries as small number of existing randomized trials of glutamine supplementation in burns patients have suggested a significant reduction in mortality, infection, and hospital length of stay. However, in other critically ill patient populations, there is a signal of increased mortality associated with glutamine administration. A trial of 270 severe burn injury patients would be needed to rule out a mortality effect with glutamine supplementation. Prior to launching such a large initiative, we conducted a multicenter, randomized, pilot trial to assess the feasibility of the larger trial. Methods: We conducted a multicenter, double-blinded, randomized, pilot trial in 8 burn centers in Canada and the United States to demonstrate the feasibility of the trial protocol. We included patients with deep 2nd and/or 3rd degree burns at moderate or high risk for death. For patients age 18 – 59 yr we required a TBSS (Total Burn Surface Area) ≥ 20%, or in the presence of an inhalation injury, a minimum of 15 % TBSS was acceptable. For patients aged 60 yr or older we required a TBSS ≥ 10%. We excluded patients who were admitted more than 48 hr before screening and patients with advanced liver and kidney disease. Patients were randomized to receive glutamine through their feeding tube, every 4 hr for a total of 0.5 g/kg/day or maltodextrin (placebo) mixed with water. Study treatment (or placebo) continued until 7 days post last graft. Patients were followed for 6 mo to document survival and time to hospital discharge. Results: To date, we have recruited 203 patients from 8 sites. On average, participating sites enrolled 0.96 patients/site/month (range: 0.68 patients/month to 1.31 patients/month). There was good compliance with study procedures and >90% of prescribed doses of study medication were delivered. Only 2.0% of patients have been lost to follow-up at 6 mo. Conclusions: The RE-ENERGIZE study seems feasible. A larger, more definitive trial is warranted and is currently underway.

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COMPARISON OF 70/30 BIPHASIC INSULIN VERSUS INSULIN DETEMIR DURING CONTINUOUS ENTERAL NUTRITION
Tiffany VanDervort, Carolyn Maness, Hal Richards

Learning Objectives: Hyperglycemia is common during enteral nutrition (EN) and is associated with increased morbidity, mortality, and risk of infection. While current AACE/ADA guidelines recommend that blood glucose be maintained between 140–180 mg/dL in critically ill patients, there are no recommendations for insulin management strategies in those receiving continuous EN (CEN). This study compared insulin as part protamine/insulin as part 70/30 mix to insulin detemir for glycemic control in critically ill patients receiving CEN. To our knowledge, no prior studies have compared these insulin regimens when used during CEN. Methods: A retrospective review of the medical records of ICU patients within the St. Joseph’s/Candler Health System between October 1, 2011 and September 30, 2014 who received CEN and either 70/30 biphasic insulin or insulin detemir for at least 72 hr was performed. The primary efficacy outcome was the proportion of blood glucose values at goal over 72 hr of concurrent CEN and insulin treatment. Secondary efficacy outcomes included the mean blood glucose and the number of patients with at least 50% and 75% of blood glucose measurements at goal. The incidence of hypoglycemia was also compared. Results: A total of 57 patients were included in the study (n = 19 for 70/30 insulin, n = 38 for insulin detemir). Significantly more patients in the insulin detemir group were on an insulin regimen as an outpatient, and the pre-inclusion blood glucose was significantly higher in the 70/30 biphasic insulin group. Blood glucose values were in the goal range of 110–180 mg/dL more often in the insulin detemir group compared to the 70/30 biphasic insulin group (36% vs. 25.9%, p = 0.003). There was no difference in the mean blood glucose (203 mg/dL vs. 209 mg/dL, p = 0.187) or the incidence of hypoglycemia (5% vs. 10%, p = 0.321) between groups. Conclusions: In this small, retrospective study, insulin detemir appeared to be safe and as effective as 70/30 biphasic insulin for controlling hyperglycemia in critically ill diabetic and non-diabetic patients receiving continuous enteral nutrition.

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INITIATION OF ENTERAL NUTRITION IN A LEVEL 1 TRAUMA CENTER SURGICAL ICU: PRACTICES AND BARRIERS
Ashley Mayer, Emily Butzer, Christina Chotiwat, Kathleen Crim, Ashley DePriest, Fatema Shirin, Kathy Taylor

Learning Objectives: The American Society of Parenteral and Enteral Nutrition (ASPEN) and the Society of Critical Care Medicine (SCCM) have published practice guidelines to help direct evidence-based use of enteral nutrition, and these recommendations suggest enteral nutrition (EN) should be initiated within the first 48 hr of admission when possible. Early EN is important to maintain gut permeability, modulate systemic immune response, and attenuate disease severity. Early EN is associated with reduced infectious morbidity and mortality, as well as decreased hospital length of stay. Patients in the surgical/trauma intensive care unit (SICU) receive early EN less frequently than research suggests. Methods: Data on EN initiation in critically ill, mechanically ventilated patients was collected in a Level 1 trauma center’s SICU as a quality improvement initiative of the clinical nutrition department. Observers conducted a manual chart review on patients not initiated on EN within 48 hr of admission to determine reasons for delaying EN. Barriers were analyzed and categorized into common themes. Results: The study included 404 SICU patients, and 133 of those patients (32.9%) were initiated on EN within 48 hr of admission. Common barriers to EN initiation included: vasopressor therapy, awaiting return of bowel function following surgery; difficult enteral access; fistulae; operative plans; rotational bed therapy; imaging needs; and potential exubration. 40.9% of patients initiated on enteral nutrition between 48 hr and 72 hr of admission were found to have no clear reasoning for the delay in EN initiation. Conclusions: Early EN initiation occurred in less than 1/3 of patients evaluated in this study confirming the notion that SICU patients receive early EN less frequently than accepted guidelines recommend. In many cases, no clear reasoning or contraindication to EN was found; EN protocols in SICUs may help prevent delays in EN initiation stemming from oversight. More research is needed to evaluate the barriers identified as not complete contraindications to EN.

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MULTIDISCIPLINARY PERSPECTIVE ON USE OF INDIRECT CALORIMETRY FOR NUTRITIONAL ASSESSMENT IN THE PICU
Nikhil Patankar, Amanda Hasinger

Learning Objectives: Delivery of adequate nutrients during illness to counteract the metabolic stress response and facilitate healing and tissue repair improves outcomes of critically ill children. These children have dynamic nutritional needs not reliably estimated with current available equations used to calculate resting energy expenditure (REE). Methods to accurately measure energy expenditure during critical illness are desirable to avoid over and underfeeding. Indirect calorimetry (IC) has been recommended as the gold standard by to guide nutrition therapy in select group of patients in the critical care setting. We hypothesized that critical care personnel in our institution had limited knowledge about IC and its indications. Methods: We conducted an electronic questionnaire based survey to assess the attitudes of health care personnel of all roles in a tertiary non-cardiac PICU. Participants responded to 12 questions that asked information about their current work position, duration in that position, importance of enteral nutrition, ways to assess nutritional status, and knowledge about IC. Results: Participants had a diverse clinical background and included attending physicians, fellows, mid-level providers, bedside nurses, nurse managers, and physicians. A total of 57 of the 78 eligible respondents (73%) participated. Average time needed to complete was 4 min and there were no drop outs. 54% of the participants were bedside nurses, and 29% of all had been in their current position for more than 15 yr. Of all respondents, 91% thought that enteral nutrition would have a positive outcome for patients. 54% had seen IC being used infrequently and 22% were unsure what IC was. 68% thought...
that using IC more than once would be helpful. 52% thought that they would use IC often, if they were told it was the gold standard. 64% felt it should be the standard of care. Conclusions: PICU personnel have a positive perspective about enteral nutrition and use of IC. Most felt they needed more information on IC and would use it more often if they were provided supporting literature.

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THE IMPACT OF THE CUMULATIVE CALORIC DEFICIT IN CRITICALLY ILL PATIENTS
Ali Papazkaz, Krista Wabby, Kari Abraham, Raymond Yost

Learning Objectives: Malnutrition is associated with increased morbidity, mortality and length of stay (LOS) in critically ill patients. However, recent studies show that short-term (<14 days) permissive underfeeding has similar outcomes compared to standard feeding. Our study aimed to evaluate the effects of cumulative caloric deficit on patient outcomes throughout the entire ICU stay.

Methods: This retrospective analysis was performed on adult patients admitted to a Detroit Medical Center ICU without oral intake for at least 6 days, excluding those transferring from another facility, baseline albumin <2.5mg/dL or acute pancreatitis. Total daily caloric and protein intake was compared to calculated goal caloric and protein required for each patient. Patients were then stratified into 3 groups based on what percent of the total caloric and protein requirements were delivered: Severely Underfed (SUF): 0–35%, Underfed (UF): 35–60%, or Well-fed (WF): >60%. Outcomes including hospital & ICU LOS, ventilator days, infections, refeeding syndrome, and acute kidney injury were collected. Results: A total of 20 patients were included in this preliminary analysis. Mean age was 60±11 and APACHE II was 17±7. ICU LOS for the SUF, UF, and WF groups were 12, 15, and 15 days respectively; hospital LOS was 16, 16, and 18 days. The cumulative % of goal calories and protein administered were: 31±17% and 41±21% in the SUF group; 46±21% and 46±20% in the UF group; and 93±36% and 100±37% in the WF group. Mortality rates were: 13% (1/8), 27% (3/11), and 0% (0/1) for SUF, UF, and WF groups, respectively. Conclusions: Cumulative nutritional deficits may contribute to increased mortality in critically ill patients.

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CLINICAL USEFULNESS OF CAPNOGRAPHIC MONITORING FOR FEEDING TUBE INSERTION IN CRITICALLY ILL PATIENTS
Jeong-Am Ryu, Joongbum Cho, Dae Sang Lee, Gee Young Suh, Jeong Hoon Yang, Kyeongman Jeon, chi yang Chung, Chi-Min Park

Learning Objectives: Decreased or delirious mentality and intubated state is a risk factor for respiratory malplacement of feeding tubes in critically ill patients. We investigated the utility of capnographic monitoring for the prevention of respiratory complications due to feeding tube mispositioning in critically ill patients.

Methods: This study is a pre- and post-intervention study, including a total of 459 feeding tube placements events that were retrospectively studied in the medical and surgical ICUs of the Samsung Medical Center. Feeding tubes were inserted in 275 cases without capnographic monitoring during tube insertion from August 2014 to October 2014. One hundred and eight four cases required capnographic monitoring and were performed from December 2014 to January 2015. We compared the outcomes between the time periods before and after the capnographic monitoring and respiratory complications. Chest X-rays was performed to confirm the positioning of the feeding tube in all feeding tube placements events.

Seventeen patients (4%) had respiratory complications in total tube placements. Tracheal insertion was in 12 (3%) patients and pneumothorax in 5 (1%) patients. Seventeen cases of respiratory complications were detected in the non-monitored group (14/275, 5%, ten tracheal insertions and four pneumothoraxes). Three cases of respiratory complications were detected in the capnographic monitoring group (3/184, 2%, two tracheal insertions and one pneumothorax). CO2 detection in capnographic monitoring group included 12 cases (12/184, 7%) and pneumothorax was occurred in 1 case. False negative of capnographic monitoring was 11 cases (tracheal insertion of feeding tube, but CO2 was not detected in two tube placements). Capnographic monitoring may significantly reduced the risk of respiratory complication during feeding tube insertion in critically ill patients (adjusted OR: 0.145; 95% CI: 0.030–0.707). Conclusions: Capnographic monitoring is a simple and easy to learn method. Capnographic monitoring is useful to prevent respiratory complication during feeding tube insertion in critically ill patients.

Research Snapshot Presentations: Epidemiology

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ASSOCIATION BETWEEN DOWN SYNDROME AND MORTALITY IN YOUNG CHILDREN WITH CRITICAL ILLNESS
Punkaj Gupta, Andrew Wilcox, Michael Roberson, Mallikarjuna Rao Rettiganti

Learning Objectives: To evaluate the outcomes among critically ill young children with Down syndrome from a national database. The specific outcomes evaluated in our study included mortality and hospital length of stay. Methods: Patients in the age group from 1 day through 24 mo at a Pediatric Health Information System (PHIS)-participating hospital (2004–2015) were included. We used propensity score matching to adjust for potential confounding variables between patients with and without Down syndrome.

Results: Of 34,491 Down syndrome patients admitted to the hospital during the study period, 12,282 (36%) patients got admitted to the ICU. In contrast, of 1,824,545 Non-Down syndrome patients admitted to the hospital, only 281,415 (16%) patients got admitted to the ICU. Mortality rates were: 13% (1/8), 27% (3/11), and 0% (0/1) for SUF, UF, and WF groups, respectively.

Conclusions: Cumulative nutritional deficits may contribute to increased mortality in critically ill patients.

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TRENDS IN ICU UTILIZATION AND HOSPITAL OUTCOMES OF THE OLDEST OLD: A POPULATION-BASED COHORT STUDY
Lavi Oud

Learning Objectives: There is ongoing debate on the proper use of critical care resources with increasing age among the elderly. There have been no population-level data on the evolving patterns of ICU utilization among the oldest old in the United States. Methods: We used the Texas Inpatient Public Use Data File to identify hospitalized patients aged ≥ 85 yr and those ≥ 85 yr for the yr 2001–2010. Hospitalizations with ICU admission were identified by presence of unit-specific charges. United States Census data were used to derive corresponding annual state population ≥85 yr. The annual volume ICU admissions, admission rates among all examined ICU admissions, rates of home discharge, and rates of end-of-life (EOL) hospitalizations (hospital mortality or discharge to hospice) among those aged ≥85 yr were examined. Descriptive statistics, regression analyses, and chi-square tests were used. Results: There were 6,132,955 hospitalizations with ICU admission, of which 5,39,821 were among those ≥85 yr during study period. The following changes were observed between 2001 and 2010 among those ≥85 yr: state population increased by 26.2% (2.7%/year; p<0.0001); ICU admissions increased by 64.7% (5.8%/year; p<0.0001); ICU admissions as percentage of all examined ICU admissions increased by 9.6% (p<0.0001); hospital discharge decreased by 43.7% (p<0.0001); EOL hospitalizations increased by 15.6% (p<0.0001). Conclusions: The growth rate of ICU utilization among the oldest old outpaced by more than 2-fold their corresponding population growth in the state. The rising rate of EOL hospitalizations suggests that reduced threshold for ICU admission in this group is unlikely to explain the observed trends. Although downtrending, nearly 1 in 2 hospitalizations ≥85 yr admitted to ICU were discharged home, supporting possible short-term benefit of critical care in this population. Further studies are warranted to corroborate our findings and examine the sources of the observed trends.
EPIDEMIOLOGY AND OUTCOME OF HOSPITALIZED INFANTS WITH PERTUSSIS: A PROPENSITY SCORE MATCHED STUDY
Fernando Beltramo, Andre Raszyński, Balagangadhar Torapally

Learning Objectives: Pertussis during infancy is associated with significant morbidity and mortality. The objective of this study was to review the epidemiology and outcome of infants discharged with a diagnosis of pertussis and compare them with propensity score matched controls using the Kids Inpatient Database (KID). Methods: The KID is one of the databases developed for the Healthcare Cost and Utilization Project. We used the 2009 and 2012 KIDs for this study. We identified infants aged 1 to 12 mo with a diagnosis of pertussis (ICD 9 code 033.0), and compared their demographic and outcome data to infants without pertussis. In a separate analysis, infants with pertussis were matched 1:1 with correlative propensity score using gender, hospital region, income quartiles, race, ventilation status, and APRDRG severity score and compared their outcomes with controls. Results: A total of 2,900 pertussis cases were identified out of 624,569 discharges (prevalence: 4.6/1000). The mean length of stay was longer (6.0 vs 4.5 days; p<0.01) in pertussis patients. Females (49% vs 43%), Hispanics (35% vs 25%), and lower income groups (59% vs 36%) were represented more frequently in the pertussis group (p<0.001). Mechanical ventilation (6% vs 4.7%; p=0.001), pulmonary hypertension [PHHTN] (36% vs 1%; p<0.001), and ECMO use (0.65% vs 0.08%; p=0.001) were more frequent in the pertussis group. In intubated pertussis patients 50% had PHHTN, 3% required a chest tube, and 10% required ECMO. The mortality rate was significantly higher in patients with pertussis who were ventilated (10.9% vs 0.04%; p=0.001), had PHHTN (1.4% vs 0.3%; p<0.001) or required ECMO (60% vs 0.3%; p=0.01). Compared to matched controls, the mortality rate (0.72% vs 0.34%; p=0.048), PHHTN (36.4% vs 0.82%; p=0.001) and ECMO usage (0.65% vs 0%; p=0.01) were higher in the pertussis group. The mortality rate in ventilated patients in our study was 11%. Conclusions: Pertussis disproportionately affects females, Hispanics, and lower income groups. Our study presents the national prevalence and outcome of pertussis in hospitalized infants.

INTENSIVE CARE UNIT LENGTH OF STAY IS ASSOCIATED WITH INSOMNIA IN CRITICAL ILLNESS SURVIVORS
Alex Warren, Charlotte Soubléy, Tara Quasim, John Kinsella, Joanne McPeake

Learning Objectives: Sleep disturbance is widespread in the ICU and evidence is emerging that insomnia may persist after critical illness. We hypothesized that post-ICU insomnia is associated with potentially modifiable factors during ICU admission. This study aims to assess the prevalence of insomnia in a population of ICU survivors in the UK and identify any predictable elements. Methods: The Insomnia Severity Index (ISI), a validated questionnaire for the detection of clinical insomnia scored from 0 to 28, was posted to 292 patients admitted to the ICU at the Glasgow Royal Infirmary over an 18-month period. Clinical and demographic variables collected at ICU admission were analyzed using appropriate tests of association and linear regression. Results: The response rate was 31.8%, comprising 87 patients who provided data and 6 who declined. The median time post-ICU discharge was 866 days. The median raw ISI score was 9 (IQR 4–18), with 53 patients (37.9%) reporting clinical insomnia (ISI >14), of which 10 (11.5%) had severe clinical insomnia. 54.3% of patients had problems sleeping more than 3 nights per week. The following factors were associated with clinical insomnia: smoking (p=0.001), social deprivation (p=0.001), ICU length of stay (ICULOS) (p=0.023). Duration of mechanical ventilation (MV) was not significant in univariate analysis (p=0.066) but was significant in multivariate linear regression. (B = +0.30, 95% CI ±0.12 to +0.50, p=0.002), along with social deprivation decile (B = -1.02, 95% CI ±0.50 to -1.54, p=0.001). Markers of disease severity, such as APACHE score, presence of sepsis and inotropic or renal replacement therapy, were not associated with insomnia. Conclusions: Clinical insomnia is highly prevalent in ICU survivors and persists yr after recovery from critical illness. The association with ICULOS and duration of MV in the absence of an association with disease severity may suggest an iatrogenic component to post-ICU insomnia. Further research is needed to explore the effect of sedation, the ICU environment and MV on sleep within the ICU and following discharge.

EVOLVING PATTERNS OF AGE-RELATED ICU UTILIZATION: A POPULATION-BASED STUDY
Lavi Oud

Learning Objectives: The rapid growth of elderly population, reported to account for half of ICU days in the United States, is expected to be increasingly the key driver of demand for critical care services. There are no recent population-level data on the evolving age-related patterns of ICU utilization. Methods: We used the Texas Inpatient Public Use Data File to identify hospitalized patients aged ≥18 yr for the yr 2001–2010. Hospitalizations with ICU admission were identified by presence of unit-specific charges. The annual volume of ICU admissions aged 18–64 yr and ≥65 yr increased by 44.1% (3.9%/year; p<0.0001) vs. 30.9% (2.9%/year; p<0.0001), respectively; ICU admissions aged 18–64 yr and ≥65 yr increased by 18.3% (2%/year; p<0.0001) vs. 24% (2.5%/yr; p<0.0001), respectively. Conclusion: The rapid growth of elderly population, reported to account for half of ICU days in the United States, is expected to be increasingly the key driver of demand for critical care services. There are no recent population-level data on the evolving age-related patterns of ICU utilization.

MATCHED STUDY

HOSPITALIZATIONS WITH ACINETOBACTER BAUMANNII PNEUMONIA AND SEPSIS IN THE US
Marya Zilberberg, Brian Nathanson, Kate Sulham, Weihong Fan, Andrew Shorr

Learning Objectives: Acinetobacter baumannii (AB) is an increasingly important pathogen in the critically ill patients with attendant high mortality. Prior studies of severe AB infection suffer from small sample sizes and lack of generalizability. We analyzed AB epidemiology and outcomes in a large multicenter database. Methods: We conducted a retrospective cohort study in the Premier Perspective database (2009–2013) of 175 US hospitals. We included all adult patients admitted with pneumonia or sepsis as principal diagnosis, or as a secondary diagnosis in the setting of respiratory failure, along with antibiotic administration within 48 hr of admission. Only culture confirmed infections were included. Patients with nosocomial infections or transfers from other facilities were excluded. Resistance to >3 classes of antibiotics defined multidrug resistant (MDR)-AB. We compared groups with non-AB, MDR-AB and non-MDR-AB. Hospital mortality was the primary and length of stay (LOS) a secondary endpoint. Results: Among 219,399 patients included (63.8% sepsis), 2,322 had culture evidence of AB, with 1,872 (80.6%) MDR-AB. While patients with non-AB infections were older (67±16.5 yr) than those with either non-MDR-AB (60.8±16.5 yr) or MDR-AB (63.0±15.8 yr), p<0.001, they were not less severely ill. Among MDR-AB, 59.5% required ICU admission compared to only 49.1% of those with non-MDR-AB and 33.4% of non-AB patients (p<0.001). Need for mechanical ventilation and vasopressors was also highest in the MDR-AB group (43.9% and 15.3%, respectively vs. 28.2% and 12.0% non-MDR-AB, and 15.5% and 7.5% non-AB, p<0.001). Hospital mortality (MDR-AB 19.6%, non-MDR-AB 10.7%, non-AB 8.8%, p<0.001) and LOS (MDR-AB 17.1, non-MDR-AB 16.4, non-AB 8.1 days, p=0.001) followed a similar pattern. Conclusions: While only 1% of all culture-positive pneumonia and sepsis admissions were due to AB, 80% of these severe AB infections were MDR. Those with AB, while younger than those with non-AB, presented with greater illness severity, faced higher mortality, and consumed more resources. Those infected with MDR-AB suffered the worst outcomes.

INSUFFICIENCY OF MEASURES TO IMPROVE NURSE SATISFACTION IN THREE HOSPITALS
John Maccoby, Nakos Tsiakas, Caroline Hawke, Daniel Small, Robert Mair, Stephen Mann

Learning Objectives: Nutritional insufficiency is a common and preventable problem in the ICU. We investigated the performance of the food service in one large hospital through the development of a new tool for nutrition assessment and an audit of ICU patients. Methods: We used the Nutrition Alarms Clinical Surveillance program (NACalS) to perform an independent nutritional audit of three hospitals during 2010. We collected data on patients admitted to the ICU with the NACalS clinical tool and compared the results to similar data collected in 2008. Results: There were 39% more patients with tube-feeding in 2010 vs 2008 (p<0.001). We found a significant improvement in adherence to clinical nutrition practice guidelines (increased from 30% in 2008 to 62% in 2010; p<0.001). Despite this improvement, 27% of patients were still unable to receive oral nutrition. Conclusions: Despite the improvements, patients are still not receiving adequate nutrition. More efforts are needed to improve nutrition support in the ICU.

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FUNCTIONAL STATUS AND REHABILITATION LENGTH OF STAY IN ICU SURVIVORS

Ryan Cauley, Jason Frankel, Jessica Rydingsward, Andrew Beam, Clare Horkan, Karin Amreich, Kenneth Christopher

Learning Objectives: Limited information exists in ICU survivors regarding the association between functional status at hospital discharge and adverse events following hospital discharge. Methods: We performed a retrospective cohort study in one hospital on 807 adults who received critical care between 2001 and 2012, survived hospitalization and were admitted to a single rehabilitation center. The exposure of interest was functional status determined by physical therapy evaluation at discharge. We utilized a risk prediction score adapted from the Functional Independence Measure. Patients were stratified into three risk groups based on functional status (low, moderate, high function). The primary outcome was rehabilitation length of stay. Negative binomial regression was utilized to describe how rehabilitation length of stay differed with functional status. Results: The cohort was 59% male, 71% white, 65% surgical, 38% trauma with 9% sepsis. The mean age was 58 yr. The median [IQR] rehabilitation LOS was 14 [9.20, 17 [12.25] and 31 [18.46] days in the high, moderate and low functional status groups respectively. Greater rehabilitation LOS was predicted by functional status at discharge. Compared to those with high functional status, following adjustment for age, gender, race, surgical patient type, sepsis, Deyo-Charlson index, Acute Organ failure, patients with moderate and low functional status had a 1.4 and 2.5-fold increase in rehabilitation LOS [IRR 1.40 (95% CI 1.20–1.63) and IRR 2.50 (95% CI 2.17–2.88) respectively].

In a subset with functional status assessed at least 7 days prior to discharge and at discharge (N=234), we analyzed the improvement in functional status and rehabilitation LOS by adding an initial functional status covariate to the above regression. Patients with large and moderate improvements in functional status had 2.3 and 1.7 fold decrease in rehabilitation LOS [IRR 0.43 (95% CI 0.27–0.68) and IRR 0.60 (95% CI 0.45–0.79) respectively].

Conclusions: Lower functional status at hospital discharge in survivors of critical illness is associated with increased rehabilitation LOS.

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IDENTIFYING FACTORS ASSOCIATED WITH PEDIATRIC VENTILATOR-ASSOCIATED CONDITIONS IN SIX U.S. HOSPITALS

Noelle Cocoros, James Gray, Gregory Pribe, Latania Logan, Susan Coffin, Philip Tolzis, Gitte Larsen, Grace Lee

Learning Objectives: We recently proposed a surveillance definition for ventilator-associated conditions (VAC) among neonatal and pediatric patients, which was associated with increased morbidity and mortality among ventilated neonates and children. In this study, we identified potential risk factors for VACs. Methods: In a cohort of ventilated neonates and children, we identified potential risk factors for VACs. Further evaluation of processes of care associated with use of neuromuscular blockade, blood products, fluid management and peri- and intra-operative care may yield useful prevention strategies for VAC.

Results: The cohort of 6179 patients, 747 (12.1%) had alcohol abuse. Patients with alcohol abuse had a higher risk of delirium than patients without alcohol abuse, controlling for the age, gender, APACHE score and presence of sepsis (RR 1.31, CI 1.01 – 1.71). Among patients with alcohol abuse, those with a diagnosis of chronic liver disease were 3.02 times more likely to require withdrawal or limitation of care (p<0.001) and were 2.34 times more likely to be discharged to hospice (p<0.05) than those without liver disease.

Conclusions: Critical ill patients with alcohol abuse are at higher risk for delirium and multi-organ dysfunction syndrome. Among alcoholic patients, those with chronic liver disease are more likely to require withdrawal of care or discharge to hospice. These findings highlight the importance of alcohol abuse as a risk factor for poor outcomes in the critical care setting.

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OUTCOMES OF CRITICALLY ILL PATIENTS WITH ALCOHOL ABUSE: RESULTS FROM THE USCHITG-CIOLS

Nina Hirsch, Jonathan Sevransky, William Checkley, Greg Martin

Learning Objectives: Alcohol use disorder is a major cause of morbidity and mortality in the U.S., with a lifetime prevalence of about 29%. The effects of alcohol abuse in the critical care setting have not been well described. In this study, we explored the association between alcohol abuse and the risks of delirium and multi-organ dysfunction syndrome. We also investigated discharge outcomes in patients with alcohol abuse and chronic liver disease.

Methods: This is a secondary analysis of the Critical Illness and Outcomes Study (CIOS), a prospective cohort study of mixed ICUs in the US. Alcohol abuse was considered present if there was any indication in the medical record of “prior or current alcoholism, alcohol abuse, problem drinking, alcoholic cirrhosis or alcoholic liver disease.” Estimation of risks was achieved using generalized estimating equations to account for variability between sites.

Results: In a cohort of 6179 patients, 747 (12.1%) had alcohol abuse. Patients with alcohol abuse had a higher risk of delirium than patients without alcohol abuse, controlling for the age, gender, APACHE score and presence of sepsis (RR 1.31, CI 1.01 – 1.71). Among patients with alcohol abuse, those with a diagnosis of chronic liver disease were 3.02 times more likely to require withdrawal or limitation of care (p<0.001) and were 2.34 times more likely to be discharged to hospice (p<0.05) than those without liver disease.

Conclusions: Critical ill patients with alcohol abuse are at higher risk for delirium and multi-organ dysfunction syndrome. Among alcoholic patients, those with chronic liver disease are more likely to require withdrawal of care or discharge to hospice. These findings highlight the importance of alcohol abuse as a risk factor for poor outcomes in the critical care setting.

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PREPRICTING FACTORS ASSOCIATED WITH DELIRIUM: A CASE-CONTROL STUDY IN A UK INTENSIVE CARE UNIT

Ruth Wan, Luigi Camporota, Catherine McKenzie, David Taylor

Learning Objectives: Delirium is a common outcome of critical illness. Numerous risk factors have been studied but few data in the UK critically ill population exist. This study was conducted to determine risk factors associated with delirium.

Methods: Matched, case-control study of patients admitted to the mixed ICU at St Thomas’ hospital, London (Jan 2014 to Dec 2014). Cases were patients given an antipsychotic for delirium. Incidence density sampling was used to select one control per case randomly, matched to cases by gender and APACHE II scores. Demographics, baseline characteristics, and length of stay were abstracted from medical records. Investigated precipitating factors included ventilation status, sedatives, opiates, and steroids – details were abstracted for cases 72 hr before antipsychotic initiation and consecutive 72 hour periods from ICU admission to ICU discharge, death or maximum of 28 days for controls. Generalized linear mixed model was used to account for correlation between repeated measures within each control. Multivariable regression analysis was performed adjusting for precipitating factors and matching covariates to determine the association with presence of delirium.

Results: 142 cases and 142 controls were included. Mean APACHE II score was 18, and mean age 60 yr. More patients were admitted intubated in the delirium group (80% vs 68%, p=0.02). The ICU length of stay was significantly longer (p=0.001) with delirium cases 14.5 days (IQR 8–26) vs 8 days (IQR 5–14). Multivariable regression models showed lorazepam (OR 8.58; 95%CI 3.76–19.56) and clonidine (OR 6.27; 95%CI 2.27–17.34) increased risk of delirium. The odds were lower for Hydrocortisone (OR 0.44; 95%CI 0.19–0.98). Neither use of propofol (OR 1.14; 95%CI 0.42–3.15), nor
ICU length of stay was 5.3 ± 8.6, 5.2 ± 8.2, 5.4 ± 8.7, and 5.4 ± 8.6 days in winter, and fall, respectively (p = 0.08). The adjusted 30-day mortality OR were 1.00 for winter, 1.01 for spring, 1.01 for summer, and 1.03 for fall, respectively (p = 0.10). Conclusions: Both 30-day mortality and ICU length-of-stay were unchanged across a cohort of all ICUs at two large academic institutions. There may be no benefit to re-allocation of ICU resources depending on the season of the year, but further studies are needed to see if there are specific disease processes that require additional resources during certain seasons.
Odds of Hospital Admission, 1.21 (1.10, 1.32), Odds of ICU Admission, 1.37 (1.20, 1.57) and spring [2010–13 vs. 2007–09]. Odds of Hospital Admission, 1.79 (1.60, 2.00), Odds of ICU Admission, 1.20 (0.99, 1.44)) regions. Regionally, in recent yr odds of RSV-associated hospital and ICU admissions have increased in South [2010–13 vs. 2007–09, Odds of Hospital Admission, 1.31 (1.17, 1.47], Odds of ICU Admission, 1.38 (1.12, 1.69)] and West [2010–13 vs. 2007–09, Odds of Hospital Admission, 1.53 (1.17, 1.51), Odds of ICU Admission, 1.46 (1.05, 2.03)] regions. Conclusions: In this multicenter observational study, wide variation in regional and seasonal patterns in hospital and ICU admissions were noted in children with RSV-associated LRTI across the United States.

309 SURVEY OF SEDATION AND ANALGESIA PRACTICE AMONG CANADIAN PEDIATRIC CRITICAL CARE PHYSICIANS

Gonzalo Garcia Guerra, Hsing Jou, Cathy Sheppard, Sunita Vohra, Ari Joffe, Dominic Cave, Jonathan Duff, Lisa Hardling

Learning Objectives: Almost all critically ill children experience some pain/ anxiety, yet there is a lack of high-quality studies providing evidence for the best approach to sedation in Pediatric Intensive Care Units (PICUs). Hence, we conducted a survey to determine sedation practice among Canadian pediatric intensivists. Methods: A literature review and focus group meetings were conducted to identify items for the survey. The survey was pre-tested, and validated using published recommendations. The final survey was distributed by email to all 134 intensivists from the 17 PICUs across Canada using the Research Electronic Data Capture system. Results: Overall response rate was 73% (98/134). The most commonly used sedation scores are FLACC (42%) and COMFORT (41%). Withdrawal scores are commonly used (65%). Delirium scores are used by 16% of the responders, and 36% have sedation protocols that are routinely used. Daily interruption of sedation is not being practiced. Most patients’ rooms have access to natural light; however, only 22% of the responders have a protocol to promote day/night cycles. The majority (66%) are not using noise reduction methods. When physicians were asked about comfort measures used in intubated patients, music, swaddling, soother, TV and sucrose solutions were among the more frequently used. The drugs more commonly used to provide analgesia are morphine and fentanyl infusion, with acetaminophen and ibuprofen being frequently used as adjunct intermittent (PRNs) drugs. To provide sedation, intensivists reported midazolam and morphine as the infusions more commonly used, with chloral hydrate and clonidine as adjunct PRNs. Conclusions: The use of sedation and withdrawal scores is common while delirium scores, sedation protocols and interrupted sedation are rarely used. Similarly, noise reduction and sleep promotion are not being frequently practiced. Morphine, fentanyl and midazolam are infusions commonly used for analgesia and sedation in mechanically ventilated children. More research is needed to identify the best strategy to provide comfort in PICU.

310 BENCHMARKING ICU UTILIZATION AMONG HOSPITALIZATIONS WITH DIABETIC KETOACIDOSIS

Lavi Oud

Learning Objectives: Diabetic ketoacidosis (DKA) is currently considered a low-risk condition, with markedly variable rates of ICU admission. While the overall incidence of DKA hospitalizations among diabetic patients has been decreasing, no longitudinal population-level data on ICU utilization has been reported in this population in the United States. Methods: We used the Texas Inpatient Public Use Data File to identify hospitalizations aged ≥18 yr and those with a principal diagnosis of DKA for the yr 2004–2013, using ICD-9-CM code 250.1X. Hospitalizations with ICU admission were identified by presence of unit-specific charges. Reports by the Center for Disease Control were used to obtain the annual prevalence of diabetes among adults in the state. We examined trends of rates of ICU admission among DKA hospitalizations, and benchmarked the incidence of DKA ICU admissions against all ICU admissions and state’s population with diabetes. Descriptive statistics, regression analyses, and chi-square tests were used. Results: There were 95,924 DKA hospitalizations, with 74,770 (77.9%) ICU admissions during study period. The following changes were noted between 2004 and 2013: the rate of ICU admission among DKA hospitalizations rose by 8.1% (1.4%/yr; p = 0.0004); the incidence of DKA ICU admissions increased from 9.5 to 14.8 per 1000 ICU admissions (5%/yr; p=0.0001) and from 453 to 455 per 100,000 population with diabetes (0.9%/yr; p=0.4288). Conclusions: The present study is the largest ICU-focused DKA cohort reported to date. Rates of ICU admission among adult DKA hospitalizations rose slowly, being markedly higher than previously reported. The incidence of ICU admission rose faster than overall ICU utilization. However, the incidence of DKA ICU utilization remained stable among the growing diabetic population in the state, contrary to the reported progressive decline in the incidence of all DKA hospitalizations in this population. Further studies in other populations are warranted to corroborate our findings and examine the sources of the observed trends.

311 FUNCTION AFTER PEDIATRIC CRITICAL ILLNESS: RESULTS FROM THE SURVIVOR OUTCOMES STUDY (SOS)

Peter Ladner, Elizabeth Rhinesmith, Neethi Pinto

Learning Objectives: Information on long-term clinical and functional outcomes of patients who are discharged after hospitalization in the PICU is sparse. We examined functional outcomes 6 mo and 3 yr after PICU discharge in order to characterize the experiences of survivors of critical illness. Methods: We recruited a cohort of patients admitted to our urban, inner city, academic PICU over a period of 13 weeks. We then collected functional status assessments at 6 mo and 3 yr based on the Functional Status Scale (FSS), a validated measure, via telephone surveys of the parent/guardian. Results: 303 patients were admitted to the University of Chicago Comer Children's Hospital PICU from June to August 2012, 253 of whom were eligible for participation. Of those surviving to discharge, 130 patients consented to long-term follow-up. We obtained 6-mo follow-up and 365-day outcomes for 76 patients (58.4%) and for 40 patients (30.7%) at 3 yr. Mortality was low (4.6%) at 6 mo and remained low (6.1%) at 3 yr. Patients exhibited mild dysfunction at both 6 mo and 3 yr (mean FSS, 7.69±2.53; 7.97±2.62). FSS did not change over time (Δ 0.28, p=0.13). At 3 yr, 31.3% of survivors had moderate dysfunction in at least one domain of the FSS and 37.5% had moderate to severe dysfunction on more than one domain. Conclusions: Despite low impairment as measured by overall functional status scores, a high proportion of PICU survivors continue to have impaired function in one or more functional domains. Functional status does not appear to improve between 6 mo and 3 yr after discharge in the SOS. Improved understanding of the factors affecting the well-being of these children could allow significant gains via interventions such as therapeutic and medical services, improved access or utilization of these services, or better social support of families and survivors. Further study of survivors will provide healthcare providers with a more robust clinical picture of the unique issues faced by this high-risk population.
patients were white, 6.1% were black, 4.1% were Hispanic, 2.3% were Asian, 0.8% were classified as other for race, and the race for 5.8% was unknown. 30-day mortality was 11.1%, 12.4%, 8.7%, 9.3%, 9.0%, and 19.7% (p <0.001), while 365-day mortality was 25.4%, 24.9%, 16.5%, 23.1%, 18.8%, and 32.8% (p <0.001) in white, black, Hispanic, Asian, other, and unknown respectively. The adjusted 30-day mortality ORs were 0.89 (95% CI 0.79–0.99), 0.75 (95% CI 0.64–0.87), 0.73 (95% CI 0.60–0.88), 0.78 (95% CI 0.56–1.11), and 1.97 (95% CI 1.79–2.16) for black, Hispanic, Asian, other, and unknown respectively using white as the reference group. The adjusted 365-day mortality ORs were 0.72 (95% CI 0.66–0.79), 0.54 (95% CI 0.48–0.61), 0.76 (95% CI 0.66–0.88), 0.66 (95% CI 0.51–0.85) and 1.50 (95% CI 1.38–1.63) for black, Hispanic, Asian, other, and unknown respectively using white as the reference group. Conclusions: This is the largest epide-
miologic multi-center retrospective study to date investigating ICU mortality. We conclude that there race does not affect 30-day or 365-day mortality even adjusting for age, gender, type of ICU and comorbidities.

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ETIOLOGIES OF PEDIATRIC VENTILATOR-ASSOCIATED CONDITIONS—THE NEED FOR A BROAD VAC PREVENTION BUNDLE

Gregory Priebe, Gitte Larsen, Latania Logan, Susan Coffin, James Gray, Philip Tolzis, Susan Hocevar, Grace Lee

Learning Objectives: Ventilator-associated conditions (VAC) in adults include diverse etiologies such as pneumonia, ARDS, pulmonary edema and atelectasis. A corollary pediatric VAC definition based on sustained increases in mean airway pressure (MAP) of ≥4 cm H2O or FIO2 of ≥25% is associated with significantly higher risk for mortality, length of hospitalization and duration of ventilation. We describe etiologies of pediatric VAC for cardiac (CICU), neonatal (NICU) or pediatric (PICU) ICU settings. Methods: Using electronic data, we identified children with pediatric VAC in a retrospective cohort (N=9,025) of mechanically ventilated children ≤18 yr of age in 6 U.S. hospitals. Clinicians at each hospital reviewed medical records and adjudicated cases to identify potential etiologies of VAC occurring within 2 calendar days of onset. Results: Among 197 confirmed cases, 98% had at least 1 potential cause identified; multiple etiologies were observed in 73%. In CICU patients (N=46), potential causes included pulmonary edema (48%), recent surgical procedures (35%), atelectasis (24%), sepsis/systemic inflammatory response syndrome (SIRS)/shock (15%). In NICUs (N=66), potential contributors included respiratory distress syndrome (45%), sepsis/SIRS/shock (21%), chronic lung disease (21%), pulmonary hypertension (20%), recent surgical procedures (18%), pulmonary edema (17%), and reopening of a patent ductus arteriosus (14%). In PICUs (N=85), pulmonary edema (36%), atelectasis (34%), pneumonia (33%), acute respiratory distress syndrome (25%), sepsis/SIRS/shock (18%), pulmonary hemorrhage (16%), and recent surgical procedures (14%) were identified as potential causes of pediatric VAC. Conclusions: Although the attributable burden of etiologies of VAC differ by ICU type, non-infectious etiologies such as pulmonary edema and atelectasis are common. To prevent ventilator-associated pneumonia may need to be augmented to incorporate care processes relevant to fluid and ventilator management, particularly around the time of procedures.

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PHYSIOLOGICAL SIGNATURES OF SUBACUTE, POTENTIALLY CATASTROPHIC ILLNESSES IN THE INTENSIVE CARE UNIT

Trevor Moss, Douglas Lake, Richard Kronfol, Nathaniel Ivanick, Karen Fairchild, Kyle Enfeld, James Calland, J. Randall Moorman

Learning Objectives: Patients in ICUs are susceptible to subacute, potentially catastrophic illnesses such as sepsis, hemorrhage, and respiratory failure. Early detection should improve outcomes, but even subtle clinical signs may only manifest late in the course. These signs—signature patterns in the dynamics of heart rate, respiratory rate, blood pressure, and oxygen saturation—may be present much earlier, but at amplitudes below the threshold of clinical detection. We hypothesized that predictive analytics might allow us to identify such signatures using large-scale time series analyses. Methods: We analyzed 144.2 patient-year of physiological monitoring time series from 9,199 consecutive admissions to neonatal, medical, and surgical ICUs at our tertiary care academic hospital (601 infants and 8,598 adults). We performed multivariable statistical analyses of mathematical time series measures from linear and non-linear domains. Results: Clinicians identified 1,248 episodes of hemorrhage, respiratory failure, or severe sepsis from standardized review of individual charts. The incidence rates ranged from 5.2 to 25 per 100 admissions. In adults, the impact of adverse events increased the ICU length of stay by a median of 2.4 to 14.0 days and increased in-hospital mortality by 2.4 to 4.2 fold over patients who did not suffer such events. Multivariate models using physiologic monitoring parameters and ECG-derived calculations to predict illnesses up to 24 hr before clinical detection and intervention had bootstrap-validated C-statistics of 0.61 to 0.78. Physiologic signatures of neonatal illnesses were concordant amongst themselves but discordant with adult illnesses. Signatures of hemorrhage and respiratory failure leading to unplanned intubations were distinct and were concordant across adult ICUs. Sepsis in the adult ICUs, however, had discordant physiologic signatures. Conclusions: We conclude that subacute, potentially catastrophic illnesses have physiologic signatures that are detectable in the hr preceding clinical detection and intervention.

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PAINFUL PROCEDURES AND THE DEVELOPMENT OF POSTTRAUMATIC STRESS IN THE PEDIATRIC INTENSIVE CARE UNIT

Lara Nelson, Kelsey Goodman, JohnDavid Barton, Jeffrey Gold

Learning Objectives: Studies demonstrate an increased risk of posttraumatic stress disorder (PTSD) in children after PICU admission. Studies in other populations have shown an association between pain and development of PTSD, but this has not been done yet in the PICU. We hypothesize chil-
dren admitted to the PICU who undergo more painful procedures (PP) will have more posttraumatic stress during and after their admission. Methods: This was a prospective, longitudinal, observational study of children follow-
ing admission to a large, urban PICU. Children admitted to the PICU who were English- or Spanish-speaking, aged 8–17 yr-old, and with an anticipated admission of > 36 hr were enrolled. Exclusion criteria included developmental delay, severe psychiatric disorder, intentional injury, traumatic brain injury, or inability to complete study measures. Data collection included chart review of PP during PICU admission and evaluation of posttraumatic stress with self-report measures: Acute Stress Checklist for Children (ASC-Kids; at admission and 1-month follow-up) and UCLA Reaction Index (UCLA RI; at 3-month follow-up). Results: A total of 46 children were enrolled and completed baseline, 1- and 3-month follow-up (M=13 yr; 60% male). Children underwent a mean of 9 (range 0–35) PP during their PICU admission, most on day 1. Excluding procedures for which sedation was most likely given, this changed to a mean of 6 (range 0–34) PP. Nearly all children had acute stress at baseline and 1-month follow-up (98% and 97%) and 50% had posttraumatic stress at 3-month follow-up. There was no correlation between the number of PP and development of posttraumatic stress. Conclusions: There is a high incidence of posttraumatic stress among PICU patients, yet there appears to be no correlation with the number of PP performed. This likely represents the complex model of development of posttraumatic stress in this population, including child and family factors and aspects of the PICU beyond just PP. Data collection continues to better define this model and develop appropriate interven-
tion strategies.

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CANCER PATIENTS REQUIRING MULTIPLE ADMISSIONS TO THE ICU: INCIDENCE, RISK FACTORS, AND OUTCOMES

Lama Nazar, Feras Hawai

Learning Objectives: Our previous work demonstrated that cancer patients who are admitted to the ICU have a significantly reduced survival, compared to patients who do not require ICU admission. In this study, we aimed to determine the impact of multiple ICU admissions on the outcomes of cancer patients and
to identify risk factors associated with multiple admissions. Methods: This was a case-control study of cancer patients admitted to the ICU between Jan 2009 and Dec 2013. The case group consisted of patients with more than one ICU admission during the study period, while the control group was patients with only one ICU admission. We determined the number of ICU admissions per patient and the time between those admissions. In addition, we recorded the patient characteristics and ICU mortality. We performed univariate analysis and logistic multivariate analysis to identify factors associated with multiple admissions. In addition, logistic regression analysis was performed to evaluate the association between multiple admissions and mortality and to determine the risk of mortality associated with each admission. Results: Over the study period, 24,394 patients were admitted to the ICU and among these 6,200 (25%) patients had more than one admission, with an average of 2 admissions per patient, after a median of 31 days from their initial ICU admission. The most common readmission diagnosis were sepsis (25%), and respiratory distress (24.5%). Hematologic malignancy (OR 1.71; CI 1.39–2.1) and having received cancer-related therapies (OR 1.79; CI 1.28–2.51) were associated with multiple ICU admissions. Multiple admissions were associated with increased ICU mortality (OR 1.42, 95%CI 1.2–1.7) and with each ICU admission, the OR of mortality increased by 1.194 (95%CI 1.07–1.33). Conclusions: About one-fourth of cancer patients admitted to the ICU required readmission to the ICU. Hematologic malignancy and having received cancer-related therapies were associated with multiple ICU admissions. Multiple ICU admissions were associated with increased mortality.

317 PREDICTORS OF ICU ADMISSION IN CANCER PATIENTS: A 5-YEAR REGISTRY-BASED CASE-CONTROL STUDY
Lama Nazer, Dalia Rimawi, Khaled Jamal, Awad Addassi, Feras Hawari

Learning Objectives: Cancer patients are at risk for developing critical illnesses that necessitate admission to the ICU. However, there are no studies that have evaluated predictors of ICU admission in this patient population. The purpose of this study was to identify risk factors that may predict admission of cancer patients to an ICU of a comprehensive cancer center. Methods: This was a case-control study utilizing the hospital’s cancer registry. We identified adult patients who were treated at the hospital, both as inpatient and outpatient, between Jan 2009 and Dec 2013. The cancer registry includes the demographics and characteristics of patients upon their initial presentation to the hospital, the smoking status, the type and stage of malignancy, and the type of cancer-related therapies received. The case group consisted of patients who required ICU admission during the study period, while the control consisted of patients who did not require ICU admission. Univariate and multivariate analysis were performed to identify factors associated with ICU admission and survival curves were utilized to compare the mortality of the case and control groups. Results: The registry included 10,792 patients, and among those, 2439 (22.6%) patients required ICU admission after a median of 10.1 mo (IQR 5.28–25.2) from the initial diagnosis. Factors associated with ICU admission included: hematologic malignancy (OR 1.51, CI 1.26–1.81), chemotherapy (OR 1.74, CI 1.48–2.03), advanced cancer (OR 2.57, CI 1.44–4.6), and a history of smoking (OR 1.38, CI 1.20–1.61). The ICU mortality was 36.5%. The 1-year and 5-year survival rates for patients admitted to the ICU were 22.8% and 14.2%, respectively, which were significantly lower than the mortality rate for the control group for all stages of cancer. Conclusions: In a comprehensive cancer center, about one-fourth of the patients required ICU admission. Addressing potentially modifiable risk factors for ICU admission in cancer patients, such as smoking and chemotherapy complications, may help preempt such admissions, and potentially improve outcomes.

318 PATTERNS OF HOSPITAL DISPOSITION AMONG PATIENTS WITH DIABETIC KETOACIDOSIS ADMITTED TO ICU
Lavi Oud

Learning Objectives: Diabetic ketoacidosis (DKA) is generally considered a low-risk condition, though commonly managed in the ICU. There are no contemporary longitudinal population-level, age-stratified data on hospital outcomes of DKA hospitalizations admitted to ICU (DKA-ICU). Methods: We used the Texas Inpatient Public Use Data File to identify hospitalizations aged ≥18 yr with a principal diagnosis of DKA for the yr 2004–2013, using ICD-9-CM code 250.1X. Hospitalizations with ICU admission were identified by presence of unit-specific charges. We examined changes in rates of end-of-life hospitalizations (EOL) [hospital mortality or discharge to hospice] and discharge to long-term care facilities among elderly (≥65 yr) and non-elderly DKA-ICU. Descriptive statistics and chi-square tests were used. Results: There were 74,770 DKA hospitalizations admitted to ICU admissions during study period. The volume of elderly DKA-ICU rose 134% over the past decade, increasing from 5.5% to 7.1% of all DKA-ICU (p<0.0001). The following data describes changes observed between 2004–2005 and 2012–2013. EOL events: all DKA-ICU 0.9% vs. 0.7% (p = 0.0279); ≥65 yr 0.5% vs. 0.4% (p = 0.0760); ≥65 yr 7% vs. 4.3% (p = 0.0155). Discharge to a long-term care facility: all DKA-ICU 2.9% vs. 3.2% (p = 0.1048); ≥65 yr 1.8% vs. 1.9% (p = 0.6793); ≥65 yr 21.4% vs. 21.3% (p = 0.8614). Conclusions: The present study is the largest ICU-focused DKA cohort reported to date. DKA-ICU remain overall a low-risk condition. However, although a minority of DKA-ICU, the volume of elderly hospitalizations is progressively rising. A principal diagnosis of DKA continues to carry a substantial risk of adverse outcome among elderly DKA-ICU. Although the rate of EOL events has decreased across examined age groups, it remained 11-fold higher among the elderly. One in 5 elderly DKA-ICU required subsequent transfer to a long-term care facility. Further studies are warranted to examine the sources of these findings and means to limit development and improve outcomes of DKA among the elderly.

319 REFRACTORY HYPOXEMIA IN ACUTE RESPIRATORY DISTRESS SYNDROME: SYSTEMATIC REVIEW OF DIAGNOSTIC CRITERIA
Abhijit Duggal, Daych Chongnarungsin, Anh Nguyen, Eduardo Mireles-Cabodevilla

Learning Objectives: Refractory hypoxemia is often used interchangeably with severe hypoxemia to describe the severity of respiratory failure. In clinical trials, the incidence of refractory hypoxemia and its clinical outcomes judge the severity of illness in a population as well as the efficacy of interventions. Because there is no standardized definition for refractory hypoxemia, we hypothesized that the diagnostic criteria used in clinical trials will affect the reported outcomes and associated therapies. To evaluate this, we performed a systematic review of published literature to evaluate the diagnostic criteria used to define refractory hypoxemia. Methods: Systematic review of studies describing refractory hypoxemia in patients with ARDS form MEDLINE, EMBASE, CENTRAL, and manual review of the table of content for 12 high impact journals from 2004 till 2014. Results: We evaluated 304 full text articles describing outcomes in ARDS. 60 (21%) of the studies described patients with severe ARDS. 56 (19%) studies mentioned refractory hypoxemia. Of this, 27 (9%) studies defined refractory Hypoxemia with specific variables (one or a combination of the following). The variables used as criteria for refractory hypoxemia where PaO2/FO2 (Range 55–100) in 25 studies, PEEP (Median PEEP >15 cmH2O) in 11 studies, duration of hypoxemia (Range 1–24 hr) in 5 studies, plateau pressure >30 cmH2O in 3 studies, Oxygenation Index of > 30 in 4 studies and the use of adjunctive rescue therapies (neuromuscular blockade, inhaled vasodilators, recruitment maneuvers) in 3 studies. Incidence of refractory hypoxemia was variable and ranged from 2–15%, it was based on the number of variables used in the definition. Conclusions: Definition of refractory hypoxemia is clinically heterogeneous. This causes significant differences in the reported outcomes and use of rescue therapies with this diagnosis. A standardized definition utilizing strict inclusion criteria can provide us with valuable information regarding the attributable mortality associated with this condition and also the use of rescue/ salvage therapies in the sickest ARDS patients.

320 LOCAL CULTURE IS A CRITICAL FACTOR IN ADOPTION OF EVIDENCED BASED MEDICINE
Xinggang Liu, Omar Badawi, Erkan Hassan, Xi Gao

Learning Objectives: Substantial evidence suggests adoption of evidence based medicine is suboptimal. NICE-SUGAR (2009) suggested relaxing avg daily glucose for the NICE-SUGAR study varied between physician specialties and local cultures. The use of rescue/ salvage therapies in the sickest ARDS patients.

320 LOCAL CULTURE IS A CRITICAL FACTOR IN ADOPTION OF EVIDENCED BASED MEDICINE
Xinggang Liu, Omar Badawi, Erkan Hassan, Xi Gao

Learning Objectives: Substantial evidence suggests adoption of evidence based medicine is suboptimal. NICE-SUGAR (2009) suggested relaxing avg daily glucose from <=110 to <=180 mg/dl. We hypothesize the change in practice following the NICE-SUGAR study varied between physician specialties and local cultures.
POST-INTENSIVE CARE SYNDROME, RESILIENCE, AND HEALTH-RELATED QUALITY OF LIFE IN ICU SURVIVORS

Jason Maley, Isabel Brewster, Iris Mayoral, Renata Siruckova, Sarah Adams, Angie Piech, Kelley McGraw, Mark Mikkelsen

Learning Objectives: Post-Intensive Care Syndrome (PICS), defined as impairment in neuropsychological and/or physical function after critical illness, appears to be common, yet fundamental questions remain unanswered about PICS and the experience of survivors. We sought to determine the frequency of PICS among survivors, the degree to which function in these domains was viewed as worse by survivors, and to examine the relationship between neuropsychological and physical function, the modifiable trait of resilience, and quality of life. Methods: We enrolled medical critical care survivors from two hospitals in an academic health system. We used a telephone-based battery of standardized instruments to assess survivors in the aforementioned domains and an original questionnaire to identify challenges encountered in the ICU and during transitions of care. Results: We interviewed 43 survivors 6–9 mo post-discharge. Impairment was identified in one or more PICS domains in 36 survivors (83.7%, 95% confidence interval (CI): 69.3, 93.2%), whereas 23 survivors (53.5%, 95% CI: 37.6, 68.8%) reported worsening of neuropsychological or physical function post-critical illness. After critical illness, 42% of survivors reported physical function was worse, 46% and 50% of survivors reported memory or executive function were worse, and 28% reported that mental health was worse. Resilience was abnormal low in 28% of survivors, as was quality of life (median Euroqol VAS=70). Resilience was correlated with anxiety, depression, PTSD symptoms, difficulty with self-care, and pain (p<0.05). Qualitative analysis of interviews revealed difficulties with cognition, weakness and fear were the most frequent challenges faced in the ICU. Functional dependence, weakness, and fatigue were frequent challenges faced upon transition to the general medical ward and home. Conclusions: More than 80% of survivors of medical critical illness reported PICS symptoms and more than 50% reported function was worse after critical illness. Resilience was abnormally low among survivors and correlated with mental health, pain, and aspects of quality of life.

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EPIDEMIOLOGICAL PROFILE OF SNAKE BITES IN A PEDIATRIC INTENSIVE CARE UNIT OF EASTERN NEPAL

Satish Shah, Suraj Bhattacharia, Manoj Chaudhary, Deepak Moktan, Jeetendra Sah

Learning Objectives: Snake envenomation has been recently included in the list of neglected tropical diseases by the World Health Organization. According to a new analysis, it could be the most neglected of all tropical diseases in the 21st century. Nepal has been recognized as an endemic country for snakebite which is prevalent mainly in the Southern lowlands. Snake bite envenomation if managed appropriately in intensive care setting can lead to good outcome. The present study describes the epidemiological and clinical profile of all children admitted to Pediatric Intensive Care Unit (PICU) of a tertiary care center of eastern Nepal. It also describes the factors associated with mortality. Methods: A retrospective record review of all the children admitted to PICU with snakebite envenomation from Jan 2007 to Dec 2014. Demographic, clinical and laboratory data were reviewed. Factors affecting the mortality were analyzed by appropriate statistical test. Children were managed as per WHO guidelines using polyvalent Anti Snake Venom (ASV) (2005).

Results: 95 cases were admitted to PICU in last 8 yr. 60% were male and median age was 9 yr. 95% of cases had neurotoxic signs of which proxi (65%), slurred speech (36%), respiratory symptoms (36%) were the common presentations. Hemorotic envenomation was seen in 5% cases. 25% of bites were due to Bungarus caeruleus, 15% du 34% of cases required mechanical ventilatory support at admission and median duration of ventilatory support was 23(10–43) hr. Mean duration of PICU stay and total hospital stay was 3.5 ± 2.5 and 4 ± 2.5 respectively. Mean number ASV vials used was 39 ± 25. 49% showed some kind of hypersensitivity reaction due to ASV. 12 cases (12.6%) died. On univariate analysis prehospital respiratory symptoms [Unadjusted OR=95%CI= 4.1 (1.2–14.90);] bite to ASV administration duration >4 hr [unadj.OR=95%CI= 5.8 (1.5–22.4)] and ph at admission<=7.2 [unadj. OR=95%CI=17.1 (4.0–75.3)] were associated with mortality. Conclusions: Neurotoxic envenomation has good prognosis when managed in PICU. Respiratory symptoms, delay in ASV initiation and low pH leads to poor outcomes.

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INJURIES DUE TO LEGAL INTERVENTIONS IN UNITED STATES: ARE THERE RACIAL VARIATIONS IN OUTCOMES?

Veerajandhar Allareedy, Natalia Martinez-Schlurmann, Seankrith Rampa, Nalliah Romesh, Karen Lidsky, Veerasalputthuss Allareedy, Alexandro Rotta

Learning Objectives: Violence and ensuing injury are a major cause of morbidity and mortality in USA. Injuries due to legal intervention (ILI) injuries sustained during contact with law enforcement and its impact on health care are unclear. The effect of race on outcomes in IILI is unknown. We sought to examine the effects of race on outcomes (in-hospital mortality-IHM, hospital charges-HC, and length of stay-LOS) in patients who were hospitalized due to IILI Methods: Nationwide Inpatient Sample for the yr 2004 to 2010 was used. All patients who were hospitalized due to IILI were selected. Amongst this cohort, the demographic characteristics were examined. The effects of race on IHM, HC(adjusted to year 2010 $ value), and LOS were examined by multivariable logistic & linear regression models. The confounding effects of age, sex, & geographic region were adjusted. The study was IRB approved. Results: A total of 17,481 patients were hospitalized due to IILI. The mean age of this cohort was 37 yr. Males comprised 89%. Racial distribution included Whites (46%), Blacks (28.9%), Hispanics (18.8%), Asians/Pacific Islanders(A/PI) (1.6%), Native Americans(NA) (0.8%), and Other races (3.8%). A total of 380 patients died in hospitals. The IHM rates according to race were: Whites (1.5%), Blacks (2.2%), Hispanics (2.8%), and A/PI (5.9%). The HC and LOS were: Whites ($51,009 & 6.6 days), Blacks ($49,491 & 6.8 days), Hispanics ($56,357 & 6.6 days), A/PI ($66,321 & 7.6 days), and NA ($56,497 & 7.6 days). After adjusting for the confounding effects of age, sex, and geographic region, A/PI were associated with higher odds for IHM(OR=3.86, 95%CI=1.03–14.66, p=0.04) when compared to Whites. Hispanics were associated with significantly higher HC (Estimate=0.13, 95%CI= 0.009–0.2526; p=0.03) when compared to Whites. Race was not significantly associated with LOS. Conclusions: IILI are an important cause of hospitalization in USA and are associated with considerable hospital resource utilization. Asians/Pacific Islanders are at higher odds of mortality following IILI compared to their counterparts. Males accounted for the majority of the admissions.
Learning Objectives: The care of all critically ill children should be informed by evidence from high-quality RCTs. Unfortunately such evidence is not always available. The number of RCTs conducted is limited; they are generally small and difficult to complete. The objective of this survey was to identify the self-reported barriers and facilitators of conducting high-quality RCTs in pediatric critical care.

Methods: We surveyed 2 authors from each of the published pediatric critical care RCTs. Respondents rated barriers and facilitators on a 7-point scale with corresponding to “a very large barrier” or a “very effective facilitator”. 1 corresponding to “not a barrier at all” or “not an effective facilitator” and 7 being availability and coordination from different countries, and funding available for pediatric critical care research, the coordination required for multinational RCTs, funding availability and coordination from different countries, and funding available for pediatric research. The 5 most effective facilitators were: ability to recruit participants 24 hr per day, 7 days per week, conducting RCTs in collaboration with a research network, funding from government agencies specifically for RCTs in critically ill children, and academic department support for conducting RCTs. Respondent experience and country income level were strongly associated with importance ratings (14 of 41 barriers). There were fewer differences for facilitators. Conclusions: Lack of funding and time are major barriers to conducting rigorous pediatric critical care RCTs. In addition to increased funding, respondents identified other strategies within the sphere of influence of the research community, in particular research networks, to facilitate the conduct of the rigorous RCTs needed in this population.

326 BASIC ICU CAPACITY IN THE PROVINCE OF ZAMBEZIA IN MOZAMBIQUE
Amina Merchant, Lazaro Calvo, Malena Outhay, Mohsin Sidat, Camila Lyon, KA Kelly McQueen

Learning Objectives: Mozambique is located in southeast Africa with a population of 25 million and life expectancy of 50.3 yr. The country recently suffered from a prolonged three-decade civil war that significantly affected health infrastructure. Health care capacity is further decreased in rural settings compared to urban settings. We surveyed the basic ICU capacity of the province of Zambezia in Mozambique. Methods: Hospitals throughout the province of Zambezia in Mozambique were surveyed for basic ICU capacity and airway and cardiovascular supplies in 2013. ICUs were surveyed if available, otherwise acute care capacity in PACU or the hospital were evaluated. Surveyed sites included Quelimane, Chinde, Alto Maloque, Morrumbala, Mocuba, Gile, and Mopeia. Results: All hospitals had emergency room beds, 5 hospitals have operating rooms and ability to perform basic surgery, 2 hospitals had difficult access to transferring patients to higher level of care due to roads and transportation. 3/7 hospitals had ICU beds, none with ventilators. Only 3/7 hospitals had BP cuffs available, with only Quelimane having electrocardiogram ability. Pulse oximetry was not available, and oxygen was only available in Quelimane and Mocuba. One in 7 hospitals had an isolation room. The WHO essential medicines epinephrine and atropine were only available in Quelimane. While there is consistent lack of resources, there is capacity for vigilance by medical personnel through monitored care and patient evaluation. Since basic WHO recommended prerequisites are not available, there is not enough capacity for ICUs at the time of this survey. Conclusions: Understanding current basic ICU capacity in the province of Zambezia may help with developing projects to increase intensive care capacity. More attention to ICU needs is necessary that aligns with WHO recommendations.

327 SEASONAL VARIATION OF INFECTIONS WITHIN THE ICU AMONG THE TRAUMA POPULATION: A STATEWIDE ANALYSIS
Jason Clark, Jason Farrah, Alejandro Garcia, Joshua Hagan, Darwin Ang

Learning Objectives: Infections within the ICU are a persistent problem among the critically ill. For the chronically critically ill, pneumonia may be an inevitable outcome in the ICU. Pneumonia, particularly viral pneumonia, has been established as having a season variations within the general population. We examine whether or not this is also true in the ICU. Methods: This is a population based retrospective analysis among all patients admitted to the ICU within the state of Florida between 1997 to 2014. Patients who were admitted for trauma and who had pneumonia were identified through ICD-9 codes. A multivariate regression analysis was performed to adjust for confounders such as age, gender, injury severity, race, and payer type. Time periods were stratified by seasons: summer, winter, spring and fall. Pneumonia infections were further stratified into infectious types (bacterial versus viral). Results: A total of 657,747 trauma patients were identified. The majority of the patients were male (58%) and of white ethnicity (83%). The most common viral infection was influenza with SARS being the least prominent. The most common bacterial pneumonia was pneumococcal with aeroebes being the least. When stratified by season, pneumonia types were found to have a seasonal variation. Compared to summer, winter was found to have a statistically higher incidence of pneumonia overall (aOR 1.04, 95% CI 1.04, 1.13). This was not seen in spring (aOR 1.02, 95% CI 0.98, 1.06) or fall (aOR 0.99, 95% CI 0.95,1.04). When stratified by either bacterial or viral infections, viral infections were more pronounced (aOR 3.59, 95% CI 2.79, 4.61) while bacterial still showed increased incidence in winter (AOR 1.05, 95% CI 1.00, 1.09). Conclusions: Pneumonia are seen more frequently within the ICU during the winter, regardless of infection type. This may have implications for prophylaxis against certain infections among the critically ill.

328 DOES PRE-HOSPITAL FUNCTIONAL IMPAIRMENT PREDICT SHORT-TERM OUTCOMES IN CRITICALLY ILL ADULTS?
Oriade Adeoye, Marianna Hurtado-Sbordoni, Shi-jun Jean Hsieh, Michelle Gong, Aluko Hope

Learning Objectives: Few studies have explored the role of pre-hospital functional status in short-term outcomes in critically ill patients. We aimed to describe the baseline functional status of critically ill patients and explore its relationship to short-term outcomes. Methods: Upon admission to the Intensive Care Unit (ICU), we asked patients (n=35) or their proxies (n=49) about pre-hospital Activities of Daily Living (ADL). 64% of patients (n=35) or their proxies (n=49) about pre-hospital Activities of Daily Living (ADL).

325 BARRIERS AND FACILITATORS OF HIGH-QUALITY RCTS IN PEDIATRIC CRITICAL CARE: A SURVEY OF TRIALISTS
Mark Duffett, Karen Choong, Jennifer Foster, Maureen Meade, Kurum Menon, Melissa Parker, Deborah Cook

Learning Objectives: Lack of funding and time are major barriers to conducting high-quality RCTs in pediatric critical care. Methods: We surveyed 2 authors from each of the published pediatric critical care RCTs. Respondents rated barriers and facilitators on a 7-point scale with corresponding to “a very large barrier” or a “very effective facilitator” and 7 corresponding to “not a barrier at all” or “not an effective facilitator”. Results: 116 researchers (31.6%) from 25 countries responded, including representation from 43 (48.6%) of the published RCTs in pediatric critical care. Respondents reported a median (Q1, Q3) of 21 (15, 26) yr of experience and 41 (36.6%) authored more than one RCT. The 5 most important barriers were primarily funding-related: funding available for large RCTs, funding available for pediatric critical care research, the coordination required for multinational RCTs, funding availability and coordination from different countries, and funding available for pediatric research. The 5 most effective facilitators were: ability to recruit participants 24 hr per day, 7 days per week, conducting RCTs in collaboration with a research network, funding from government agencies specifically for RCTs in critically ill children, and academic department support for conducting RCTs. Respondent experience and country income level were strongly associated with importance ratings (14 of 41 barriers). There were fewer differences for facilitators. Conclusions: Lack of funding and time are major barriers to conducting rigorous pediatric critical care RCTs. In addition to increased funding, respondents identified other strategies within the sphere of influence of the research community, in particular research networks, to facilitate the conduct of the rigorous RCTs needed in this population.

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Jason Clark, Jason Farrah, Alejandro Garcia, Joshua Hagan, Darwin Ang

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Oriade Adeoye, Marianna Hurtado-Sbordoni, Shi-jun Jean Hsieh, Michelle Gong, Aluko Hope

Learning Objectives: Few studies have explored the role of pre-hospital functional status in short-term outcomes in critically ill patients. We aimed to describe the baseline functional status of critically ill patients and explore its relationship to short-term outcomes. Methods: Upon admission to the Intensive Care Unit (ICU), we asked patients (n=35) or their proxies (n=49) about pre-hospital Activities of Daily Living (ADL). 64% of patients (n=35) or their proxies (n=49) about pre-hospital Activities of Daily Living (ADL).
Living (ADLs) and Instrumental Activities of Daily Living (IADLs) and followed patients until death or hospital discharge. **Results:** In our cohort of 84 patients (mean (standard deviation), SD) age 57.4 (18.0), 32 had at least one impairment in ADL, with a median (interquartile range IQR) of 3 (1.5–4.5). Of the 52 without impairment in ADLs, 10 reported ≥ 1 impairment in IADL; 42 were completely independent. Patients with functional impairment were older (mean age (SD) 63.3 (19.9) versus 57.5 (15.5) in those without impairment, p=0.003); more likely to be admitted from a nursing facility (30.9 % versus 0%, p=0.002) and had higher Co-morbidity Index (median (IQR) 3 (1–4) versus 1.5 (1–3), p=0.041). Patients with functional impairment did not appear to have significantly higher severity of illness on presentation to the ICU (mean APACHE II score (SD) 65.0 (23.4) versus 57.1 (20.7) in those without functional impairment, p=0.22). Of the 84 patients in the sample, 17 died in the hospital (20.5%) hospital mortality). Pre-hospital functional impairment was not significantly associated with hospital mortality (unadjusted Odds Ratio (95% Confidence Interval (CI) 1.52 (0.51–4.47, p=0.449) nor was it associated with discharge to a skilled facility in those who were admitted from home (n=71) (Odds ratio 1.43 (95% CI 0.55–3.70, p=0.47). **Conclusions:** In this sample of critically ill adults, pre-hospital functional impairment was prevalent but not significantly associated with hospital mortality or discharge location. Other approaches for identifying critically ill patients at high risk of short-term outcomes are needed.

**329 IMPACT OF VARIED CENTER VOLUME CATEGORIES ON MORTALITY IN CHILDREN RECEIVING ECMO FOR HEART DISEASE**

Michael Robertson, Mallikarjuna Rao Retiriganti, Paul Seib, Punkaj Gupta

**Learning Objectives:** Most of the literature evaluating volume-outcome relationship in children undergoing heart surgery is based on annual cardiopulmonary bypass (CPB) cases per center, while literature evaluating volume-outcome relationship in children receiving ECMO is based on annual ECMO cases per center. To date, there is no volume-outcome relationship in children receiving ECMO after heart surgery. It is unclear which variable should be used for volume categorization: annual CPB cases per center or annual ECMO cases per center? To address this knowledge gap, we undertook this study to evaluate the volume outcome relationship among children receiving ECMO for heart disease using a myriad of center volume categories. **Methods:** We performed a post hoc analysis of data from an existing national database, the Pediatric Health Information System (PHIS). Centers were classified into five different volume categories using different cut offs and different variables. Mortality rates were compared between the varied volume categories using a mixed effects logistic regression model after adjusting for patient- and center-level risk factors. Data collection included demographic information, baseline characteristics, pre-ECMO risk factors, operation details, patient diagnoses, and center data. **Results:** Overall, 3,502 patients from 42 hospitals qualified for inclusion. In unadjusted analysis, there was a significant relationship between center volume and mortality, with low and medium volume centers associated with higher mortality rates compared to high volume centers in all volume categories. In contrast, there was no significant association between center volume and mortality among all volume categories in adjusted analysis. **Conclusions:** Data from this large, multi-center national database establish that despite using different cut offs and different variables for volume categorization, the volume outcome relationship remained similar for the majority of the categorization schemes. This study requires replication for a different procedure from a different national database, if possible from a clinical database.

**330 ED VISITS DUE TO LEGAL INTERVENTIONS IN THE STATE OF CALIFORNIA: IMPACT OF RACE ON FIREARM USE**

Veeraajandhar Allareddy, Natalia Martinez-Schurmann, Sankeerth Rampa, Nalliah Romesh, Veerajalandhar Allareddy, Natalia Martinez-Schlurmann, Sankeerth Rampa, Veeraajandhar Allareddy, Natalia Martinez-Schlurmann, Sankeerth Rampa, Veeraajandhar Allareddy, Natalia Martinez-Schlurmann, Sankeerth Rampa

**Learning Objectives:** Is it unclear if the race of victim influences the type of Legal intervention (LI) used by legal personnel (LP). We sought to examine the profile and characteristics of hospital based emergency department visits(ED) attributed to LI by LP in the state of California and to assess the impact of victim’s race on types of LI. **Methods:** The California State ED Database for the yr(y) 2005 to 2011 was used. All ED visits due to LI were selected. The association between race and type of LI was examined by multivariable logistic regression analysis. The effects of age and sex were adjusted in the regression model. **Results:** A total of 69,349 ED visits were due to injuries by LP. Annual number of ED visits ranged from a low of 8645 visits in y2005 to a high of 10808 visits in y2009. The frequently reported types of LI included: by firearms(FA) (5% of all ED visits), explosives (<0.5%), gas (<1%), blunt object (6.1%), cutting/piercing instrument (5.7%), blow/manhandling (70.9%), and unspecified means (12%). Age groups of the patients included: ≤18y (9.9%), 18 to 45y (74.6%), 46 to 65y (14.6%), and ≥65y (0.8%).Males comprised 89.2%, Race included: Whites (39.8%), Blacks (17.7%), Hispanics (35.9%), Asians/Pacific Islanders/AIP(1.7%), Native Americans (0.3%), and other (4.5%).Insurance included: Medicare (3%), Medicaid (10.5%), Private(19.8%), and Other (29.1%), 37.6% were uninsured. 170 patients died in the ED. After adjustment for age and sex, Blacks were associated with a lower odds for experiencing a LI by FA (OR=0.87, 95% CI=0.78–0.98, p=0.02) compared to Whites. Hispanics (1.29, 1.19–1.40, p=0.001) and A/P were more likely to experience a LI by FA by FA (1.46, 1.13–1.87, p=0.003) when compared to Whites. Females were less likely to experience a LI by FA compared to males (0.58, 0.51–0.67, p=0.001). Those aged ≤18y (0.60, 0.52–0.69, p=0.001) and those aged 46 to 65y (0.83, 0.74–0.92, p=0.001) were less likely to have a LI by FA when compared to those aged 18 to 45y. **Conclusions:** Injuries due to LI by LP are a common cause of ED visit. There is an association between victim's race and firearm use by LP.

**331 EPIDEMIOLOGY AND OUTCOME OF VENTILATOR-ASSOCIATED PNEUMONIA IN A HETEROGENEOUS ICU POPULATION IN QATAR**

Husain Ali, Salib George, Fahmi Khan, Nissar Shaikh, Jameela Al-Ajmi

**Learning Objectives:** Despite advances in management strategies & infection control policies, ventilator-associated pneumonia (VAP) continues to complicate the clinical course of mechanically ventilated patients in ICU. In this study, our objective was to describe the epidemiology & outcome of VAP. **Methods:** This retrospective chart review evaluated all adult patients with VAP in medical (MICU), surgical (SICU) and trauma-ICU (TICU) between January 2010 and December 2012. Patients ventilated for ≥48 hr were clinically diagnosed with VAP if they had new & persistent chest infiltrates, signs of systemic infection (fever, altered WBC count) & purulent endotracheal aspirate. **Results:** 106 patients had been clinically diagnosed with VAP of which 52 were from TICU, 27 from SICU & 27 from MICU. Predominant age group was <60 yr (73.6%, N=78), 80.2% (N=85) were males. Majority patients were from Indian sub-continent (64.3%). Most common comorbidities were hypertension (34%, N=36), diabetes mellitus (28.3%, N=30) & cardiac disease (14.2%, N=15). 69 patients (65.1%) were admitted from emergency room. ICU admission diagnosis were polymyrauma 36.8%, neurologic disease 18.9%, respiratory failure 13.2%, head trauma & sepsis 11.3% each, abdominal disease 4.7% & cardiac disease 1.9%. Mean SOFA score on ICU admission was 6.46 ± 3.56 & mean duration of mechanical ventilation before developing VAP was 11.9 ± 9.5 days. 30-day mortality was 23.6% (N=25). Amongst patients who developed VAP, mortality rate was significantly higher in ≤60 yr age group (p=0.001), female gender (p=0.02), pre-existing hypertension (p=0.001), diabetes (p=0.012), respiratory disease (p=0.004), poor functional status (p=0.018); smokers (p=0.012), MICU admissions (p=0.001), previous stay in medical/surgical wards (p=0.001) & admission diagnosis of respiratory failure (p=0.001). **Conclusions:** In our retrospective review of VAP cases, baseline patient characteristics (age, gender, co-morbid conditions, functional status, smoking history); admission diagnosis, source of admission & place of admission have a significant association with clinical outcome.
Subjects were recruited from a Surgical Trauma and Medical ICU. There were 77 subjects age 18–75 intubated 24–96 hr and without preadmission cognitive disorder or dysfunction. Delirium was determined by the Confusion Assessment Method-ICU (CAM-ICU) for 5 days. The sample was dichotomized based on delirium presence for analyses. Pre-admission medical history was extracted from the medical record and categorized by individual system, number of comorbid conditions and number of systems involved. Twenty-eight day outcome measures including days of mechanical ventilation (MV), ICU length of stay (ILOS) and discharge disposition were collected from the medical records. Data were analyzed using univariate and multivariate analyses. Results: The sample was primarily female (n=41; 53.2%) and Caucasian (n=70; 90.9%) with a mean age of 47.9 (±17) yr. Fifty-nine (76.6%) subjects had delirium. Subjects with a history of endocrine disorders were more likely to develop delirium (p=0.04) and have a longer ILOS (p=0.04). No other system co-morbidity associated with delirium. In the multivariate analyses, delirium was predictive of all outcome measures (p<0.05); neurologic history was predictive of ILOS (p=0.02); cardiovascular history was predictive of MV days (p=0.05). Increased number of comorbidities or systems involved did not predict any outcome measure.

Conclusions: Endocrine dysfunction likely predisposes individuals to ICU delirium. As expected, Neurologic or cardiac comorbidities associate with longer ICU stays and ventilation periods. Further exploration of endocrine dysfunction in ICU patients in the context of delirium is necessary.

PREVALENCE AND CLINICAL OUTCOME OF BRAIN AVM IN CHILDREN ADMITTED TO A PEDIATRIC INTENSIVE CARE UNIT

Hector Rojas-Martinez, Milton Miranda-Rosa, Anabel Puig-Ramos, Ricardo Garcia De Jesus

Learning Objectives: A brain arteriovenous malformation (AVM) is an abnormal connection between arteries and veins, bypassing the capillary system. AVMs are considered sporadic congenital developmental vascular lesions, but their pathogenesis is not well understood. They occur in 0.1% of the generalized population between the ages of 10 and 40 yr. There is no evidence about the prevalence of AVM and its management in the pediatric Hispanic population. This study was designed to evaluate the prevalence of AVM in the pediatric population in patients admitted to the Pediatric Intensive Care Unit. Methods: This study is a retrospective cross-sectional that evaluates the prevalence of AVM and its clinical outcome in patients admitted to the Pediatric Intensive Care Unit (PICU) at the University Pediatric Hospital for a 5 yr period: January 1, 2008–December 31, 2012. Patients with diagnosis of traumatic brain injury, past medical history of coagulopathies and/or chronic hypertension and history of brain tumor at admission were excluded. Data were expressed as medians and percentiles. Results: During study period, a total of 2,450 patients were admitted to the Pediatric Intensive Care Unit, where we found a prevalence of patients diagnosed with AVM of 1.4% (35 patients). Most of the patients diagnosed were females (63%) and a 46% were at the age range of 6–12 yr old. The average PICU length of stay was 6.9 ± 1.7 days. Mortality rate was 14.2%, with a mean Pediatric Mortality Score 2 (PIM 2) of 18.9%. A 51.4% of patients required mechanical ventilation support during their PICU stay, with a mean Mechanical Ventilation Days of 3.5 ± 1.3 days. Conclusions: To our knowledge, we reported the first Brain AVM in pediatric patients admitted to a Pediatric Intensive Care Unit in Puerto Rico. We found a high prevalence (1.4%) as compared to the reported in the general population in the United States. It is essential to further analyze why females (2:1) are more affected by this condition than males and the use of Spetzler-Martin score to categorize AVMs to correctly diagnose and treat this population.

THE LEVEL OF RESUSCITATION KNOWLEDGE AMONG NURSES AND ASSISTANTS

Josefa Betlehem, Alexandra Juhász, Balázs Radnai, Balint Banfai, Kristine Deutsch, Emese Pek

Learning Objectives: Sudden cardiac arrest may occur at any time in everyday life and any health care system segment. Therefore it is essential that the sectors employers to be always up to date with the current guidelines and to be able to effectively resuscitate the patient. We would like to examine how social demographic aspects affect Basic Life Support (BLS) the health care workers (nurse or assistant). Methods: The research was piloted on 102 nurses and assistants who have been working in the designated field for at least one year. The BLS-skills were examined by observation in a simulated situation. We used a standard research tool (BLS scoring
system accepted by the University of Pecs) and completed it with demographic data (gender, age, professional yr and background). Depending on the performance, a participant could achieve 0–1 or 0–1.2 points per task. The maximum score was 12. For the statistical analysis we used T-test, Chi-square test, Fisher’s exact test and descriptive statistics. Results: The average score at BLS achieved by the nurses was 9.40 while the assistants achieved 9.13 points. There was no significant difference between BLS-skills of the nurses and assistants (p=0.38). There was difference between gender’s BLS points; women: 9.51 points, men: 8.11 points (p=0.02). There was no correlation between BLS-skills and work yr (p=0.79). The age doesn’t affect the BLS points (p=0.53). The calculations showed that from the 102 particpants, 50 had proper BLS skills, while in case of the remaining 52 staff members the BLS skills were not adequate. 22.00% of the nurses and 40.40% of the assistants had never thought about safety (p=0.04). Another major difference was between contact and gender (p=0.01). Conclusions: It would be necessary for the hospital staff to attend resuscitation training. Frequently organized trainings would help keeping the resuscitation knowledge up to date, to complement the lack of knowledge and correct the mistakes. It would also help making the staff members more self-confident, which could reduce inaccuracy caused by nervousness.

HOW HEALTHY ARE HUNGARY’S AMBULANCE PERSONNEL?–A REPRESENTATIVE STUDY
Emese Pek, Balint Banfai, Krisztine Deutsch, Balázs Radnai, Jozsef Betlehem

Learning Objectives: The high job stress among ambulance personnel is widely known a phenomenon. The aim of this study is to assess the physical and mental health status of the Hungarian ambulance workers (based on their subjective self-evaluation), using an internationally recognized, standardized and validated, generic assessment tool (SF-36) on a representative sample. Methods: The representativen, cross-sectional research covers the pre-hospital emergency service personnel of 65 ambulance stations in 6 counties of Hungary. Participants of the study were invited to fill out a questionnaire on a voluntary and anonymous basis that consisted of standardized (SF-36) and self-developed. Resulting data were interpreted by descriptive- (average and frequency calculations) and coherence-revealing matematical-statistical analysis (Chi-square test, Mann-Whitney and Kruskal-Wallis test, correlation analysis and linear regression tests.) Results: Based on the dimensions of the SF-36 questionnaire the respondents considered their “Physical Functioning” the best, while “Vitality” was regarded the worst. The more time an employee have been worked at the HNAS the worse his health was in the first four dimensions like, “Physical Functioning”, “Role-Physical”, “Bodily Pain”, “General Health”; p<0.001. Those working in secondary part-time jobs considered their health in all dimenions worse. The respondents who do some kind of sports hold their health in all dimensions better (p<0.001). The workers with higher BMI regarded their health status worse, in four dimensions: “Physical Functioning”; p=0.001; “Role-Physical”; p=0.013; “General Health”; p<0.001; “Role-Emotional”; p=0.05. Conclusions: The workers health status proved to be insufficient according to the subjective perception and measurable parameters. According to the subjective perception of health and measurable parameters of health status of workers proved to be insufficient. Poor physical health can lead indirectly to psychological problems, which may lower the measurable parameters of health status of workers proved to be insufficient. Poor workers health status proved to be insufficient according to the subjective perception “Social Functioning”: p=0.013; “General Health”: p<0.001; “Role-Emotional”: p=0.05. Conclusions: It would be necessary for the hospital staff to attend resuscitation training. Frequently organized trainings would help keeping the resuscitation knowledge up to date, to complement the lack of knowledge and correct the mistakes. It would also help making the staff members more self-confident, which could reduce inaccuracy caused by nervousness.

LONG-STAY PATIENTS IN PEDIATRIC INTENSIVE CARE UNITS IN RIYADH: A CROSS-SECTIONAL DESCRIPTIVE STUDY
Ayman Aleyadhy, Mohammad-Hani Temsah, Yousef Al Mana, Abdullah Alwohaibi, Abdullah Alturki, Ali Habooab

Learning Objectives: Long Stay Patients (LSP) may seem as minority in the ICUs, however, they consume large amount of resources. There is limited published data on pediatric ICU in our region in particular. In order to have more insight on LSP cases in PICU in our population, we performed this cross-sectional study to describe characteristics of LSP and the magnitude of this problem in Riyadh, Saudi Arabia.

Methods: This was a cross-sectional study where we approached all public PICUs and pediatric surgical cardiac intensive care units (SCICU) in Riyadh. There were 8 PICU and 3 pediatric SCICU. The data were obtained by interviewing the units’ managers using structured questionnaire. We defined long stay to be 21 days or more of staying in the unit at the time data were collected. A pilot study was done to validate the questionnaire. IRB approval was obtained. No identifiable data of the patients were obtained. Appropriate statistical analysis was applied. Results: 10 out of 11 (90%) PICU/SCICU Units accepted to participate in the survey, with their total capacity of 155 beds. There were 48 patients who stayed 21 days or more, with Length of PICU/SCICU Stay ranging from 22 days to 13.5 yr, and median length of stay 113.5 days. Amongst LSP 72.9% of them were in PICUs, and the rest were in Pediatric SCICU. LSP who were admitted through the ED accounted for 31.3%, while 27.1% from the ward, 25% were referred from another hospital. Majority of LSP were patients who are known to have neuromuscular or cardiac disease whom are admitted with respiratory compromise. SAP was the most prevalent complication, occurring in 37.5 % of LSP. The most commonly used resources was mechanical ventilation 93.8%, followed by antibiotic use 60.4%, and blood products 35.4%, inotrropes. The most common reason of long stay was medical reasons 51.1%, followed by lack of family resources 26.5%, followed by lack of referral to long stay facilities 22.4%. Conclusions: LPS in Riyadh is associated with significant PICU occupancy, complications, and resources which necessitate long term facility for high dependency patients.
We provide the first report on the status of South Korean PCC. We no pediatrician who was exclusively in charge of PCC, and low medical prices. Pediatric cardiology, and neonatology. Many hospitals had difficulties managing sivists. Others had multiple subspecialties, including pediatric pulmonology, PICU. The specialties of the attending physician in charge of PCC were pediatrics of beds for neonatal intensive care (24.7±13.7, range: 0–58) and adult critical was 8.0 ± 9.6 (range: 2–30). This number is very low compared to the number hospitals in South Korea. We contacted pediatricians involved in pediatric critical care costs. A systematic review was conducted to evaluate the effect of pal- liative care. The ICU consumes 20% of hospital expenditures and approxi- mately 1% of GDP. Many strategies have been entertained in an attempt to reduce critical care costs. A systematic review was conducted to evaluate the effect of palliative care (PC) consultations in the ICU on length of stay (LOS) as a surrogate of cost of care. Methods: A literature search was performed using PubMed, MEDLINE (Ovid), EMBASE and the Cochrane Library. Randomized controlled trials, prospective and retrospective cohort studies, and case reports looking at PC consultations in adult ICUs published between January 2000 and February 2014 were selected. Independent reviewers assessed the eligibility of studies, extracted data on ICU and hospital LOS as well as mortality, and rated each study’s quality of evidence. Cost analysis was derived from a model proposed by Kahn et al. (Med Care 2008; 46:1226–33). The primary outcome was ICU LOS. Secondary outcomes were direct vari- ables, mortality and hospital LOS. Results: 814 abstracts were reviewed. Data were extracted from 8 eligible studies. 4 studies were of good quality. 1 of moderate
quality and 3 of poor quality. The patients who had a PC consultation in the ICU, when compared to the ones who did not, showed a trend towards reduction in ICU and hospital LOS. This was statistically significant in the high quality studies. Mortality outcomes were similar in both patient groups. PC consultations also led to a significant reduction in ICU and total hospital costs in 5 of the 8 eligible trials. Using weighted means, ICU costs were (control vs PC) $7,553 vs $6,406 (p<0.001) and hospital costs were $59,18 vs $89,71 (p<0.001). No meta-analysis was done due to inter-study heterogeneity. Conclusions: This review shows a trend that PC consultations in the ICU reduce LOS and cost of care with no impact on mortality. However, due to small sample sizes and varying quality of evidence, many questions are left unanswered. A large multicenter randomized trial and formal economic evaluation would be needed to evaluate the effect of a proactive PC approach on ICU LOS and cost.

345 BARRIERS TO PROVIDING QUALITY END OF LIFE CARE IN THE ICU: RESULTS OF A MULTICENTER SURVEY


Learning Objectives: In the US, approximately 20% of patients die during or shortly after an ICU stay. End of Life (EOL) care practices can vary widely between hospitals and may often be inconsistent with patient preferences, values or goals. Our goals were to survey ICU health care providers (HCPs) to determine the education, knowledge and perceived barriers to providing high-quality EOL care. Methods: We conducted a multicenter survey of ICU HCPs at 4 academic medical centers across the US (Beth Israel Deaconess Medical Center, Brigham and Women’s Hospital, University of California San Francisco, Intermountain Medical Center). All physicians, nurses, respiratory therapists and social workers working in any of the participating ICUs during a two-week study period were eligible and invited to participate in the study. Results: A total of 440 HCPs responded (62% nurses, 24% physicians, 11% respiratory therapists and 3% social workers). Overall, 35% of respondents reported receiving EOL education; however, this varied widely among centers ranging from 22% to 68%. The majority of HCPs (57%) were unaware EOL guidelines existed at their institution. HCP perceptions of barriers to providing high-quality EOL care were predominately centered around the clinician - patient/family interactions rather than symptom management. Specifically, the highest rated barriers identified included: 1) Differing expectations or understanding of prognosis between the patient’s family and clinicians; 2) Differing expectation or understanding of the prognosis among family members; 3) The patient’s wishes or values are unknown or not documented; 4) Under-utilization of palliative care services. Conclusions: There is an ongoing need for quality improvement and education around EOL care in the ICU setting. Future work should focus on improving and ensuring early clinician - patient/family discussions on goals of care, improving education for ICU HCPs on quality EOL care with specific emphasis on institution specific guidelines and developing quality assurance metrics to track adherence to guidelines as well as patient/family satisfaction.

346 DEATH IN THE PEDIATRIC INTENSIVE CARE UNIT: A TALE OF TWO CITIES

Renata Quinet, Deise Correa, Ashima Das, Ingrid Anderson, Richard Speicher, Luis Fernando Carvalho, Alexandre Rotta

Learning Objectives: Approaches to end-of-life in the PICU can vary widely across the world, owing to, at least in part, cultural differences, legislation, communication practices, and family inclusion in the medical decision-making. We performed this study to better characterize this variability and gain insights into end-of-life care between two similar PICUs in different countries. Methods: We performed a retrospective analysis of all deaths in two PICUs, one in Brazil (Br) and one in the US, for the yr of 2013–14. Both units are located in academic medical centers and are staffed by pediatric intensivists, fellows, residents and specialized nursing. Data abstracted from the medical records were analyzed by the education, knowledge and perceived barriers to providing high-quality EOL care. Methods: We conducted a multicenter survey of ICU HCPs at 4 academic medical centers across the US (Beth Israel Deaconess Medical Center, Brigham and Women’s Hospital, University of California San Francisco, Intermountain Medical Center). All physicians, nurses, respiratory therapists and social workers working in any of the participating ICUs during a two-week study period were eligible and invited to participate in the study. Results: A total of 440 HCPs responded (62% nurses, 24% physicians, 11% respiratory therapists and 3% social workers). Overall, 35% of respondents reported receiving EOL education; however, this varied widely among centers ranging from 22% to 68%. The majority of HCPs (57%) were unaware EOL guidelines existed at their institution. HCP perceptions of barriers to providing high-quality EOL care were predominately centered around the clinician - patient/family interactions rather than symptom management. Specifically, the highest rated barriers identified included: 1) Differing expectations or understanding of prognosis between the patient’s family and clinicians; 2) Differing expectation or understanding of the prognosis among family members; 3) The patient’s wishes or values are unknown or not documented; 4) Under-utilization of palliative care services. Conclusions: There is an ongoing need for quality improvement and education around EOL care in the ICU setting. Future work should focus on improving and ensuring early clinician - patient/family discussions on goals of care, improving education for ICU HCPs on quality EOL care with specific emphasis on institution specific guidelines and developing quality assurance metrics to track adherence to guidelines as well as patient/family satisfaction.

347 QUALITY OF END OF LIFE CARE IN PEDIATRIC INTENSIVE CARE UNITS: A NATIONAL SURVEY

Raul Rodriguez, Yonga Bulur, Myke Federman

Learning Objectives: Practice guidelines can serve as important tools in improving patient care at end of life. The goal of this study is to determine whether pediatric intensivists have access to end of life guidelines, and if so, are likely to utilize them and feel they enhance care. Secondly, to determine the frequency of end of life practices such as spontaneous breathing trials prior to terminal extubation, benzodiazepines for terminal anxiety, use of neuromuscular blockade for distressing symptoms, preferred opioids for analgesia, medications for terminal congestion, and the removal of unnecessary equipment from a dying patient. Methods: A survey was sent to all pediatric intensivist members of the AAP Sections of Critical Care and Palliative Care and pediatric critical care fellowship programs across the U.S. There were 214 respondents with an estimated response rate of 40%. Data were analyzed using chi-squared tests or Fisher’s exact test as appropriate. Results: The majority (66%, n=123) of respondents do not have end of life guidelines or are unaware of them being available. Of intensivists who have access to guidelines, the majority (91%, n=55) routinely employ them in their practice. Most intensivists who do not have guidelines feel that having them will enhance patient care and will use guidelines if their institution adopts them (60%, n=54). The majority (84%, n=154) use narcotics for air hunger with morphine the preferred opioid (n=140, 79%). Experienced intensivists use fentanyl twice more frequently than their less experienced counterparts (25% vs 13%, p=0.05). Most do not use spontaneous breathing trials prior to terminal extubation (62 %, n=113). Most intensivists (90%, n=165) do not use neuromuscular blockers for distressing tachypnea and the majority (65%, n=119) assure neuromuscular function is restored prior to terminal extubation. Conclusions: This study demonstrates the need and lack of availability of standardized end of life care guidelines for pediatric critical care patients and is a first step towards developing such guidelines to enhance quality of care at end of life.

348 PEDIATRIC BIOBANKING IN THE CRITICAL CARE SETTING: PATIENT AND PARENT PERSPECTIVES

Sabrina Derrington, Erin Paquette

Learning Objectives: Biobanks including samples from critically ill children could facilitate ground-breaking discoveries about pediatric critical illness. This study explored Pediatric Intensive Care Unit (PICU) patient/parent understanding and perspectives regarding biobanking. Methods: We distributed a disclosure form describing a biobank of discarded biosamples and de-identified clinical data to all admissions in a 40-bed PICU. The form asked for agreement or refusal to participate (opt in). Parents and patients ≥12 yr were asked to participate in an interview, using the Semi-Structured Comprehension Interview (SSCI) and open-ended questions to elicit perspectives on biobanking. We used Kruskal-Wallis to analyze nonparametric variables (SSCI) and t-test for normally distributed variables (length of stay, LOS). Interview data were coded and analyzed using thematic content analysis. Results: Disclosure forms were completed for 44% of 1148 admissions. Of these, 400 (80%) agreed to participate in the biobank. 59 parents and 10 parents completed interviews. Comprehension scores were similar for parents and patients (SSCI mean 6.73 vs 7.57/12, p=0.22). Only 36% of parents...
PROFESSIONAL RESPONSIBILITY AND THE CARE OF
CHRONICALLY CRITICALLY ILL CHILDREN

Miriam Shapiro, Sapna Kudchadkar, Pamela Donohue, Nancy Hurton, Renee Boss

Learning Objectives: A growing population of pediatric ICU patients are “chronically critically ill” (CCI), with prolonged hospitalizations and uncertain prognosis. Unlike acute care, longitudinal communication and decision-making related to their care is often dispersed over many clinicians. The current study explores the tension between an ICU clinician’s duty to make personal recommendations (“personal”) vs. a duty to seek team consensus (“team-based”) when approaching serious decisions for a CCI patient. Methods: Pediatric ICU physicians practicing in US medical centers completed a web-based survey in May 2015. The survey sought to measure physician attitudes and practices, on a spectrum of personal to team-based, around longitudinal care decisions and consensus using vignettes about infants with CCI. Participants characterized their local ICU climates and previous training experiences. Results: We received 321 surveys from 1282 pediatric intensivists (25% response rate) representing 107 institutions (60% institution response rate). Participants report that an average of 24% (range 0–76%) of their daily ICU census are CCI. Respondents equally identify attributes representing a strong team (32%) vs. weak personal (32%) approach to serious decisions for CCI children. However, 69% report that in practice they would utilize a team approach to such decisions. 98% of respondents favor disclosing disagreement among the medical team to the family. In the setting of disagreement, 76% would not make specific recommendations to a family. 62% of respondents agree that ICUs inadequately address the needs of CCI children. Conclusions: This study confirms that a substantial proportion of CCI children experience in this vulnerable population necessitates innovative consent models and ongoing inclusion of research participants in biobank development and oversight.

ADVANCE DIRECTIVES AND LIFE-SUSTAINING TREATMENT IN ADOLESCENT AND YOUNG ADULT BONE MARROW TRANSPLANT PATIENTS

Jennifer Needle, Angela Smith

Learning Objectives: Advance directives (AD) are encouraged in patients undergoing bone marrow transplant (BMT) to provide care that is consistent with patient preferences for life-sustaining treatment (LST). Little is known about the frequency or role of AD on the use of LST for adolescent and young adult (AYA) patients undergoing BMT. Methods: The aim of this study was to describe the frequency, type, and influence of AD on the use of LST in AYA patients following BMT. We performed a retrospective chart review of AYA BMT patients age 14–26 at the University of Minnesota between April 2011 and January 2015. Life-sustaining treatment was defined as positive pressure ventilation (PPV), dialysis, and/or cardio-pulmonary resuscitation (CPR). AD were categorized as those preferring LST, those naming proxies only, and those without AD. Results: A total of 96 patients were included in the study; 22 patients completed an AD (23%). Of the 26 (27%) patients who died; 13 (50%) had an AD. Nineteen (73%) patients died in the ICU. There was no significant difference in PPV, dialysis, withholding or withdrawing of LST, timing of Do Not Resuscitate orders, or length of ICU stay between those with AD preferring LST (n=5), those naming proxies only (n=4), and those without AD (n=10). Patients with AD expressing preference for LST were significantly more likely to receive CPR than those with proxies or those without AD (p=0.002). There was a significant difference in location of death between the 3 patients with AD preferring limitations of LST (100% died at home) and all other patients (p=0.009). No patient received LST that was inconsistent with preferences expressed in their AD. Conclusions: Despite the high risk of morbidity and mortality; a minority of AYA patients undergoing BMT had AD. Patients who had AD expressed preference for LST and those without AD (n=10). Further research is needed to explore patient preferences and ICU decision-making in this population.

LIKELIHOOD OF RAPID RESPONSE PATIENTS HAVING PALLIATIVE CARE TRIGGERS


Learning Objectives: Rapid response teams were created to decrease cardiac arrests, mortality, and morbidity by identifying deteriorating patients. A high proportion of patients receiving rapid responses (RRs) though have conditions/ co-morbidities associated with a poor prognosis. Previous studies have shown that certain clinical traits (palliative care (PC) triggers) improve the integration of PC services into patient care. Our objective was to estimate the proportion of hospitalized patients having RRs that met criteria for PC consultation as determined by PC triggers prior to their RR. Methods: Retrospective study of RRs from March 2014–March 2015. Palliative care triggers were utilized to determine eligibility for PC consultation. 9 PC triggers utilized: dementia and cannot care for self; ≥75 yr old and with two life-threatening co-morbidities; Nursing Home patient; Peg tube, tracheostomy, prior admission within 12 mo, prior admission within 6 mo, Intra-cerebral Hemorrhage requiring mechanical ventilation, COPD on home O2 with more than 2 admissions past year (1st 5 triggers significant and associated with PC consult, p<.05).

Results: Over a 12 month period, 504 patients had an RR. 83 RR patients went on later to a cardiac arrest. 48 patients (9%) had been seen by PC prior to their RR. Following RR, 106 additional subjects received PC consultation. The ICU team determined 80% of RRs were not eligible for ICU care because of low likelihood of benefit. Patients who received PC consultation were older (77.8 ± 11yr vs 72.2 ± 15.8, p=.006). PC patients were more likely to have ≥ 3 triggers (46% vs 21%, p=0.005). 73% of patients had at least one significant PC trigger. An increased number of PC triggers before the RR was weakly associated with having a PC consult (ROC analysis, AUC 0.65, 95% CI[0.57, 0.74;p=0.004]). Conclusions: A high proportion of patients having RRs had co-morbidities associated with a poor prognosis. Identifying PC appropriate patients early in their hospitalization via PC triggers and enlisting PC services could help in preventing a large number of RRs and lead to better patient care.
tubes, and that death nor be prolonged. The least important value was that life be preserved. However, based on pre-specified relationships between the various values measured, there were inconsistencies in participants expressed value statements. With few exceptions, participants’ expressed values were not associated with expected corresponding preferences regarding use of life-sustaining treatments. Of the 109 (40%) patients and 95 (42%) family members who were aware of decisions being made about use of life-supporting treatments, 68 (56%) patients, 60 (59%) family members had residual decisional conflict. Conclusions: Decision-making regarding the use of life-supporting treatments at the EOL is inadequate. To reduce residual conflict, patients and their families need more support to clarify their values and ensure their preferences are grounded in adequate understanding of their illness and treatment options.

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PROACTIVE SCREENING PROCESS FOR PALLIATIVE CARE IN THE INTENSIVE CARE UNITS OF AN ACADEMIC HOSPITAL
Jonathan Wu, David Lee, Sarah Dobson, Cristobal Barrios, Mudit Dahral, SOLOMON LIAO

Learning Objectives: Studies have shown that palliative care (PC) can improve communication between providers and patients, improve quality of care, and decrease unwanted aggressive treatment. Yet most patients who die in the ICU do not receive PC consultations. The goals of this study are to assess the effectiveness of a proactive screening process for PC consultations in the ICU and evaluate which ICU patients could benefit from a PC consultation. Methods: This single-center retrospective study of 888 patients examined the impact of a PC screening tool and huddle on dying patients in the ICUs. Data was collected before (phase 1) and after (phases 2 and 3) the intervention. The intervention consisted of two parts. The first part (phase 2) involved the implementation of a nationally recommended screening tool, and the second part (phase 3) included both the screening tool and an interdisciplinary huddle. Participants who received PC consultations were also grouped into early and late based on the average time to receive consultation. Results: The intervention reduced the time to PC consultation after ICU admission from 9.6 to 4.8 days (p<0.01) and after meeting screening criteria from 8 to 2.2 days (p<0.01). The average number of PC consultations per month increased from 10.6 to 17.7 (p<0.01) from phases 1 to 3. However, the proportion of patients who received a PC consultation among total hospital deaths per month decreased from 67% to 51% (p<0.01). The sensitivities and specificities of the screening tool plus huddle were 62.5%, respectively. Among participants who received a PC consultation, participants who received an early consultation had costs significantly less than those with late consultation. Conclusions: This study showed that a proactive screening process improves access to PC and helps critical care physicians identify which patients are appropriate for PC consultations. Further research is needed to improve screening instruments that differentiate which patients benefit from PC.

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A REVIEW OF THE DNR DECISION MAKING PROCESS FOR UNBEFRIENDED PATIENTS AT AN URBAN PUBLIC HOSPITAL
Tabassum Khan, Jason Lesandrin, Anuradha Subramanian

Learning Objectives: 16% of ICU patients have been reported to be unbefriended. These individuals lack capacity for decision making, are without any advanced directives regarding their care, and have no surrogate decision maker. At our institution, an ethics consultation is required to designate these patients as DNR. The purpose of our study was to review unbefriended patients at our institution from 2000–2013 and determine the time frame from admission to DNR designation. We compared this to controls with surrogates in the literature. We also investigated the role certain demographic factors play in increasing time from admission to DNR designation. Methods: We retrospectively reviewed charts of all unbefriended patients for which an ethics consultation was obtained to facilitate DNR designation. Demographic and outcome data were collected. A multivariate model was constructed using time from admission to ethics consultation as the outcome variable, with age, race, disposition, homeless ness, and presence of a prior code during the current admission as independent variables. Results: Of the total cohort of 169 patients, 87 (51%) were found to meet inclusion criteria. The average time from admission to ethics consultation was 14.27 ± 19 days vs. 6.6 days for patients with surrogates (p < 0.05). The average time from ethics consultation to discharge was 6.0 ± 11 days vs. 3.5 days for patients with surrogates (p = NS). The multivariate model showed that age and homelessness were significant predictors of prolonged time (p < 0.05). 81% of patients included in our study died during their hospital admissions. 17 patients coded prior to DNR designation. Conclusions: Unbefriended patients have a significantly longer time to DNR designation than patients with advanced directives or family, but once DNR status has been designated, there is no difference in the time to discharge between groups. This suggests the need for prompt ethics consultations and involvement especially in patients age > 50 and the homeless. Earlier ethics consultation would decrease length of stay, costs and moral distress amongst providers.

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TIMING OF DNR/DNI DISCUSSIONS AND PALLIATIVE CARE CONSULTATION IN THE PICU
Leanna Huard, Martiniano Flores, Tristan Grogan, Robert Kelly

Learning Objectives: Determination of medical futility is a challenge in the PICU. Often, a Do Not Resuscitate (DNR)/Do Not Intubate (DNI) discussion or palliative care consultation is delayed, which may affect treatment goals and end-of-life care. Methods: With IRB approval, a survey was sent to sub-specialty physicians at our children’s hospital throughout California who likely treat children within a PICU. Subspecialties included critical care, cardiology, gastroenterology, pulmonology, hematology/oncology, and neurology. Critical care nurses at our tertiary care children’s hospital were also surveyed. Results: 80 physicians and 52 PICU nurses replied. 92% of respondents agreed that a patient’s diagnosis should contribute to whether a DNR/DNI discussion should take place. Nurses and physicians disagreed, however, when that discussion should take place (P<0.001). Physicians tended to favor beginning such a discussion in an outpatient setting, while nurses tended to favor delaying until it is obvious that death is inevitable. No difference was seen, however, between nurses and physicians regarding the timing of palliative care consultations. Although 32% of respondents agreed that palliative care should be consulted upon the diagnosis of a chronic illness, 60% indicated that such consultation should be pursued once the prognosis is poor or the patient’s treatment is futile. While 96% of physicians agreed that the responsibility for beginning limitation of care conversations for a child whose condition is deteriorating should rest, at a minimum, with a subspecialist involved, fellows were more likely than attendings to believe that beginning limitation of care discussions without the general agreement of other teams involved was appropriate (P=0.0027). Conclusions: While most providers agree that a child’s diagnosis should contribute to whether a DNR/DNI discussion should take place, disparity exists regarding the timing of palliative care consultations. Palliative care education may help initiate these discussions earlier in order to advance compassionate family-centered care initiatives.

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RETROSPECTIVE REVIEW OF LIMITATIONS OF CARE AT A FREE-STANDING, TERTIARY CARE CHILDREN’S HOSPITAL
Christopher Plymire, Elissa Miller, Meg Frizzlola

Learning Objectives: The “do not resuscitate” (DNR) order has been in existence for over 25 yr. Recent studies have shown the importance of DNR orders in pediatrics, including its influence on goals of care. There are few studies investigating the details surrounding DNR order placement in pediatrics. Understanding timing and conditions of DNR order placement may help improve advanced care discussions. Our study aims to further delineate the timing, location, and health care staff involved with DNR order placement prior to death. The study includes a period prior to, and following, palliative care team (PCT) availability at our institution. Methods: We reviewed all patients admitted to a tertiary pediatric free-standing hospital between January 2009 and August 2014. We identified 471 deceased patients and included 195 patients with a DNR order in that time period. We analyzed the time between DNR placement and death for those patients who died, demographic factors, and the location and specialty of the ordering physician. Results: The location of death of forty-nine percent of patients with a DNR in place was in an ICU setting. The death rate in the
ICU patients receiving prolonged life-sustaining treatments
Mary Peterson, Cheryl Robinson

Learning Objectives: From a socioeconomic and ethical perspective, individuals who receive extended critical care services to prolong life are a problem in technologically advanced healthcare systems. The cost versus benefit involves complex processes: death and dying, ethical issues relevant to informed decision making, quality of life, comfort and dignity at end of life. This study was done to determine the demographics, costs, outcomes and utilization of palliative services for critically ill patients who received prolonged life-sustaining treatments e.g. mechanical ventilation. Methods: Single center, retrospective, descriptive study of critically ill adult patients who received mechanical ventilation greater than thirty consecutive days over a three year period at a metropolitan, teaching hospital in the southeastern United States. Data were obtained from electronic health records for period January 1, 2011 to December 31, 2013. Patients were divided into trauma versus non-trauma admissions. Results: A total of 53 patients were included in the study. All received mechanical ventilation greater than 30 consecutive days. Mean age 55.2 (range 23–87) yr, 75% male, 43% Caucasian, mean LOS 61.4 (range 32–207) days, trauma 45%, Medicare 38%, days on mechanical ventilation (range 31–205), palliative consultation 28%. The mean charges for the hospitalization was $625K. There were no significant demographic differences between trauma versus non-trauma groups except age (P=0.05). Conclusions: These data show trends that may be used as the basis for: earlier intervention, improving patient outcomes, reduction of length of stay (LOS), support for patients/families in ethical end-of-life decision-making, and acknowledgement that cost is an ethical issue in healthcare decisions. Explore use of screening tools for objective assessment and early identification of patients likely to require prolonged life sustaining treatments.

A NOVEL SCREENING TOOL TO IDENTIFY PEDIATRIC PALLIATIVE CARE NEEDS IN THE PICU: A PILOT STUDY
Moshe Cohn, Linda Siegel

Learning Objectives: Children with severe neurologic impairment (SNI) often require PICU-level care unrelated to the indication for hospitalization. These children have a shortened life expectancy mostly related to recurrent respiratory illnesses, but they often survive multiple hospital admissions and discharges, unlike adult patients. The progressive need for multi-disciplinary assistance and increased likelihood of being technologically-dependent indicates that palliative care (PC) services would be beneficial. Our goal was to develop, pilot, and implement a screening tool to identify children with SNI in the PICU, as a trigger for a palliative care consult. Methods: A definition of “advanced illness” in children was developed with an interdisciplinary team of experts. A subset of children with SNI was further defined, and a screening tool was developed to identify these patients in the daily PICU census. The tool was implemented by PICU residents and fellows. The tool was piloted for two weeks, and then again for six mo, from October 2014–March 2015. Patients who were discharged and re-admitted were eligible for re-screening. Results: PICU residents and fellows reported no difficulty in administering the screening tool. 72 out of 80 patients met full screening criteria (90%) for triggering a palliative care consult. Of those, 32 received a consult (44%). There was a median delay of 1.5 days between screening and actual consult. Implementation of the tool had no impact on median LOS for patients who received consults. Conclusions: A simple, 4-item screening tool can identify patients in the PICU who would benefit from a palliative care consult. Expansion of such a tool throughout a tertiary-care referral children’s hospital would greatly increase the number of patients who receive palliative care.

INTEGRATING PALLIATIVE CARE INTO THE ICU: EXPERIENCES, ATTITUDES AND BARRIERS OF ICU CLINICIANS
Felicia Hui, Jennifer Kapo, Kathleen Akgun

Learning Objectives: Multiple methods have been used to identify palliative care needs of patients with serious life-limiting conditions admitted to ICU. Trigger tools for palliative care consultation (PCC) may help identify such patients. We surveyed ICU clinicians across four demographically and culturally diverse hospitals in a single health system to describe experiences, attitudes, barriers and suggested ICU triggers for PCC. Methods: A taskforce was assembled to create a needs assessment survey for a quality improvement project within a 2,130-bed health system that includes 12 adult ICUs. Survey domains were adopted from the ICU Palliative Care Quality Assessment Tool. Paper and/or electronic surveys were distributed to all-time ICU clinicians (attending physicians, nurses, advanced practice providers; n=526) in eight ICUs throughout the health system. A 5-point Likert scale was used. Responses ≥4 (agree, strongly agree) were considered positive. Results: Survey response rate was 31% (MD/DO 31%, RN 60%, PA/APRN 9%). Experiences in providing palliative care was variable. Routine symptom management was reported by 89% while goals of care conversations and emotional support to other clinicians was less routine (55% and 53%, respectively). The majority of respondents (95%) believed palliative care was an important part of their patients’ treatment experience.
**Results:** We interviewed 136 patients through consensus and the code list was developed. The data were analyzed using conventional content analysis where codes were derived directly from transcribed verbatim and anonymized. Interview transcripts were analyzed about their experiences with the project, including questions about the role of spirituality in the dying process for patients and their families. We conducted semi-structured interviews with 136 patients in the 3 Wishes Demonstration Project with the aim of improving the role of spirituality in the 3 Wishes Project.

**Methods:** A survey was sent nationwide to medical staff working in the PICU/NICU of hospitals identified to have a training program. The survey was sent via email using survey monkey to the program directors (PD)/ nurse coordinators (NC) to be forwarded to the rest of the ICU team. All results were collected in a de-identified manner and analyzed in a descriptive manner. **Results:** Survey links were sent to 367 PD/NC. There were 19% respondents with 130 being female. 72% were < 50 yr age. 40% were attending physicians. PICU (77%) and NICU (86%) fellowships were available in the surveyed institutions. 53% felt that futile care had been provided in the 3 mo prior to the survey. 74% considered managing patients perceived as receiving futile care caused personal stress. 65% reported that they had received training to address futile care and 85% of these respondents felt that it was helpful. Modes of training included conferences (72%) and role modeling (46%). 63% were interested in additional training regarding futile care. **Conclusions:** Futility of care is a widely debated topic. Nearly 86% of respondents in our study feel that futile care was provided within their scope of practice, causing personal stress amongst the majority. Providing training regarding futility of care and relevant ways to address stress could equip medical caregivers to provide better care and promote wellness and resilience for health care providers.

**FINDINGS FROM THE 3 WISHES PROJECT**

**SPIRITUALITY DURING THE DYING PROCESS IN THE ICU:**

**PERCEPTIONS REGARDING FUTILITY OF CARE IN PEDiatrics**

Ashaima Das, Praneeta Chodavarapu, Diana Yip, Veerajandhar Allareddy, Katherine Mason

**Learning Objectives:** Intensive care interventions may sustain and prolong life. However, it may be questioned whether the interventions provide good quality of life for the patient. Futility is an essentially subjective but realistically indispensable judgment. Professional consensus about the appropriate consideration of futility in medical decision-making is lacking. Perceptions of the medical community in the pediatric context in the USA has not been sufficiently characterized. Our objective is to characterize the medical community’s experience of futility of care in the PICU/NICU in a nationwide sample and to delineate the type of training that is provided regarding the same. **Methods:** A survey was sent nationwide to medical staff working in the PICU/NICU of hospitals identified to have a training program. The survey was sent via email using survey monkey to the program directors (PD)/ nurse coordinators (NC) to be forwarded to the rest of the ICU team. All results were collected in a de-identified manner and analyzed in a descriptive manner. **Results:** Survey links were sent to 367 PD/NC. There were 19% respondents with 130 being female. 72% were < 50 yr age. 40% were attending physicians. PICU (77%) and NICU (86%) fellowships were available in the surveyed institutions. 53% felt that futile care had been provided in the 3 mo prior to the survey. 74% considered managing patients perceived as receiving futile care caused personal stress. 65% reported that they had received training to address futile care and 85% of these respondents felt that it was helpful. Modes of training included conferences (72%) and role modeling (46%). 63% were interested in additional training regarding futile care. **Conclusions:** Futility of care is a widely debated topic. Nearly 86% of respondents in our study feel that futile care was provided within their scope of practice, causing personal stress amongst the majority. Providing training regarding futility of care and relevant ways to address stress could equip medical caregivers to provide better care and promote wellness and resilience for health care providers.

**362 SPIRITUALITY DURING THE DYING PROCESS IN THE ICU:**

**FINDINGS FROM THE 3 WISHES PROJECT**

Marilyn Swinton, Trudy Rose, Anne Woods, Anne Boyle, Feli Toledo, Tracey Hand-Breckenridge, Melissa Shears, Deborah Cook

**Learning Objectives:** The fast-paced technological ICU environment may limit acknowledgement of the role of spirituality during the dying process. Little is known about clinicians’ experiences with, and perspectives about, the role of spirituality during the dying process for critically ill patients. The objective of this research was to explore ICU clinicians’ understanding about the role of spirituality in the 3 Wishes Project. **Methods:** We enrolled 56 ICU patients in the 3 Wishes Demonstration Project with the aim of improving the dying process for the patients and their families. We conducted semi-structured interviews with 136 clinicians who cared for these patients to learn about their experiences with the project, including questions about the role of spirituality in the 3 Wishes Project. Interviews were digitally recorded, transcribed verbatim and anonymized. Interview transcripts were analyzed using conventional content analysis where codes were derived directly from the data. Two investigators analyzed a subset of transcripts in duplicate and through consensus the code list was developed. **Results:** We interviewed 136 clinicians (69 physicians [staff, fellows and residents], 41 nurses, 8 chaplains and 18 allied health professionals). Four main categories and associated themes emerged from the data: (1) Spirituality is Important at the End of Life (EOL). (2) Clinicians’ Hold Variable Definitions of Spirituality. (3) Clinicians’ Spirituality Influences Their Practice. (4) The 3 Wishes Project Facilitates Spirituality through: (a) creating a space (b) changing the focus, (c) providing spiritual care, (d) nurturing peace for patients and families and (e) the implementing the wishes. **Conclusions:** Spirituality is an important dimension of EOL care. Critical care clinicians value the role of spirituality during the dying process, for patients, family members and for themselves. The 3 Wishes Project supports the expression of spirituality during the dying process in this institutional setting.

**363 COMPARISON OF FULL CODE STATUS VERSUS DO NOT RESUSCITATE STATUS IN PATIENT SURVIVAL**

Arun Singh, Kiran Hebbaz, Jeffrey Klick, Gregory Sysyn, Courtney McCracken, Julie Williamson

**Learning Objectives:** 40–60% of children dying in-hospital have a Do-Not-Resuscitate (DNR) order in place. Adult studies have previously shown that for the 75% of adults with a DNR status at time of death, the DNR was initiated in the last 7 days of life. We aim to describe the effect of DNR on time to death or discharge in pediatric patients admitted to the PICU, since it has not been previously well characterized. **Methods:** A retrospective chart review was conducted of all patients admitted to a large, quaternary PICU who died in the PICU between January 2011 and December 2014. Exclusion criteria included: 1) age greater than 21 yr, 2) partial code status at the time of death and 3) repeat PICU admissions following initiation of DNR. Data collected included age, PRISM III Score, PICU length of stay (LOS), code status and survival. **Results:** Over a four-year period, 7294 patients were admitted to the PICU. 120 of 154 patients with a DNR and 165 patients with FCS died during the PICU admission. Mortality rate for FCS patients was 2% compared to 78% for DNR patients. Survival curves by PICU day 14 showed that DNR patients had improved survival compared to FCS patients (LR = 0.011). The survival curves for patients with a DNR placed prior to PICU admission and those admitted with FCS were similar to each other, yet significantly different (P = 0.001) when compared to those with a DNR initiated during their PICU admission. Fifty-three percent of DNR patients had the order placed prior to admission. DNR patients who survived had a lower PRISM III score (8 vs 16, p = 0.013) and a longer PICU LOS (8 vs 5.1 days, p = 0.060) compared to those who died. **Conclusions:** DNR patients have an overall higher mortality rate, yet improved survival by PICU day 14 when compared to those with FCS. Interestingly, children who enter the PICU with a DNR status tend to die at a similar rate to those with FCS. Additional investigation is pending regarding the correlations between DNR status, primary diagnosis, palliative care team involvement, clinical management and time to discharge or death.

**364 THE IMPACT OF GOALS OF TREATMENT ON MORTALITY OUTCOMES**

Irene Spinnello

**Learning Objectives:** The purpose of this study is to demonstrate the impact of an Intensivist-led model provided by The Intensivist Group (TIG) on ICU mortality rates at Twin Cities Community Hospital, a 122-bed hospital with 10 bed mixed ICU in Coastal California. **Methods:** Retrospective chart review. We collected the demographic and outcomes data on consecutive admissions for second quarter (Q2) 2012 and 2014 - before and after TIG became the provider of critical care services. The outcomes compared were: 1) mortality rates, 2) ICU LOS, 3) Hospital LOS (HLOS). **Results:** The number of Q2 ICU admissions in 2012 and 2014 were 207 and 235 respectively. The mortality rate in 2012 was 6.28% (13 patients), compared to 2014 mortality rate of 8.51% (19 Patients). This difference was not statistically significant (p-value 0.82). Then, we compared the ICU LOS and overall hospital LOS for the expired patients. In 2012, before TIG, the ICU LOS of expired patients was 3.7 days with the overall HLOS of 7.2. In 2014, the ICU LOS
of expired patients decreased to 2.4 days, while the HLOS decreased to 3.8 days, making the difference in ICU LOS and HLOS 1.3 days and 3.4 days respectively. Conclusions: Our study compared data from the same quarter to eliminate seasonal variations in admission diagnoses. The number of admission and mortality rates were similar. But the striking difference was in the LOS of expired patients. It is clear that Intensivist-led model showed a considerably shorter LOS. The implications are tremendous, if we take into consideration not just the cost savings, but more importantly the human factor – decreased pain and suffering for the patient and family. As a matter of fact, the rate of patients who expired on comfort care rose from 61.6% to 94.7% in 2014. We contribute this difference to following: 1. Goals of care are identified immediately upon admission to ICU 2. Intensivists are physically present in the Unit or readily available 3. Daily meetings take place with families of seriously ill patients Our study indicates that a patient-centered Intensivist-led ICU model is the foundation of compassionate care.

365 DISPARITIES IN ADVANCE DIRECTIVE USE BY INDIGENT PATIENTS IN THE SURGICAL/TRAUMA INTENSIVE CARE UNIT
Zuhdi Abdo, Natalie Provenzale, Brian Williams

Learning Objectives: Decisions regarding end-of-life care in the ICU are frequently complicated when patients do not have an Advance Directive (AD). The Department of Health and Human Services reports that the US national average of medical and surgical ICU patients with an AD is between 18–30%. We hypothesized that the predominantly indigent patient population admitted with an AD to our Surgical/ Trauma Intensive Care Unit (STICU) is significantly lower at 5%. Methods: We retrospectively examined the electronic medical records (EMR) of patients admitted to the STICU of an urban, Level 1 trauma, safety-net hospital from Jan 1 to Dec 31, 2014. We then compared the number of patients admitted to the STICU with an AD to the total number of patients admitted to the STICU over that time period.

Results: There were 1,046 patients admitted to the STICU in 2014. Of those, 799 (76.4%) had an AD status documented at the time of admission. The other 247 (23.6%) did not have an AD status documented upon admission. Since we could not confirm their AD status, these patients were not included in the final analysis. Of the 799 confirmed patients, 41 (5.13%) had an AD documented at the time of admission to the STICU. Conclusions: This single institution review supports our hypothesis that approximately 5% of all admissions to our Surgical/Trauma ICU have an Advance Directive upon admission. This is significantly lower than the national average of 18–30%, and represents a potential disparity in our largely indigent patient population. Future efforts will require data validation to determine the actual AD status of patients who have none documented in their EMR, assessing the role ADs have on patient and family outcomes, and implementing methods to increase the AD rate for patients admitted to the STICU.

366 ETHICAL ISSUES IN CRITICAL CARE MEDICINE: UNCOVERING THE COMMON AND UNCOMMON ISSUES
Jason Lesandrini, Kasey Lanier, Mary Homan, Katleen Chester, Marina Rabinovich, Khadeja Johnson, Prasad Abraham

Learning Objectives: As medicine becomes more complex, ethical issues continue to arise especially in Critical Care Medicine. The literature surrounding these complex ethical issues concentrates on specific problems in specialized populations, failing to employ a more comprehensive lens that encompasses all ethics topics. The objective of this study is to evaluate the prevalence and types of ethical issues encountered by critical care practitioners.

Methods: This was an IRB approved study. An expert validated survey was developed to identify a broad scope of ethical issues that may be encountered in the ICU. The electronic survey was then emailed to the members of SCCM during the mo of June and July 2015.

Results: There were a total of 46 responses. The top respondents were physicians (24%) followed by nurses (22%). A majority of respondents worked in academic centers (50%) and practiced primarily in the Medical (26%) and Pediatric (22%) ICUs. Forty-three percent of the practitioners had 20 or more hr of ethics related training followed by 26% with only 1–5 hr of training. An overwhelming majority (96%) of institutions had an ethics committee. The top 3 broad categories of ethical issues encountered by practitioners over a 3 month period were*: 1. Shared decision making with patients (866), 2. End-of-life care (584) and 3. Professionalism in patient care (535). Despite the large number of ethical issues, the institutional ethics resources were consulted an average of one time over a 3 month period.

Conclusions: ICU practitioners encounter a large number of ethical issues on a daily. Based on this survey however the ethics resources are rarely utilized. There also appears to be a need for more training surrounding ethical issues as 57% of the respondents had less than 20hr of training.

Research Snapshot Presentations: GI/Hepatic

367 PROGNOSTIC SCORES IN ACUTE ON CHRONIC LIVER FAILURE PATIENTS ADMITTED TO ICU: A CANADIAN STUDY
Constantine Karvellas, Eric Sy, Juan Ronco

Learning Objectives: Cirrhotic patients with organ failure/critical illness (acute on chronic liver failure - ACLF) are at a high risk for mortality. The chronic liver failure–sequential organ failure assessment (CLIF-SOFA) recently was developed but has yet to be validated in North American patients.

Methods: We retrospectively examined 274 ACLF patients (mean age 55 yr; 50% alcohol) that were urgently admitted between 01/2000 and 12/2011 to ICU at Vancouver General Hospital, Canada. The abilities of liver (Model for end-stage liver disease ~ MELD), lung (Acute Physiology and Chronic Health Evaluation ~ APACHE II), and kidney (Sequential Organ Failure Assessment ~ SOFA) scores on ICU admission predicted patient mortality with area under the receiver-operating curve (AUROC) values of 0.86 and 0.85, respectively. These AUROC values were higher than those obtained from admission MELD (0.84), APACHE II (0.71). At 48hr post-admission, SOFA (AUROC 0.94) outperformed MELD (0.88). The number of organ failures (OF) defined by CLIF-SOFA correlated strongly with in-hospital mortality (1 OF ~ 17%, 2 OF ~ 53%, 3 OF ~ 80%, 4 or more OF ~ 89%, Log rank p < 0.001). Conclusions: CLIF-SOFA and SOFA scores within the first 72 hr of ICU admission perform well in predicting in-hospital mortality. Reason for ICU admission (GI bleeding) impacted mortality. Increasing number of OFs as defined by CLIF-SOFA correlated with significant increased mortality.

368 IMPACT OF OBESITY ON OUTCOMES IN CRITICALLY ILL INTUBATED PEDIATRIC PATIENTS
Esther Davis, Li Xie, Yosef Levenbrown

Learning Objectives: An inverse association between obesity (BMI > 35 kg/m2) and mortality has been reported in adult critical care patients. There is little data analyzing the effect of obesity on outcome in pediatric critical care patients.

Methods: A retrospective analysis was performed on intubated patients in the pediatric ICU of a single tertiary care pediatric institution from 2009–2014. Only intubated patients were included as they represented the patients with the highest severity of illness. Patients were divided into 3 groups based on CDC BMI percentiles for age: normal (BMI < 85%), overweight (BMI 85% – 94.9%), and obese (BMI > 95%). Outcomes that were analyzed include mortality, ICU length of stay, length of hospital stay, and duration of mechanical ventilation.

Results: 670 patients were included in this analysis, 493 (73.6%) in the normal-BMI category, 78 (11.6%) in the overweight category, and 99 (14.8%) in the obese category. A total of 39 patients died (5.8%): 24 were normal weight (4.9%), 8 were overweight (10.3%), 7 were obese (7.1%). Overweight and obese patients had a higher proportion of mortality than normal-weight patients (odds ratio 3.0, p = 0.001). Conclusions: The HLOS decreased to 2.4 days, while the HLOS decreased to 3.8 days, making the difference in ICU LOS and HLOS 1.3 days and 3.4 days respectively.
A DESCRIPTION OF PATIENTS IN ANHEPATIC PHASE POST PRIMARY GRAFT NON-FUNCTION

Amini A. Larijani, Nguyen, Vinod Dhawan, Stephen Tranchina, John Oropepo, Ad Basuly-Marcus, Roopa Kohli-Seth

Learning Objectives: There is a small population of orthotopic liver transplant patients who require to be in an anhepatic phase after primary graft failure. They need to be managed in the surgical intensive care unit (SICU) with continuous renal replacement therapy in an attempt to achieve homeostasis. The anhepatic phase is extended as long as possible until a new donor liver becomes available. There are case reports that have shown how patients survive during the anhepatic phase; however, we will report the outcome of the largest case series of critically ill patients who had an anhepatic phase following primary graft non-function and re-transplantation.

Methods: A retrospective chart review was completed on 13 patients admitted to the SICU after unsuccessful OLT in an anhepatic state to await re-transplantation between 2006 and 2010. Patient demographics included age, sex, reason for initial transplantation, duration of ICU stay, duration of hospital stay, type of initial liver transplant (cadaveric versus living donor), duration of anhepatic phase, and basic laboratory data.

Results: There were 13 patients admitted to the SICU who were anhepatic for primary graft non-function. All 13 patients survived to re-transplantation and 7 of 13 where eventually discharged from the hospital. The mean age was 56.2 +/- 10 yr and 62% were males. The time between transplants was 2.8 ± 1.6 days. During their SICU stay, the lactate values ranged from 2.3 and went as high as 30. The ALT ranged from as low as 9 to as high as 4502, the AST ranged from 38–7538, the pH ranged from 5.5–7.55, and the INR ranged from 1.2–13.8.

Conclusions: All 13 patients who survived a mean of 2.8 +/- 1.6 days without a liver were re-transplanted. Afterwards, 62% survived their SICU stay, and all patients who were discharged from SICU survived their hospital stay. Continuous renal replacement therapy was used to manage the patient’s metabolic derangement long enough to have a second opportunity of receiving a new liver. After re-transplantation for primary graft non-function, the patients had a good chance at surviving their hospital stay.

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COST-EFFECTIVENESS OF H2RAS VERSUS PPIS FOR STRESS ULCER PROPHYLAXIS IN CRITICALLY ILL PATIENTS

Dratyn Hammond, Anuj Shah, Bradley Martin

Learning Objectives: Many critically ill patients are at risk for developing stress-related mucosal bleeding (SRMB) that results in increased mortality and greater healthcare costs. A large propensity-matched observational study (OS) and a large propensity-matched development of pneumonia between histamine-2 receptor antagonists (H2RA) and proton pump inhibitors (PPI). This study sought to determine costs and probabilities were obtained from the published literature and costs were expressed in 2015 U.S. dollars. To explore the full range of uncertainty, the model used three scenarios to incorporate transition probabilities of major complications; the base case (incorporated all clinical data including the OS and MA), one based on the MA, and another based on the OS. The models were constructed in TreeAge Pro 2015, incorporated distributions for probabilistic sensitivity analyses and underwent technical verification by two of the authors. Results: In the base case scenario, the costs, rate of complications, and mortality were $8995, 17%, and 2.5% for H2RAs and $11,231, 22%, and 3.4% for PPIS, indicating that H2RAs dominated PPIS. The model based on the OS provided similar results; however, in the model based on the MA, H2RAs had a cost of $8319 and a mortality rate of 3.2% compared to $7658 and 2.0% for PPIS. At a willingness-to-pay threshold of $50000 per death averted, H2RA was superior or preferred in 72.4%, 74.1%, and 32.5% for the base case, OS, and MA scenarios, respectively. Conclusions: Cost effectiveness models incorporating OS evidence found H2RAs to be cost effective the majority of the time, while models based on less contemporary, randomized controlled trials found PPIS to be cost effective more often.

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PNEUMONIA PREVENTION IN INTUBATED PATIENTS GIVEN SUCRALFATE versus PPI AND/or H1 RECEPTOR BLOCKERS

Gene Grindlinger, Carol Duperre, Julienne Ontengco, Steven Desjardins, Sarah Cairo

Learning Objectives: Ventilator-Associated Pneumonia (VAP) is the most common infection acquired in the ICU and has a considerable attributable morbidity and mortality. Though ventilator bundles often will reduce occurrences, we previously had observed an increase in VAP as bundle compliance increased. Therefore we examined whether the type of stress ulcer prophylaxis given, sucralfate (S) versus PPI/H2 might be responsible for the observed increase. Methods: All ventilated surgical patients admitted between January 1 and June 30 during the yr 2012, 2013, 2014 were evaluated for the occurrence of VAP using current CDC definitions for possible and probable VAP. Demographics, APACHE II, ISS (if trauma), ventilator days, sepsis, bronchodilator use. Results: There were 547 patients who survived a mean of 3235 days (mean 31.0 ± 16.0). The mean age was 59.6 ± 17.4 and the mean APACHE II was 18.6 ± 6.6. Eight patients died. The ISS of the 30 trauma patients was 31.0 ± 16.0. 45 patients met CDC criteria for VAP, 12 in the S group and 33 in the PPI/H2 group (p = 0.051). There were 37 VAPs/1000 ventilator days in S patients compared to 10.2 VAPs/1000 ventilator days in PPI/H2 patients (p = 0.002). Causative bacteria in PPI/H2 patients were far more likely to be MRSA or gram-negative bacilli (Pseudomonas, Stenotrophomonas, Serratia) compared to S patients whose BAL often grew H. ducreyi, S. aureus or P. aeruginosa. (nosocomial flora: PPI/H2 = 29 v. S = 6, p < 0.001). There were no difference in age (S = 56.4 ± 22.7, PPI/H2 = 61.0 ± 14.7). APACHE II (S = 17.9 ± 8.1, PPI/H2 = 18.5 ± 6.1), or days ventilated (S = 17.3 ± 8.6, PPI/H2 = 17.6 ± 13.8). Transfusion requiring UG bleeding was not observed. Conclusions: We found substantial differences in VAP occurrence and in the culprit bacteriology between S and PPI/H2 treated patients. Unless precluded by active GI hemorrhage or otherwise contraindicated, sucralfate should be preferred for SUP in intubated surgical patients.

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D-LACTATE IS A FEASIBLE BIOMARKER FOR DIAGNOSIS OF INTESTINAL ISCHEMIA IN THE ICU

Shinichiro Yoshida, Yoshiaki Masuda, Hiromi Tatsumi, Hitoshi Imaizumi, Kanako Takahashi, Satoshi Kazuma, Yoichi Katayama, Michiaki Yamakage

Learning Objectives: Intestinal ischemia (I-I) in critically ill patients is often associated with poor outcome in the ICU, but specific examinations are limited. L-lactate elevation is one of the findings of I-I; however, it is difficult to evaluate the location and area of ischemia, and many factors raise the level of L-lactate. D-lactate has been reported to be a useful biomarker for diagnosis of I-I. We conducted this study to clarify whether D-lactate is applicable for diagnosis of I-I that needs surgical treatment in the ICU setting. Methods: Patients with I-I (I-I group), septic shock (S-S group) and hyper-L-lactatemia without shock (H-L group) were retrospectively enrolled in this study during the period from 2007 to 2014. L- and D-lactate were determined by using a blood gas analyzer and by the enzymatic spectrophotometric assay, respectively. Lactate levels in the I-I group
were determined within 24 hr before intestinal resection due to intestinal necrosis or immediately after the operation. Lactate levels in the S-S group and the H-L group were determined at admission to the ICU. Patients with cardiopulmonary arrest at ICU admission or without a plasma sample were excluded. Results: The numbers of patients in the I-I group, S-S group and H-L group were 12, 19 and 8, respectively. The level of L-lactate in the H-L group (10.2 l/dl) was significantly higher than that in the I-I group (60.3 mg/dl) and that in the S-S group (46.8) (p=0.002). The mean level of D-lactate in the I-I group (1.29 mg/dl) was significantly higher than that in the S-S group (0.65) and that in the H-L group (0.70) (p=0.026). The SOFA score in the S-S group was higher than those in the other groups (p=0.043), while ICU mortality rates were not significantly different between the groups. Conclusions: Systemic hypoperfusion due to septic shock decreases intestinal blood flow and can result in I-I. However, D-lactate could differentiate ischemia between intestinal necrosis and indirect hypoperfusion of the intestine. D-lactate could be a useful biomarker for diagnosis of I-I in the ICU.

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ORGAN SUPPORT, READMISSION AND ETIOLOGICAL FACTORS IN THE MANAGEMENT OF CRITICALLY ILL CIRRHOTICS
Charlotte Soulsby, John Kinsella, Tara Quasim, Martin Shaw, Stephen Barclay, Joanna McPeake
Learning Objectives: Hospital admissions and mortality from liver cirrhosis continue to rise in the UK. Debate exists as to which patients should be admitted to the ICU with a previous study demonstrating conflicting views between Gastroenterologists and Intensivists in the management of patients with cirrhosis. This study explores levels of organ support offered, readmission to intensive care and etiology of disease. Methods: A prospective survey was sent to Consultant Gastroenterologists and Intensivists in Scotland. Each recipient completed 3 case studies specifying if ICU admission was appropriate, level of organ support they would offer and readmission following ICU discharge. Case studies consisted of Child-Pugh C with alcoholic liver disease presenting with sepsis or hematemesis and Child-Pugh B with non-alcoholic fatty liver disease and sepsis. Results: 31 Gastroenterologists (30%) and 41 Intensivists (29%) responded. Intensivists were more likely to offer multi organ support. Intensivists were less likely to readmit those with sepsis during hospital stay (29.3%) vs 53.3%) or during a later hospital admission (26.8% vs 60%). Both specialties gave identical scores for Child-Pugh A stable 1 year mortality (10%) and ICU mortality (25%). Gastroenterologists believed Child-Pugh B 1 year mortality was higher than Intensivists (30% vs 20%) with a similar ICU mortality (40% vs 42%). Both scored Child-Pugh C stable 1 year mortality at 50% with Intensivists scoring Child-Pugh C ICU mortality at 80% and Gastroenterologists at 75%. 50% of Intensivists and 46% of Gastroenterologists indicated etiology was significant, with belief that alcohol impacted upon transplant candidacy. Intensivists expressed concern about reversibility of cirrhosis, potential for rehabilitation and responsibility for disease. Conclusions: Whilst agreement exists between both specialties regarding patient selection, differs exist in management following ICU discharge and for those with sepsis. Etiology of cirrhosis influences decision, but is not universal within either specialty, requiring further evaluation.

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DIARRHEA DURING CRITICAL ILLNESS
Joanna Dionne, Lois Saunders, Erick Duan, Kristen Sullivan, Alyson Takaoka, Diane Heels-Ansdell, Nicole Zyraruk, Deborah Cook
Learning Objectives: Research characterizing the frequency of diarrhea in the ICU is sparse, and many definitions exist. Our objective was to describe the bowel movements (BMs) of mechanically ventilated patients expected to need life support for at least 72 hr. Methods: bedside nurses prospectively maintained stool charts daily, recording the number, frequency, and Bristol stool type of all BMs in 150 patients in 12 centers, as well as antibiotics and aperients. diarrhea was defined as either >3BMs or >1 Bristol type 6 or 7 stool. Antibiotic-associated diarrhea (AAD) was defined as occurring the day of or within 24 hr of antibiotics. Results: The median (IQR) number of BMs/day was 1 (0–3); 110 (73%) patients had >3BMs/day and 133 (89%) had >1 Bristol type 6–7 stool. Aperients were used in 98% of patients for 85% of ICU-days. The median (IQR) number of days with >3BMs/day was 2 (0–4); for 5 (2–10) days there were >1 Bristol type 6–7 stool. Over 2098 ICU-days for 150 patients, no BMs were passed on 641 (31%) days, >3BMs were passed on 555 (27%) days, and >1 Bristol type 6–7 stool were passed on 1187 (57%) of days. The median (IQR) number of days/patient with >3BMs/day was 2 (0–4); days with >1 Bristol type 6–7 stool were 5 (2–10). Of 3535 BMs in 150 patients, the median (IQR) Bristol stool type was 6 (6–7), AAD occurred in 95 (63%) of patients using the >3BMs/day definition and in 118 (79%) of patients using the >1 Bristol type 6–7/day definition. Clostridium difficile developed in 5 (3%) patients. Fecal management devices were inserted in 56 (37%) of patients for an average of 3 days, typically 6 days after ICU admission. Conclusions: Defined as >3BMs/day, the diarrhea incidence was 73%, reflecting 27% of ICU days. Defined as >1 Bristol stool type of 6/7, the diarrhea incidence was 89%, reflecting 57% of ICU days. AAD developed in 63% or 79% of critically ill patients using these 2 definitions, respectively. Aperients were universal and fecal management devices were common.

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DECREASED AIRWAY COMPLICATIONS WITH GLYCOPRYROLATE PROPHYLAXIS FOR ENDOSCOPY: A PROSPECTIVE TRIAL
Megan Prunty, Patricia Wanukam, Esma Britici, Jordan Anderson, Abdallah Dalabah
Learning Objectives: To date, there is no consensus about antispasmodic premedication prior to deep sedation in pediatric patients undergoing routine upper endoscopy and gastrointestinal reflux disease (GERD). Hypothesis: If glycopyrrolate, an anticholinergic, is administered prophylactically prior to EGD, then subjects will have decreased oral secretions and fewer airway complications. Methods: A prospective trial enrolled 212 subjects to study adverse events during routine EGD between 2013 and 2015. Pediatric intensivists provided sedation. Group A (n=129) received propofol in addition to glycopyrrolate, fentanyl and midazolam. Group B (n=83) received propofol sedation alone. Procedure and recovery time, subject demographics, procedural outcomes, and adverse events were recorded and subdivided into 3 categories: major airway complications (apnea >20 seconds, bag valve mask ventilation, endotracheal intubation, oral airway), minor airway complications (desaturation, oropharyngeal suctioning, head positioning, oxygen mask, nasal cannula), and non-airway complications (hypotension, nausea, emesis, arhythmia, allergic reaction). Results: There were significantly fewer total airway complications in the glycopyrrolate group (Group A, n=17) than in the group without glycopyrrolate (Group B, n=33) (p<0.01). It is plausible that when glycopyrrolate decreases oral secretions, it decreases the need for oropharyngeal suctioning and is responsible for the significant decrease in minor airway events and shorter procedure time noted in Group A. Conversely, Group A had an increase in apnic events (Group A, n=2; Group B, n=0; p=1.00) and transient desaturations (Group A, n=15; Group B, n=3; p=0.05). Fentanyl and midazolam, but not glycopyrrolate, are suspected as the cause of the apnea and desaturation in Group A. Conclusions: Glycopyrrolate was associated with decreased adverse airway events during routine EGD; the increase in non-airway adverse events in Group A was likely confounded by the co-administration of fentanyl and midazolam. As such, a randomized, controlled trial is needed to isolate the effects of glycopyrrolate with propofol sedation.

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TIMING AND UTILITY OF CHILD-PUGH SCORE IN PATIENTS WITH LIVER CIRRHOSIS REFERRED TO THE ICU
Joanne McPeake
Learning Objectives: The incidence of liver disease is rising in the UK with increased demand on limited critical care provision. This has led to development of clinical scoring tools for liver cirrhosis and critical care. Child-Pugh was the first tool described and is still used widely. When patients are referred to intensive care it remains unclear whether Child-Pugh score when stable or at time of referral is most relevant to outcome. This study aims to assess the relationship between Child-Pugh score when stable or at referral and survival. Methods: Single centre, prospective cohort of patients with liver cirrhosis admitted to the ICU at Glasgow Royal Infirmary between June 2012 and December 2014. Diagnosis and Child-Pugh score on ICU admission were recorded. Medical records were examined to identify Child-Pugh score prior to hospital admission. Results: 120 patients were
included in the database with 18 (35%) Child-Pugh A, 51 (43%) Child-Pugh B and 51 (43%) Child-Pugh C at time of referral. Prior to admission there were 49 (41%) Child-Pugh A, 51 (43%) Child-Pugh B and 15 (12.5%) Child-Pugh C. 51 (43%) of patients had Child-Pugh score recorded in a liver outpatient clinic, the remainder scored at time of discharge from an inpatient stay, at an outpatient appointment out with hepatology or by blood results from primary care. 5 patients had no healthcare contact prior to ICU admission. The median time between scoring when stable and referral to ICU was 119 days, with a minimum of 9 and a maximum of 1381 days. Child-Pugh score when stable was not significantly associated with ICU or hospital survival. For every 1 point increase in Child-Pugh score at time of referral to ICU there is a 19% decrease ICU survival (OR 0.81 CI 0.69–0.94) and 25% decrease in hospital survival (OR 0.75 CI 0.63–0.88). Conclusions: Child-Pugh score can indicate both ICU and hospital survival but must be calculated at time of referral to ICU. Further studies should address the multifactorial nature of ICU and hospital survival.

377 RISK FACTORS FOR INAPPROPRIATE STRESS ULCER PROPHYLAXIS IN MEDICAL AND SURGICAL ICUs
Phillip Mohorn, Rylee Rankin, Julie Ann Justo, William Owens, Bryan Love
Learning Objectives: Stress ulcer prophylaxis (SUP) is important for prevention of stress related mucosal damage in ICU patients; however, inappropriate SUP (inSUP) use contributes to negative outcomes. The purpose of this study was to determine the proportion of appropriate SUP use (aSUP) in ICU patients and to determine risk factors associated with inSUP. Methods: This was a single center, retrospective, observational study of 200 randomly selected adult ICU patients receiving SUP for >24hr from January 1 to December 31, 2013. SUP appropriateness was assessed daily in the ICU, at ICU transfer, and at hospital discharge. The primary outcome was the proportion of aSUP at ICU day 1. Multivariable logistic regression was used to identify risk factors associated with inSUP. Results: On day 2 of hospital admission, 147/200 patients (73.5%) remained in the ICU with 105 (71%) and 42 (29%) admitted to the medical and surgical ICUs, respectively. Eighty of the 147 patients (54%) received aSUP on ICU day 2 with the most common indications being mechanical ventilation >48 hr and coagulopathy. At ICU transfer, 88/147 patients (60%) were still on SUP with 17 (19%) classified as aSUP. At hospital discharge, 15/147 patients (10%) were still on SUP with 1 (7%) classified as aSUP. Five occurrences of thrombocytopenia and hospital-acquired pneumonia, and one occurrence of Clostridium difficile infection were documented. In the multivariable model, significant risk factors associated with inSUP at day 2 were age ≥50 yr (adjusted OR [aOR] 3.47, p = 0.031), APACHE II score ≥12 (aOR 9.65, p = <0.001), ICU stay <5 days (aOR 3.66, p = 0.009) and surgical ICU admission (aOR 3.72, p = 0.016). Conclusions: Approximately half of the patients received aSUP on day 2 of ICU admission; however, most patients were inappropriate continued on SUP therapy upon ICU transfer. Risk factors for inSUP use at day 2 suggest patients with a high likelihood for transient ICU stays may be a target group for reevaluation of SUP.

378 THE EFFECTIVENESS OF INTRAVENOUS VITAMIN K IN CIRRHOTIC PATIENTS WITH COAGULOPATHY IN THE ICU
Ryan Rivosecchi, Sandra Kane-Gill, Jeffrey Garavaglia, Adam MacLasco, Heather Johnson
Learning Objectives: Cirrhosis ranks in the top 15 causes of death worldwide with a 1-year mortality that approaches 57%. A clinically relevant complication of cirrhosis is the development of coagulopathy. Intravenous (IV) vitamin K supplementation is often used to correct this coagulopathy, despite a lack of quality evidence supporting its use. The purpose of this study was to evaluate the effectiveness of vitamin K in cirrhotic patients. Methods: This was a retrospective review of a cohort of hospitalized cirrhotic patients receiving at least a single dose of IV vitamin K between September 2013 and July 2014. Patients were excluded if: (1) vitamin K was administered outside of the ICU, (2) baseline international normalized ratio (INR) ≤1.5, (3) the only repeat INR outside the 6 to 24 hour post-administration time frame, or (4) received anticoagulation other than subcutaneous heparin. The primary outcome was the effectiveness of IV vitamin K as determined by a 30% decrease in INR or a decrease in INR to an absolute value of <1.6. Results: A total of 96 were evaluated with 52 patients meeting inclusion criteria. The average INR at the time of reversal was 3.1 ± 1.2. Overall, 13.5% (n=7) were deemed to have an effective decrease in INR. Thirty-four patients (65.4%) failed to achieve at least a 10% decrease in INR. The average baseline INR in patients achieving at least a 30% decrease was 3.8 ± 1.1. A logistic regression analysis was completed with the following variables: baseline INR, use of fresh frozen plasma, model for end-stage liver disease (MELD) score, and vitamin K dose. Patients with a higher baseline INR were twice as likely to have an effective response to vitamin K (OR: 2.0; 95% CI 1.1–3.8). Conclusions: The results of this analysis demonstrate that the use of IV vitamin K to correct coagulopathy of cirrhosis in the ICU may not be beneficial. Patients with higher degrees INR elevation are more likely to have an effective response. Further studies are needed, including a comparison of vitamin K use to a cohort of patients not receiving therapy and an outcome assessment.

379 DISCONTINUING PPI STRESS ULCER PROPHYLAXIS IN THE MEDICAL ICU WHEN ENTERAL FEEDS REACH 30 ML/HR
Nathan Cope, Jessica Millen, Nita Johnston, Daniel Feinstein
Learning Objectives: Acid suppression therapy (AST) is utilized frequently in ICU patients to minimize the rate of stress related mucosal damage, but it can be associated with complications. Methods: Medical ICU patients gathered from February to March 2015 were compared to a retrospective historical control within the same ICU. Patients in the historical control received pantoprazole concurrent with enteral nutrition, while patients in the prospective study group had pantoprazole discontinued when enteral feed rates reached 30 ml/hr. Patients were included if >18 yr of age, mechanically ventilated >48h, ICU stay ≥72h, and were receiving concurrent pantoprazole and enteral nutrition. Patients with an active or high suspicion of GI bleed; those admitted for surgical GI procedure, TBI, major burns; and those with history of liver disease, varices, PUD, or Barrett’s esophagus were excluded. The primary outcome was the occurrence of clinically significant GI bleeds. Secondary outcomes included rates of complications (HCAH C.difficile, length of stay, and mortality). Results: The historical control group included 65 patients, and the prospective study group included 8 patients. There was no difference in age or gender between the groups. The control group had a larger percentage of GI bleeds, pneumonia, and C.difficile infections (1.59 vs 0), (4.8 vs 0), (6.4 vs 0). The total LOS was 16 vs 10 days, but there was no difference in ICU LOS or duration of ventilation. Inpatient mortality did not differ between the groups (0.29 vs 0.38). Conclusions: Although the study numbers are small and did not reach statistical significance, the prospective group did not appear to have increased morbidity or mortality with stopping pantoprazole once enteral feeds reached 30 ml/hr. Additional prospective studies are needed to support discontinuation of AST when enteral feeds are 30 ml/hr. This practice may prove to limit the adverse effects of AST and reduce unnecessary costs to the ICU patient.

Research Snapshot Presentations: Hematology

380 PEDIATRIC ACUTE RESPIRATORY DISTRESS SYNDROME IN HEMATOPOIETIC STEM CELL TRANSPLANT RECIPIENTS
Courtney Rowan, Julie Fitzgerald, Shira Gertz, Lincoln Smith, Mark Hall, Robert Tamburro, Ira Cheifetz, PALISI Subsection on HSCT
Learning Objectives: The most common reason for hematopoietic stem cell transplant (HSCT) recipients to require admission to the PICU is a pulmonary-related transplant complication. Immuno deficiency is both a preexisting condition and a risk factor for mortality in pediatric acute respiratory distress syndrome (PARDS). We describe in a population of pediatric allogeneic HSCT patients, the occurrence and severity of PARDS based on the recent Pediatric Acute Lung Injury Consensus Conference (PALICC) guidelines. Methods: Twelve centers contributed up to 25 consecutive pediatric HSCT recipients requiring mechanical ventilation to a retrospective database. Investigating the first week of mechanical ventilation, patients were categorized into: no PARDS or mild, moderate, and
severe PARDS based on oxygenation index (OI) or oxygen saturation index. Univariable logistic regression evaluated the association between PARDS and mortality. Results: Over 91% of the 211 patients met criteria for PARDS: 61.1% were severe, 27.5% moderate, and 11.4% mild. Entire cohort survival was 39.3%. Survival decreased with worsening PARDS: no PARDS 66.7% survival, mild 63.6%, OR=1.1 (95% CI 0.3, 4.2, p= .84), moderate 52.8%, OR 1.8 (95% CI 6.5, 5.5, p=0.31), and severe 24.6%, OR= 6.1 (95% CI 2.1, 17.8, p= .0003). Nonsurvivors were more likely to have multiple consecutive days at moderate and severe PARDS (p=0.001). Moderate and severe patients had longer PICU length of stay (p<0.01) and longer mechanical ventilation course (p=0.02) compared to those with mild or no PARDS. Nonsurvivors had a higher median maximum OI than survivors at 28.6 (IQR: 15.5, 49.9) vs. 15.0 (IQR 8.4, 29.6) (p=0.001). Conclusions: In this multi-center cohort, the vast majority of pediatric alloengenic HSCT patients with respiratory failure meet oxygenation criteria for PARDS based on the new PALICC guidelines within the first week of invasive mechanical ventilation. Both morbidity and mortality increased as the severity of PARDS worsened.

381 PROPHYLACTIC PLATELET TRANSFUSION IS NOT ASSOCIATED WITH DECREASED ICU RED BLOOD CELL REQUIREMENTS

ARUN CHANDRAN, Matthew Warner, Louis Schenck, Daryl Kor

Learning Objectives: Thrombocytopenia is frequently encountered in critically ill patients, often resulting in prophylactic transfusion of platelets for the prevention of bleeding complications. While several trials have investigated prophylactic platelet transfusion in hypoproliferative thrombocytopenia, most platelet transfusions are triggered at higher platelet count (PC) thresholds. However, the efficacy of prophylactic platelet transfusion remains unclear. Methods: This is a retrospective review of adult patients admitted to the ICUs at a single institution between 2009 and 2013. Inclusion criteria were age > 18 yr and a valid PC during their ICU stay. Univariate and multivariable propensity-matched analyses were used to assess associations between baseline PC, prophylactic platelet transfusion in those with PC < 100 x 10^9/L, and the outcomes of interest, with a primary outcome of red blood cell (RBC) transfusion within 24h of qualifying PC measurement. Results: In total, 40,693 patients were included with 9,158 (22.5%) having PC < 100 x 10^9/L and 2,244 (24.5%) receiving prophylactic platelet transfusion. 1,792 patients receiving prophylactic platelet transfusion were matched 1:1 with non-transfused patients in multivariable propensity analysis. Those receiving prophylactic platelets had significantly higher RBC transfusion rates (23.9% vs 12.4%; OR 2.4 [2.0 – 2.9], p < 0.001) and 30 day mortality (22.5% vs 14.3%; OR 1.8 [1.5 - 2.1], p < 0.001) with fewer ICU free days [median (IQR) 24.2 (14.5, 26.3) days vs 26.2 (24.0, 27.0) days, p < 0.001] than those not transfused prophylactically. In a predefined sensitivity analysis restricted to those with PC < 50 x 10^9/L, the relationships between prophylactic platelet transfusion and adverse outcomes remained significant. Conclusions: In a heterogeneous population of ICU patients, prophylactic transfusion of platelets was not associated with improved outcomes. Rather, platelet transfusion was associated with increased RBC requirements and mortality, suggesting that more conservative management of thrombocytopenia may be warranted in critically ill populations.

382 NUCLEATED RED BLOOD CELLS AND POST-DISCHARGE OUTCOMES IN ICU SURVIVORS: A COHORT STUDY

Steven Purtle, Clare Horkan, Takahiro Moromizato, Fiona Gibbons, Kenneth Christopher

Learning Objectives: The risk factors for post-hospital death in critical illness survivors are not well-known. Nucleated Red Blood Cells (NRBCs) are not present in normal adults and reflect extreme increases in erythropoietic activity such as inflammation. We hypothesized that the presence of NRBCs in patients who survived critical care would be associated with increased risk of 90-day post-discharge hospital mortality. Methods: We performed a two-center retrospective cohort study of patients treated in medical and surgical ICUs. We studied 2,569 patients, age ≥ 18 yr, who received critical care between 2011 and 2015 and survived to hospital discharge. The exposure of interest was the highest absolute NRBC count occurring 2 days prior to 7 days after ICU admission. The primary outcome was mortality in the 90 days following hospital discharge determined from the Social Security Administration Death Master File. Adjusted odds ratios were estimated by multivariable logistic regression models with inclusion of covariate terms thought to plausibly interact with both NRBCs and vital status. Adjustment included age, race, gender, Deyo-Charlson Index, MICU vs SICU, sepsis and acute organ failure. Results: The cohort was 54% male, 79% white, 45% surgical, with 9% septic, 19% with pneumonia and 9% with leukemia or myelodysplastic syndrome. The mean age was 61 yr and the mean hemocrit at ICU admission was 54% 27% of the cohort had NRBC present. The absolute risk of 90-day post-discharge mortality was 5.9%, 11.7%, 15.3% and 21.9% in patients with 0/µl, 1 to 100/µl, 101 to 200/µl and more than 200/µl NRBCs respectively. NRBCs were a robust predictor of post-discharge mortality and remained so following multivariable adjustment. The adjusted odds of 90-day post-discharge mortality in patients with 1 to 100/µl, 101 to 200/µl and more than 200/µl NRBCs fully adjusted were 1.77 (95%CI, 1.23–2.54), 2.51 (95%CI, 1.36–4.62) and 3.72 (95%CI, 2.16–6.49) respectively, relative to patients with 0/µl NRBCs. Conclusions: In ICU survivors, NRBCs are a robust predictor of mortality following hospital discharge.

383 CANCER RELATED THROMBOTIC MICROANGIOPATHY: A DEADLY DISEASE

Biplab Saha, Bushra Syed, Sunil Sapru, Nirav Mistry, Kristin Fless

Learning Objectives: Thrombotic microangiopathy (TMA) in cancer patients is an uncommon but potentially fatal disease. TMA differs from thrombocytopenic purpura (TTP) or hemolytic uraemic syndrome (HUS) in clinical presentation and it is not associated with ADAMTS-13 deficiency. Survival is weeks to months after diagnosis. Methods: Fifty-two-year-old lady with metastatic breast cancer presented with worsening lightheadedness, exertional shortness of breath, fatigue for the past 2 weeks and bloody urine for 2 days. She denied any chest pain, palpitation, recent weight change or cold intolerance. Her vital signs revealed tachycardia and tachypnea. Physical examination was significant for marked conjunctival pallor. Laboratory data showed hemoglobin of 3.1, WBC 9.8, platelet 31000, INR 1.2, PTT 24, reticulocyte 19, low haptoglobin, elevated fibrinogen, LDH 5021 and a negative coomb’s test. Peripheral blood film showed more than 50% schistocytes and urinalysis was positive for large blood with very few RBCs. She was treated with corticosteroid and received 3 units of PRBC transfusion. The hemoglobin, although improved to 7.3 initially, dropped again with a platelet count of 8000. Plasmapheresis was started for thrombotic microangiopathy. She received 2 cycles of plasmapheresis. Eventually, she became confused, spiked a fever and plasmapheresis had to be stopped due to massive hemolysis. Patient was transfused with FFP but despite all efforts she died. Results: TMA is most common in metastatic gastric, breast, prostate and lung cancer. Lymphoma and Myeloma are also known to cause TMA. The extent of hemolysis and resultant LDH elevation are usually much worse than in TTP or HUS. This condition is usually refractory to plasmapheresis, steroids or immunotherapy. Initiation of chemotherapy might be associated with better outcome and survival. Conclusions: TMA is associated with a very high mortality rate. As the clinical course is different from other thrombotic microangiopathies and prognosis is extremely poor, early recognition and initiation of chemotherapy, in addition to conventional treatment, might be lifesaving.

384 OUTCOMES OF ACUTE MYELOID LEUKEMIA PATIENTS UNDERGOING INDUCTION CHEMOTHERAPY TRANSFERRED TO THE ICU

Abby Koch, Tanmeej Ahmed, Scott Isom, Heidi Klepin, Jonathan Bishop, Leslie Ellis, Bayard Powell, Timothy Pardee

Learning Objectives: Patients with Acute Myeloid Leukemia (AML) have compromised marrow function and chemotherapy causes further suppression. As a result, infectious and hemodynamic complications are frequent, and require admission to the ICU. Outcomes of AML patients who require ICU care are unclear. Methods: Adult patients with AML, undergoing induction chemotherapy, and transferred to the ICU in January 2000 through December 2013 were included. Data was collected by chart review. Results: 94 patients were included. Median survival for the cohort was 1.3 mo. At 3 mo overall survival (OS) was 27%, at 6 mo OS was 18%. Respiratory failure was the reason for transfer to ICU for 83 patients (88%), with 59 (63%) requiring mechanical ventilation at the time of transfer. Other reasons for ICU transfer included: cardiac arrest (17; 18%), septic shock (16; 17%),...
hypotension (8.9%), and acute renal failure (8.9%). The most frequent interventions received were mechanical ventilation in 80 patients (85%), vasopressors in 58 (62%), and hemodialysis in 28 (30%). While in the ICU 55 patients (58%) had a change in code status. Overall, 46 patients (49%) changed from Full Code (FC) to Comfort Care (CC), 7 (7%) from FC to Do Not Resuscitate (DNR), and 2 (2%) from DNR to CC. For the entire cohort, ICU mortality (IM) was 61% and hospital mortality (HM) was 71%. For FC or DNR patients, IM was 30% and HM was 41%. For CC patients, IM was 90% and HM was 100%. Overall, 27 patients (29%) survived to discharge. Of those discharged, 22 (81%) were alive at 3 mo and 17 (63%) were alive at 6 mo. Conclusions: Patients that require ICU admission during induction chemotherapy have a poorer prognosis than those that do not. Previous studies report 45–60% survival to hospital discharge. This study is unique in that it includes only patients undergoing first induction. Of the patients that continued therapeutic measures, 59% survived to discharge. 29% of the entire cohort survived to discharge, emphasizing the need for reliable predictors of survival.

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COMPARISON OF OPTICAL DENSITY RANGES OF IgG SPECIFIC ELISA UTILIZING CONFIRMATORY RESULTS OF SRA
Kevin Ferguson, Maresa Glass

Learning Objectives: Heparin-induced thrombocytopenia (HIT) is a very serious complication of unfractionated heparin (UFH) and low-molecular weight heparin (LMWH) therapy that can cause thrombosis, limb ischemia, and sometimes death. The initial evaluation of patients with suspected HIT can be challenging due to the high false positive rate of the commonly used non-specific (IgG/IgM/IgA) PF4 enzyme linked immunosorbent assay (ELISA). This problem has improved with the introduction of the IgG specific PF4 ELISA, however, there are still false positives with this assay. When a positive ELISA returns, the optical density (OD) is reported. An OD result states that the serotonin release assay (SRA) is usually positive only when the OD reading is >1.0. The purpose of this review was to determine the number of positive SRAs with OD greater than 1.0 and those with an OD 1.0 or less. The SRA will only return as positive in patients where the OD of the IgG specific PF4 ELISA reading is greater than 1.0. Methods: Retrospective chart review of all adult ICU patients with a positive IgG specific PF4 ELISA result. Outcome measures included the percentage of SRA positive results in patients with OD readings less than or equal to 1.0 (Group 1) and those with OD readings greater than 1.0 (Group 2). Results: The total number of patients in this review included 38 patients in group 1 and 34 in group 2. Group 1 had 1/38 (2.6%) positive SRAs and group 2 had 13/34 (38.2%) positive SRAs. The SRA positive rate was significantly higher (X2 n=72, -14.5221, p=0.000139) in group 2 vs group 1. Conclusions: The IgG specific PF4 ELISA utilized at our institution reports that OD readings >1.0 have a high probability of having the confirming SRA result as positive. This review determined that for OD readings greater than 1.0, there were 38.2% of patients that had a positive SRA. In addition, there was a very low incidence of positive SRAs in patients who had an OD reading that was 1.0 or less. These optical density ranges can assist the clinician in the decision to treat for HIT while awaiting the result of the confirmatory SRA.

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PEDIATRIC INTENSIVE CARE UNIT ACQUIRED VENOUS THROMBOEMBOLISM
Minh Tran, Steven Shein, Hong Li, Sanjay P Ahuja

Learning Objectives: Venous thromboembolism (VTE) occurs in Pediatric Intensive Care Unit (PICU) patients and is associated with central venous catheters (CVC), but an association with clinical outcome is not well established. Methods: With IRB approval, the Virtual Pediatric Systems, LLC database was interrogated for children <18yo admitted 01/09/09-14 who had PICU length of stay (LOS) ≥ 1 yr and a CVC present at some point during PICU care. DVT-PICU was defined as an ‘active’ VTE that was not ‘present at admission’. DVT-prior was defined as a VTE that was “resolved,” “ongoing” or “present on admission.” Variables (demographics, diagnoses, and Pediatric Index of Mortality [PIM2] scores) associated with outcomes (PICU mortality and prolonged LOS ≥ 7d) in univariate analyses (chi squared and Wilcoxon rank-sum) were included in multivariate models (shown as OR [IQR]). Results: Among 143,524 subjects (median age: 2.8yo; 55% male; 44% post-operative), 1741 (1.2%) had DVT-PICU and 2498 (1.7%) had DVT-prior. Mortality rates were 7.1% (DVT-prior), 7.2% (DVT-prior), and 10.1% (DVT-PICU) (p<0.001). In the model, DVT-PICU(1.25 [1.05–1.49]) and DVT-prior(1.18 [1.02–1.39]) were associated with death vs. DVT-none. PIM2 score, traumatic injury and several primary diagnosis categories were also independently associated with death. In subgroup analysis, DVT-PICU was independently associated with death in post-operative patients (3.56 [2.67–4.75]) but not the rest of the cohort (0.99 [0.83–1.21]). Median LOS were 4.2 (DVT-prior), 5.1 (DVT-prior) and 16.0 (DVT-PICU) days (p<0.001). Rates of prolonged LOS were 34.1% (DVT-prior), 42.3% (DVT-prior) and 78.1% (DVT-PICU) (p<0.001). DVT-PICU(6.55 [5.82–7.57]) and DVT-prior(1.46 [1.34–1.59]) were independently associated with prolonged LOS vs. DVT-none. Conclusions: Among PICU patients with a CVC, newly diagnosed VTE were associated with death and prolonged LOS. The relationship between VTE and LOS is complex, and prospective data collection with serial VTE screening to determine precise onset of VTE is likely needed to determine if prolonged PICU care is a risk factor or sequelae of PICU-acquired VTE.

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CHARACTERISTICS AND OUTCOMES OF CHILDREN WITH ACUTE CHEST SYNDROME AT A CHILDREN’S HOSPITAL ICU
Nihal Godiwala, Anne Watson, Michael Spaeper, Christiane Corriveau, Matthew Sharron

Learning Objectives: Acute chest syndrome (ACS) is the leading cause of severe morbidity and mortality in children with sickle cell disease (SCD), and initiation of positive pressure ventilation (PPV) is the most common indication for PICU admission. We hypothesized that earlier initiation of PPV due to direct transfer to the PICU for patients diagnosed with ACS in the ED would decrease severity of illness and PICU length of stay (LOS). Methods: We used a single center database of consecutive ACS admissions from 2009–2014. Specifically, we compared direct admissions from ED to PICU (EP) vs transfers from ED to general inpatient ward to PICU (EWP). We defined complicated outcomes as need for bronchoscopy, intubation, thoracostomy, renal replacement therapy and exchange transfusion. We collected demographic, clinical and laboratory data upon ED and PICU admission, including an adapted Clinical Respiratory Score (aCRS), PRISM III Risk of Mortality score, PPV requirement, presence of complicated outcomes, and PICU LOS. Wilcoxon Rank Sum was used for continuous variables and presented in medians with interquartile ranges. Chi-square or Fisher’s Exact Testing was used for categorical variables as appropriate. Results: There were 73 patients with ED diagnosis of ACS admitted to the PICU during hospitalization: 34 EP vs 39 EWP. The median PICU LOS for EP patients was 2.1 days vs. 3.4 days for EWP (p=0.0014). The aCRS was higher in the EP vs EWP group (<0.001). PRISM III was correlated with PICU LOS, (R=0.4045, p<0.001). Controlling for PRISM III score, multivariate regression revealed that EP patients had a PICU LOS 1.5 days less than those patients admitted to the ICU from the Ward (p=0.0014). Conclusions: Our results suggest that ACS patients with higher aCRS scores and more significant physiologic abnormalities at hospital admission have a shorter LOS if admitted to the PICU from the ED as compared to those transferred to the PICU via the Ward. This shorter PICU LOS is most likely explained by the earlier addition of non-invasive mechanical ventilation for ACS patients.

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EFFECT OF HEMOFILTRATION ON HEPARIN DOSE IN PEDIATRIC EXTRACORPOREAL MEMBRANE OXYGENATION (ECMO)
Keegan Ziemba, W. Joshua Frazier

Learning Objectives: Patients requiring ECMO are often fluid overloaded as a result of pre-ECMO fluid resuscitation or ongoing inflammation. Continuous hemofiltration (HF) allows for net fluid removal, but the effects of HF on drug clearance are largely unknown. Since unfractionated heparin is the anticoagulant used to maintain ECMO circuit function in our hospital, we conducted this retrospective review of consecutive ECMO patients undergoing HF to test the hypothesis that initiation of HF would affect heparin dosing requirements. Methods: Data were reviewed for all ECMO patients in the pediatric and cardiac ICUs at Nationwide Children’s Hospital who received HF for fluid removal from 01/2010 – 06/2015; HF was accomplished with Terumo components. We examined activated
clotting time (ACT), antifactor-Xa (anti-Xa), activated partial thromboplastin time (aPTT) and heparin dose (U/kg) in the 6h pre- and 6h post-HF initiation. Transmembrane oxygenator gradient, as a surrogate of circuit clotting, was also measured pre- and post-HF. All data were analyzed by Wilcoxon matched-pairs signed rank test. **Results**: 36 patients were analyzed. Heparin dose to maintain goal anti-coagulation (ACT 180–220, anti-Xa 0.3–0.6, aPTT 60–80) was higher after HF (p = 0.001). ACT was lower after HF as well (p = 0.04). No differences were noted between pre- and post-HF anti-Xa or aPTT. Transmembrane oxygenator gradient was unchanged. **Conclusions**: HF increased the heparin dose in ECMO patients at our center which was likely prompted by lowered ACT. The lack of change in anti-Xa and aPTT post-HF is perhaps due to the infrequency of measurement relative to ACT at our hospital, meaning adjustment of heparin based on ACT prevented changes in other measures. Our data support the conclusion that HF increases heparin requirement, likely thru increased clearance. Our data also suggest ACT trend has a role in management of ECMO patients undergoing HF or other interventions which can rapidly alter heparin dynamics.

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PROPHYLACTIC PLASMA TRANSFUSION FOR INTERVENTIONAL RADIOLOGY PROCEDURES AND RED CELL REQUIREMENTS
Matthew Warner, Andrew Hanson, Daryl Kor, Gregory Wilson, David Woodrum, Darrell Schroeder

**Learning Objectives**: Preprocedural plasma transfusion for the correction of an elevated international normalized ratio (INR) prior to invasive percutaneous image-guided interventions is common practice. However, it is unclear if the benefits of prophylactic plasma transfusion outweigh the risks. **Methods**: In this retrospective cohort study, all patients undergoing invasive image-guided procedures with an INR available within 30 preprocedural days during the study period of Jan 1st, 2009 to Dec 31st, 2013 were eligible for inclusion. Baseline characteristics, coagulation parameters, transfusion requirements, and procedural details were evaluated. Univariate and multivariable propensity-matched analyses were used to assess the relationships between preprocedural INR, prophylactic plasma transfusion, and the outcomes of interest, with a primary outcome of peri-procedural red blood cell (RBC) transfusion occurring during the procedure or within the first 24 hr post-procedurally. **Results**: A total of 18,204 study participants met inclusion criteria for this study, and 1,803 (9.9%) had an INR greater than or equal to 1.5 prior to their surgical procedure. Among these, the median (interquartile range) time between INR measurement and procedural onset was 7.5 (3.3 – 21.4) hr, and 196 patients (10.9%) received prophylactic plasma transfusion. Plasma administration was associated with higher rates of peri-procedural RBC requirements compared to those that were not transfused preprocedurally (29.6% versus 10.9%, p < 0.001). This relationship remained significant in multivariable propensity-adjusted analysis (OR (95% CI) = 2.20 (1.38 – 3.50); p = < 0.001). Hemostatic efficacy (early 40% vs. standard 60%; p = 0.09) and mortality (early 33% vs. standard 0%; p = 0.09) were not significantly different between groups, nor across the quintiles of time. Although hemostatic efficacy (<0.01) and male gender (p = 0.02) were correlated with mortality, no multivariable models using time to treatment were able to predict mortality in logistic regression. Only one patient experienced a thromboembolic event. **Conclusion**: Although these results do not support an additional benefit with early PCC, this is likely secondary to a selection bias where the most high risk patients received PCC in an expedited manor. As PCC is a high risk drug with complex operational challenges yet is time sensitive, additional studies are needed to define the goal time to PCC administration.

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DOES EARLY PCC ADMINISTRATION INFLUENCE OUTCOMES FOR WARFARIN-ASSOCIATED INTRACRANIAL HEMORRHAGE
Manasa Murthy, Chris Cruz, Ben King, Irene Tábas, Brady Helmink, Evan Peterson, Truman Milling, Mitchell Daley

**Learning Objectives**: Reversal standards for warfarin-associated intracranial hemorrhage (WAICH) have evolved with the approval of 4-factor prothrombin complex concentrate (PCC). Reversal of International Normalized Ratio (INR) less than 1.3 by 4 hr is associated with lower rates of hematoma enlargement, yet it is unknown if more rapid administration of PCC correlates with improved efficacy. Therefore, the purpose of this study is to describe the effect of early versus standard administration of PCC on outcomes in the setting of WAICH. It is hypothesized there is improved outcomes with early PCC. **Methods**: This retrospective multi-center chart review evaluated all patients who received PCC within the Seton Healthcare Family from October 2013 to March 2015. Patients were excluded if they received PCC for non-warfarin reversal or an extra cranial hemorrhage. Time until administration of PCC was calculated into five percentiles. Patients were categorized as early PCC (bottom two quintiles) and standard PCC (top two quintiles). **Results**: A total of 24 patients were included (early n = 12; standard n = 12), with a median time to PCC of 60 (22.5–78.5) min in the early group and 198.5 (147.5–299) min in the standard group. Baseline characteristics were comparable, including median Glasgow Coma Score (14 vs. 14.5, p = 0.57). Hemostatic efficacy (early 40% vs. standard 60%; p = 0.09) and mortality (early 33% vs. standard 0%; p = 0.09) were not significantly different between groups, nor across the quintiles of time. Although hemostatic efficacy (<0.01) and male gender (p = 0.02) were correlated with mortality, no multivariable models using time to treatment were able to predict mortality in logistic regression. Only one patient experienced a thromboembolic event. **Conclusion**: Although these results do not support an additional benefit with early PCC, this is likely secondary to a selection bias where the most high risk patients received PCC in an expedited manor. As PCC is a high risk drug with complex operational challenges yet is time sensitive, additional studies are needed to define the goal time to PCC administration.

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THE OUTCOMES OF AML PATIENTS WHO WERE RECEIVING INDUCTION CHEMOTHERAPY IN THE ICU.
Jeongwon Heo, Gee Young Suh, Chi-Min Park, Jeong Hoong Yang, Chi Ryang Chung, Silvia Park, Mi Kyoung Hong, Jinkyeong Park

**Learning Objectives**: The patients with acute myeloid leukemia (AML) are often diagnosed in serious conditions like sepsis at first presentation. They receive induction chemotherapy (CTx) in the ICU. Our objectives were to describe the clinical characteristics and outcomes in critically ill AML patients receiving induction therapy. **Methods**: This was a retrospective case-control study. Cases were defined as adult patients who newly diagnosed as AML and treated induction CTx (cytarabine plus idarubicin) admitted to ICU at Samsung Medical Center between January 1st 2010 and June 30th 2015. Cases were compared with non-ICU AML controls. Data were extracted on demographics, course of hospitalization, and clinical outcomes. **Results**: 14 (7.8%) of 179 patients were received the induction CTx for AML in ICU. Mean (SD) age was 53 (12.05) and 3 (21.43%) were female. Compared with non-ICU patients, ICU patient had significantly higher WBC (p = 0.001), Charlson comorbidity index (p=0.005), ECOG score (p=0.001) and significantly lower GFR (p=0.01). Crude in-hospital, one-year and overall mortality were 35.71% (p=0.001), 78.57% (p=0.004) and 78.57% (p=0.004), respectively. ICU cases had significantly higher adjusted-hazards of death (HR 3.92, 95% CI 1.85–8.28, p < 0.001) and non-ICU controls (OR 1.0, reference variable). However, the patients who could discharge after the induction CTx in ICU did not show the different mortality during follow-up compared to controls. **Conclusions**: AML patients who were receiving induction CTx in ICU may a minority of all critically ill admissions. These AML patients had a higher risk of death when compared with non-ICU controls. However, the success to ICU treatment was associated with lower mortality for AML patients receiving induction CTx in ICU.

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ICU OUTCOMES OF BONE MARROW TRANSPLANT PATIENTS WITH EMERGENT DECOMPENSATION
Aarti Bavare, Sridevi Ellickal, Caridad Martinez, Tassy Thomas, Robert Krance, Eric Williams

**Learning Objectives**: Pediatric bone marrow transplant (BMT) patients are vulnerable to clinical decompensation needing activation of Rapid Response (RR). Upon transfer to ICU, there is concern for worse outcomes despite maximal therapy. Knowledge about factors that impact prognosis can guide management. We hypothesized that after RR, BMT survivors differed from non-survivors with respect to the diagnosis, bone marrow (BM) donor source and interventions needed. **Methods**: We conducted a retrospective review of RR database at a tertiary care academic pediatric hospital over a three-year period. Patients who had RR activation post BMT were reviewed. Descriptive and comparative analyses with Chi-square were performed. **Results**: Fifty-seven BMT patients had 85 RR events. Reasons for BMT included: Malignancy (hematologic: 35%,...
solid tumors: 18%. Hemorrhagic lympho-histiocytosis: 14%; Non-Malignancy (immune dysfunction: 20%; bone marrow failure: 13%). Reasons for reclassification were: Respiratory- 42%, Cardiac- 15%, Neurologic- 16% and Multifactorial- 27%. Interventions needed were: ICU transfer - 68%, ventilation- 26%, hemodynamic support- 29% and invasive procedures (chest tubes, dialysis, biopsies etc.) - 35%. Deaths occurred in 31(54%) patients with 21(37%) deaths within 30 days after RR events. The median times from BMT and RR to death were 101 days and 13 days respectively. Comparison between survivors (S) and non-survivors (NS): 1) Reason for BMT: Malignancy-86%, NS-77%; Non-malignancy- S:33%, NS:23% [p=0.11]; 2) BM donor source: Allogenic- S:64%, NS:91%; Autologous- S:20%, NS:5%; Cord blood- S:16%, NS:4% [p=0.01]; 3) ICU therapies: Ventilation- S:88%, NS: 39%; Hemodynamic support- S:20%, NS:38%; Invasive procedures- S:5%, NS:37% [p=0.01]. Conclusions: Respiratory decompensation was the most common etiology for Rapid Response in BMT patients. Mortality was high and was proximate to RR event but distant (beyond 90 days) from BMT. Non-survivors were significantly more likely to have received Allogenic BMT and significantly needed more ICU therapies like ventilation, hemodynamic support and invasive procedures.

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ACQUIRED ANTITHROMBIN DEFICIENCY IN PEDIATRIC CRITICAL ILLNESS
Jennifer Kramer, Kristen Brown, Tyler Llewellyn, Diane Alejo, Kristen Nelson

Learning Objectives: Antithrombin (AT) is a natural circulating anticoagulant protein and is essential for the anticoagulant effects of heparin through binding of AT to factors II and X. Patients with congenital AT deficiency require replacement for surgery or peripartum to prevent thrombosis. During critical illness, AT can be consumed in a variety of illnesses, resulting in acquired deficiency and potentially resulting in increased thrombotic risk. Furthermore, age-dependent changes in the coagulation system of children result in AT levels often below those of adults, which may also predispose to increased risk.

Methods: We conducted a retrospective evaluation of AT levels for patients in a tertiary pediatric ICU, age 0–21 yr of age, from January 2004 through June 2015. With respect to AT levels, patients were classified by age, gender and diagnosis. Results: There were 111 AT percent activity levels evaluated for 110 unique patients who received replacement AT. Normal AT activity is reported as 80–120% in our lab, consistent with published literature. Average AT activity by age in this cohort: 0–1 month: 31.5%, 1–6 mo: 54.6%, 6–12 mo: 37.3%, >12 mo: 41.7%. Average AT activity by diagnosis: cardiac arrest: 65%, post-op cardiac: 38%, ECMO: 33.5%, liver transplant: 44.6%, PEG-aspariginase: 61%, pulmonary hypertension: 35%; shock: 16%. Average for male patients: 34.7% with females, 41.2%.

Literature review suggests that infants may achieve AT activity near adult range (80–120%) by 6 mo of age, such that these patients would be classified as having acquired AT deficiency. Conclusions: Acquired AT deficiency is common in pediatric critically ill patients. Determining adequate AT levels for age and diagnosis as a means to prevent thrombosis requires further investigation. We are currently evaluating those patients with acquired AT deficiency to determine incidence of thrombosis in this population.

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EFFECT OF ECMO USE ON THE INCIDENCE OF SEVERE THROMBOCYTOPENIA DURING SEVERE ARDS
John Devlin, Amy Dzierba, Russel Roberts, Justin Muit, Abdullah Alhammed, Jacqueline Clark, Robin Rithazer, Greg Schumaker

Learning Objectives: Extracorporeal membrane oxygenation (ECMO) is perceived to cause thrombocytopenia (T); however, whether T in this population is a direct result of ECMO or non ECMO-related factors remains unclear. We sought to characterize the incidence and factors associated with severe T (platelet (plt) count ≤ 50 x 10^9) among adults with severe acute respiratory distress syndrome (ARDS) managed with or without ECMO. Methods: This retrospective, cohort analysis compared consecutive adults with severe ARDS, without severe liver disease or severe T on admission, who were managed with or without ECMO, between 2009–2013 at 2 academic medical centers. Incidence of severe T and time to severe T were compared between ECMO and non-ECMO treated patients and factors that might cause T were compared between the severe T and non-severe T groups using both univariate and multivariate methods. Results: The ECMO (n=32) and non-ECMO (n=55) groups had a similar plt count (214 vs 117 vs 179 ± 86 x 10^9, p=0.21) and APACHE II score (21 vs 23, p=0.13) at baseline and frequency of heparin exposure (SC or IV) in the 2 days prior to the plt nadir (97 vs 87%, p=0.62). Both severe T incidence (25 vs 19%, p=0.50) and the median ICU (IQR) days to develop it [5[2–16] vs. [5–25], p=0.86) were similar between the ECMO and non-ECMO groups. Patients who developed severe T (n=18; 21%) [vs. those that did not (n=67; 79%)] had a higher baseline APACHE II score (26 vs 22, p=0.01) and a greater incidence of new-onset liver failure (17 vs 5%, p=0.01) and ≥1 unit platelet transfusion use (23 vs. 2%, p=0.0009), but a similar incidence of sepsis requiring a vasopressor (6 vs 9%, p=0.64), heparin infusion use (56 vs 45%, p=0.41), exposure to ≥1 non-heparin medication known to cause T (88 vs 100%, p=0.77) and ECMO use (44 vs 36%, p=0.50). In the multivariate model only baseline APACHE II score was independently associated with severe T development [OR=1.86 (1.021, 2.0), p=0.01]. Conclusions: In our severe ARDS cohort ECMO does not appear to have an independent effect on T; however larger studies are needed to confirm this finding.

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ACQUIRED ANTITHROMBIN 3 DEFICIENCY IN PEDIATRIC PATIENTS WITH PERITONEAL AND PLEURAL DRAINAGE
Whitney Law, Susan Guthrie, Bradley Peterson, David Shellington

Learning Objectives: Antithrombin III (ATIII) is an important inhibitor of the coagulation cascade that prevents uncontrolled coagulation activation and clot formation. Deficiency of ATIII is associated with increased risk for venous thrombosis. Drainage of pleural and peritoneal fluid may cause acquired antithrombin 3 deficiency, but the incidence in children and effects of acquired low ATIII are not well described. Methods: A 10-year retrospective chart review of all patients who were admitted to the Rady Children's Hospital PICU who had an ATIII assay obtained between 1/2002 and 11/2014 was performed. Data collected included demographic information, diagnosis, presence of chest tube or peritoneal drain, daily volumes of drainage, ATIII and immunoglobulin G levels, blood product and ATIII administration, presence of thrombosis and hemorrhagic complications. Statistical analysis was performed with SigmaPlot 13 software. Results: We identified 92 patients with ATIII assays performed in the setting of peritoneal or pleural drainage. Patients evaluated for hypoacontithrombinemia were aged 3.5 ± 0.5 yr and weighed 14.5 ± 1.9 kg. Admission diagnoses included: congenital heart disease (62%), sepsis (21.7%), post-operative care (5.4%), cancer (4.3%) and trauma (3.3%). Fifty-seven patients (62%) had hypoacontithrombinemia characterized by an ATIII level < 80% (child) or < 60% (neonate < 6 mo). Hypoacontithrombinemia had a moderate positive correlation with volume of pleural or peritoneal drainage (Pearson r = 0.301, p=0.003). Hypoacontithrombinemia was treated with 2.77 ± 0.38 doses of ATIII. Only one hemorrhagic complication was noted in an ATIII treated patient. Thrombotic complications were identified in 11.5% of patients, but thrombosis was not associated with low levels of AT3 (Fisher's, p=0.51) in our population. Conclusions: Acquired ATIII deficiencies occur in a significant proportion (62%) of pediatric patients with pleural or peritoneal drainage. We did not demonstrate an association between low AT3 and thrombotic complications, but this may have been affected by aggressive treatment of hypoacontithrombinemia.
were used to examine the association between the outcome and independent variables. The confounding effects of age, sex, race, type of admission, type of SCT, & co-morbid burden were adjusted. **Results:** Over 7y, a total of 101,462 SCTs were performed. Overall, a vast majority (97%) were performed in TH. Performance of SCTs in TH over the time period varied from a low of 91.5% in year 2007 to a high of 99.7% in year 2010. Following adjustment for confounders, year 2010 (OR=15.75, 95%CI=2.70–91.35; p<0.001) and year 2008 (OR=15.40, 95%CI=2.34–101.28; p<0.001) were associated with a significantly higher odds of having a SCT performed in a TH as opposed to in a nTH when compared to year 2007. When compared to 2004, SCT were more likely to be performed in TH in year 2010 (OR=8.01, 95%CI=1.22–52.84; p=0.031) and in year 2008 (OR=7.84, 95%CI=1.19–51.46p=0.03). Across all sensitivity analyses models, the SCT were significantly more likely to be performed in TH during the later year as compared to in the earlier yr. SCT procedures were also more likely to be performed in TH in the Northeastern region (OR=54.91, 95% CI=18.81–160.28; p<0.001) compared to other regions. **Conclusions:** There is increasing concentration of SCT into TH. Furthermore, it appears that concentration of SCT into TH is also influenced by geographic location. This could have implications for access to care.

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**WEIGHT GAIN AND SUPPLEMENTAL O2 ARE ASSOCIATED WITH RESPIRATORY FAILURE IN PEDIATRIC HSCT**

Courtney Rowan, Mara Nitu, Jamie Rhenburger, Nancy Szwigonski

**Learning Objectives:** Respiratory failure in pediatric hematopoietic stem cell transplant recipient (HSCT) is the leading cause for admission to the ICU and carries a high mortality rate. The objective of this study is to investigate the association of clinical risk factors with the development of respiratory failure in the pediatric allogeneic HSCT patient. **Methods:** This is a single center, retrospective review of allogeneic pediatric HSCT from 2008–2014. Independent variables included age, gender, underlying diagnosis, source of transplant, related donor, daily weights, daily use of supplemental oxygen, use of diuretics, length of stay, and renal replacement therapy. Percent weight gain measured: 1) peak increase in weight, 2) increased at end point (either intubation or discharge), and 3) weight gain at day 43 (median day of intubation). Outcome was respiratory failure (RF) (intubation/mechanical ventilation). Categorical variables were compared using chi-squared or Fischer exact test; continuous variables used student t test. ROC curves were constructed for percent weight gain and need for supplemental oxygen. **Results:** 22/87 (25.3%) allogeneic HSCT patients developed RF. Median to RF was 43 days (IQR 25.2, 68.7). Mortality for entire cohort was 13.8%. All who died had RF and were intubated prior to death. The group with RF had significantly higher increase in percent weight gain at multiple time points: peak weight prior to discharge or intubation [p=0.008], weight at discharge or intubation [p=0.001], and weight at day 43 [p=0.002]. Odds Ratio (OR) for respiratory failure increased with increasing % peak weight gain: 10% increase [3.1 (1.1, 9.0)], 15% increase [4.1 (1.5, 11.2)], 20% [8.3 (2.4, 26.9)], 50% of all patients required supplemental O2. OR for RF in patients requiring > 1L supplemental O2 is 25.3 (6.5, 98.7). Area under the curve was 0.88. **Conclusions:** Percent weight gain and need for supplemental oxygen is highly associated with the development of respiratory failure in pediatric HSCT, representing predictors of acute respiratory failure in the pediatric HSCT.

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**PLATELET DYSFUNCTION IS COMMON IN CRITICALLY ILL PATIENTS**

Sarah Stajulak, Travis Hase, Patrick Maluso, Babak Sarani

**Learning Objectives:** Coagulopathy is common in critically ill patients, but there are few studies specifically evaluating platelet dysfunction. Thromelastography Platelet Mapping (TEG-PM) allows for measurement maximal potential clot strength (MA) as well as strength selectively due to stimulation of the arachidonic acid (MA-AA) and adenosine diphosphate (MA-ADP) receptors. This study was conducted to assess degree of platelet dysfunction in critically ill, adult patients. We further sought to determine the impact of anticoagulation with aspirin (ASA) and/or clopidogrel in this cohort. **Methods:** A retrospective study of critically ill, adult, non-trauma patients in a mixed medical/surgical ICU was conducted from August 2013–September 2014. All patients who underwent TEG-PM testing at the discretion of the ICU team were enrolled. Patients without an APACHE II score and cardiac surgical patients were excluded. Patients were divided into those with and without ASA/clopidogrel use. Demographics, APACHE II score, and laboratory results were abstracted. Student t-test were used to test significance. **Results:** 79 patients were enrolled, 61% of whom were male. Average age and APACHE II score were 61 ± 16 yr and 18 ± 9, respectively. 22 patients were on ASA only while 2 were on clopidogrel and 5 others were on both. Although MA was normal in the overall, anticoagulated and non-anticoagulated cohorts (66 ± 7, 66 ± 7, and 64 ± 8 mm, respectively), MA-AA and MA-ADP were significantly reduced in all critically ill patients (43 ± 17 and 34 ± 15 mm, respectively, p<0.001). Relative to the non-anticoagulated cohort, MA-AA was significantly reduced (37 ± 17 vs 46 ± 16, p=0.02) in those on ASA/clopidogrel. There was no difference in mean MA (67 ± 6 vs 67 ± 7) or MA-ADP (31 ± 14 and 37 ± 15) in those with and without anticoagulation. There was no difference in mortality in any cohort. **Conclusions:** Inhibition of the AA and ADP pathways in platelet function is common in critically ill patients. The clinical correlation between these results, need for transfusion, and outcome requires further assessment.

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**ACTIVATED PROTHROMBIN COMPLEX CONCENTRATE OR PLASMA FOR REVERSAL OF WARFARIN-ASSOCIATED COAGULOPATHY**

Anthony Rowe, Pinks Mahbubani, Mason Bucklin, Christopher Clark, Leslie Hamilton

**Learning Objectives:** Many options are available to facilitate the reversal of warfarin-associated coagulopathy in patients experiencing hemorrhage. However, two common agents employed for this purpose are prothrombin complex concentrates (PCC) and plasma. The majority of literature concerning PCC is with non-activated 4-factor or 3-factor agents. We sought to evaluate the efficacy and safety of an activated PCC (aPCC) as compared to plasma for the reversal of warfarin associated coagulopathy. **Methods:** This was a single center retrospective cohort analysis of adult patients with warfarin associated hemorrhage admitted between January 1, 2011 and July 1, 2013. Patients received either aPCC (FEIBA®) or plasma. Patients who received both plasma and aPCC were excluded from the final analysis. Patients received 500 units of aPCC if their INR was less than 5 and 1000 units if their INR was greater than 5. Chi square and Student’s test were used to evaluate primary and secondary outcomes. **Results:** A total of 278 patients were included in the final analysis, of which 128 received aPCC, and 148 received plasma. The two groups had similar baseline demographics; however, more patients in the plasma group had a history of diabetes (32 [25%] vs. 54 [36.5%]; p=0.04). Despite having a similar pre-treatment INR, those patients who received aPCC achieved a lower post-treatment INR (1.1 [0.1] vs. 1.6 [0.5]; p=0.05). Patients who received aPCC had 4.3 times higher odds of achieving an INR of less than 1.4 (OR=75.1% vs. 65 [43.9%]; p=0.05; OR=4.35 [95 CI 2.6–7.3]). In addition, there was no statistical difference between the groups with regard to number of infusion reactions, pulmonary embolism, deep vein thrombembolism, stroke, or myocardial infarction. **Conclusions:** As compared to patients who received plasma, patients who received aPCC achieved a lower post-treatment INR and had higher odds of achieving an INR less than the pre-specified goal. Those patients who received aPCC did not have a higher incidence of thromboembolic events.
demographics, type of ECMO, mechanical factors (pump head type, flow rates, cannula max flow rating), hemolysis factors (peak plasma free hemoglobin, hemoglobin levels) were obtained. Results: The patients were divided into four categories namely centrifugal venovenous (VV), centrifugal venoarterial (VA), roller VV, roller VA. These groupings were then analyzed against the following variables for each ECMO run: maximum plasma free hemoglobin (mPFH), maximum hemoglobin (mHb) and maximum cannula flow rate percent (maxflowRCT). Our initial analysis does not show any difference in the rate of hemolysis between the different types of ECMO and the different pump types. A preliminary analysis using linear regression examining the relationship between mPFH, mHb and maxflowRCT showed that mPFH was positively associated with mHb suggesting that a high hemoglobin value during the run is associated with higher levels of hemolysis. Conclusions: The results of this study suggest that the higher the hemoglobin level it is the more likely to encounter hemolysis. This was true for whichever pump type was used or the type of ECMO. It is possible, that as we study more patients, a difference in the pump heads and or other factors such as type of ECMO could be seen.

401 OFF-LABEL USE OF 4-FACTOR PROTHROMBIN COMPLEX CONCENTRATE FOR DIRECT ORAL ANTICOAGULANT REVERSAL
Cory Weaver, Ryan Rivosecchi, Sandra Kane-Gill, Pamela Smithburger, Joseph Durkin

Learning Objectives: Four-factor prothrombin complex concentrate (4F-PCC) is indicated for the urgent reversal of acquired coagulation factor deficiency induced by vitamin K antagonist (VKA) therapy in adult patients with acute major bleeding or need for urgent surgery/invasive procedures. Off-label use of 4F-PCC for the reversal of direct oral anticoagulants (DOACs) has become common practice based upon hemostasis studies performed in healthy volunteers. However, it is unknown if this off-label use carries a higher risk of venous thromboembolism (VTE). The goal of this project was to evaluate the safety of 4F-PCC when used for this off-label indication.

Methods: A retrospective review of the electronic health record of patients receiving 4F-PCC for the reversal of DOAC therapy at a large academic medical center from September 2013 to March 2015 was performed. Demographic and medical information such as indication for reversal of DOAC therapy and adherence to institutional dosing protocol was recorded. The rate of VTE within seven days was documented from radiographic and medical progress notes. Results: Thirty-three patients received 4F-PCC for the reversal of DOAC therapy. Twenty-eight (84.8%) patients received 4F-PCC for rivaroxaban reversal, four (12.1%) for apixaban reversal, and one (3.0%) for dabigatran reversal. The most common indication for reversal was intracranial hemorrhage (42.4%), followed by need for emergent surgery (21.2%), gastrointestinal bleed (18.1%), trauma (15.1%), and hematoma (3.1%). Approximately 60% of 4F-PCC doses were administered outside of institutional protocol with the dose being inappropriately high in most cases. A total of 2/33 (6.1%) patients had a VTE within seven days. Conclusions: An incidence of VTE of 6.1% is comparable to the published rate of VTE for VKA reversal in acute major bleeding of 8.7%. The incidence of VTE appears relatively low for the off-label use of 4F-PCC for DOAC reversal in this small cohort even when doses outside institutional protocol are used.

402 FREE HEMOGLOBIN IMPAIRS THE BODY’S ABILITY TO INCREASE OXYGEN CARRYING CAPACITY
Malcolm Anderson, David Irwin

Learning Objectives: Elevated plasma free hemoglobin (Hb) levels are common in the ICU; and are associated with medical interventions such as ECMO, assist devices, and CRRT as well as illness such as severe sepsis and hemolytic disease. High free Hb levels during illness/ECMO correlate with increased mortality in recent studies. We found that a hemoglobin infusion during tissue hypoxia blunts the body’s ability to make more red blood cells, causing persistent hypoxia. We hypothesize this effect is reversible and may be due to iron dysregulation, leading to blunted HIF-2 alpha, erythropoietin, and RBC production.

Methods: Male Sprague Dawley rats were divided into 3 groups; control (n=12), hypoxia (n=18), and hemoglobin infusion with hypoxia (n=18). Subcutaneous pumps were surgically implanted. Hypoxic rats had a sham surgery. After a 7 day recovery period, Hb (250 mg/mL) was placed in the pump and the IV infusion started at 6 uL/hr (~35 mg/day) giving an equivalent serum concentration of 6–8 mg/dL. Tissue hypoxia was simulated by ambient chambers set at 18k feet. Blood was drawn on day 0, 7, and 18. Half of the animals were sacrificed at 7 days, and the other half at 18 days. Blood and tissues were harvested and analyzed for hemocrit, erythropoietin (mesosomal), erythropoietin mRNA (qPCR), and HIF-2 alpha (WB). Immunofluorescence was performed on renal tissue, with antibodies specific for erythropoietin and HIF-2 alpha. Results: Hemoglobin-infused rats had a decreased ability to mount a physiologic polycythemic response to hypoxia (p<0.002). Erythropoietin level (plasma), erythropoietin mRNA (renal cortex), and HIF-2 alpha (renal cortex) levels were above normoxic controls but below hypoxic control animals (p=0.02, p=0.16, p= pending). Conclusions: Elevated plasma free hemoglobin, as seen in ECMO, assist devices, CRRT, severe sepsis, and hemolytic disease blunts the body’s physiologic ability to increase red blood cell mass in response to hypoxia. The results are repeatable and are probably due to iron deposition/dysregulation leading to decreased levels of HIF-2 alpha and erythropoietin.

403 THROMBOEMBOLISM PROPHYLAXIS IN THE OBSE QUATE: PIPULATION: IS SUBCUTANEOUS STANDARD HEPARIN APPROPRIATE?
Steven Trottier, Barry Stoll, Madeleine Caito, Upagya Kompalli

Learning Objectives: Providing adequate and safe venous thromboembolism (VTE) prophylaxis in the obese ICU population has not been well defined. Published data are conflicting regarding the most appropriate pharmacologic agent directed at VTE prophylaxis in the hospitalized obese population. This study describes one institution’s clinical experience dosing obese patients with standard unfractionated subcutaneous heparin. Methods: Patients with a BMI greater than 30 who were admitted to and discharged from the hospital in 2013 and 2014 received 5,000 units of unfractionated heparin every 8 hr were electronically selected. Study patients had a length of stay (LOS) greater than 2 days. Retrospectively, charts were reviewed for the following data: demographics, development of VTE during the hospitalization, major bleeding, transfusion of packed red blood cells, surgery during the admission, history of VTE, heparin induced thrombocytopenia, dose of anticoagulant, lowest platelet count and lowest hemoglobin during the hospitalization. Results: Five-hundred and nine-teen of 637 patients receiving 5,000 units every 8 hr had a LOS greater than 2 days. The average BMI was 37 +/- 8 with an average age of 62 +/- 15 yr and 53% were female. Two-hundred and ninety-nine (57%) patients had surgery and 148 (28%) patients received a transfusion. The average platelet count was 179 +/- 77 thousand and the average hemoglobin was 9.7 +/- 2 g/dL. VTE occurred in 31 (6%) and major bleeding occurred in 44 (8.3%) of the patients. No patient was diagnosed with heparin induce thrombocytopenia. Conclusions: This study provides a practical real time experience of dosing subcutaneous standard unfractionated heparin in an obese hospitalized patient population. Subcutaneous heparin was associated with a relatively high rate of VTE, bleeding, and transfusion. Appropriateness of administering subcutaneous heparin in an obese hospitalized patient population warrants further evaluation.

404 REAL TIME DETECTION OF THROMBUS FORMATION WITHIN VASCULAR ACCESS SHEATHS USING BIOIMPEDANCE
Taylor Daileda, Mathews John, Shukai Chen, Elisa Clark, Morgan Sutter, Anand Ganapathy, Christopher Arevalos, Mehdi Razavi

Learning Objectives: Indwelling vascular access (VA) sheaths are associated with an increased risk of blood clots especially in immobile critical care patients. Intrahumal clots form in up to 17% of sheaths and can cause a threat to patients if they embolize, particularly during medication administration or catheter deployment. Since the impedance of blood increases as it clots, we hypothesized that clot formation can be detected by monitoring relative impedance changes inside of a modified VA sheath.

Methods: The inside lumen of a VA sheath was functionalized with a series of electrodes electrically isolated from the surrounding tissue. Bioimpedance was measured in real time across a frequency range of 1–91 kHz in 10kHz increments. Ex vivo testing involved injection of either fresh porcine blood (n=5) or body temperature water as a control (n=3) into the sheath for 30 min with continuous measurements. In vivo testing involved sheath placement in the femoral vein of a heparinized pig.
with reversal of heparin to baseline in order to simulate a physiologic coagulation response. Results: For the ex vivo study, an increase in impedance and visible clot formation were observed after 30 min. The percent change in impedance from baseline was greater than 10% in all 5 ex vivo trials (100%) and greater than 20% in 3 out of the 5 trials (60%). All 3 of the control trials (100%) showed less than a 10% change in impedance, indicating that the detected rise in impedance of the clotting blood was not due to temperature effects or measurement drift. For the in vivo study, a 20% increase in impedance was seen 20 min after sheath placement in the vein. Clot formation was confirmed upon sheath removal and subsequent flushing with water to expel a cylindrical thrombus. Conclusions: A functionalized VA sheath virtually identical in its use to current sheaths using bioimpedance spectroscopy enabled early detection of intraluminal thrombus formation. This technique will be validated in further animal models. Real time detection of these thrombi could potentially prevent downstream complications associated with embolization.

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ACDC: ASSESSMENT OF ABC SCORE VS. PWH USING TEG AND ROTEM FOR THE PREDICTION OF MT IN TRAUMA
Laila Cochon, Ariel Mejia, Amado Baez

Learning Objectives: The objective was to evaluate the integration of the Assessment of Blood Consumption score (ABC), Prince of Wales Hospital score (PWH), with the integration of Thromboelastogram (TEG) and Rotational Thromboelastometry (ROTEM) in prediction of necessity of massive blood transfusion utilizing Bayesian statistical modeling. Methods: The patient population was stratified based on scoring system: the ABC score: 0–1 point is low risk, 2–3 points is medium risk, and 4 points is high risk; using PWH score: 0–2 is low risk, 3–5 is medium risk, and 6–10 is high risk. Percentage risk according to each score was used as pretest probability. TEG and ROTEM Likelihood ratios (LR) were obtained from pooled data. Bayesian nomogram was used to obtain posttest probabilities. Absolute (ADG) and relative diagnostic gains (RDG) were calculated. Results: Meta-analysis data yielded in TEG sensitivity of 0.42 and specificity 0.94, LR+ 7, LR- 0.62. For ROTEM sensitivity 0.71, specificity 0.85, LR+ 4.73, LR- 0.34. Using TEG and ABC score results were: low risk POST 61%, ADG 43%; moderate 85%, high 100%, 1% respectively. Applying PWH score and TEG: low risk 64%, ADG 44%, moderate 68%, 45%, high risk 97%, 14.1% respectively. Using ROTEM and ABC score yielded low risk POST 51% ADG 53%, moderate 79%, 35%, high 100%, 1% respectively. Applying PWH score and ROTEM resulted in low risk POST of 54% 34%, moderate 59%, 36%, 1% respectively. Conclusions: Bayesian statistical analysis for the comparison of ABC and PWH score demonstrated a statistical superiority of PWH score, especially in high risk population using both TEG and TEG for the prediction of needing massive transfusion. For low and moderate risk there was no marked superiority. Limitations include data from meta-analysis and the retrospective nature of the data. Further validation is recommended.

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ACDC: PERFORMANCE ASSESSMENT OF 4T VS. HEP SCORE IN THE DIAGNOSIS OF HIT USING BAYESIAN ANALYSIS
Ariel Mejia, Laila Cochon, Amado Baez

Learning Objectives: Heparin Induced Thrombocytopenia (HIT) is a pathological entity that eludes experienced physicians. The objective was to compare the 4T and the HIT-Expert Probability score (HEP) validated by Point of Care HEP4 Immunoassay in assisting prediction of diagnosis utilizing Bayesian statistics. Methods: The 4T score incorporates Thrombocytopenia, Timing of onset of platelet fall, Thrombosis, or other causes of thrombocytopenia. The patient population was stratified: 0–3 points as low with 5% risk used as pretest probability, 6–8 as high risk with 64%. HEP score incorporates: Magnitude of fall in platelet count, timing of fall in platelet count/ days after heparin exposure, Thrombosis, Progression of pre-existing VTE/ATE while receiving heparin, Acute systemic reaction, Bleeding, or Other causes of thrombocytopenia. HEP score were low risk with 5 points representing a 2%, high risk was ≥2 points with a 50% risk of HIT. HEP4 Immunoassay was used as gold standard validation, sensitivity and specificity were obtained from pooled data and used to calculate likelihood ratio (LR). Percentage risk accord-
included who received rFVIIa (n=19, 38%), 3F-PCC/rFVIIa (n=9, 18%), or 4F-PCC (n=22, 44%), during the study period. The groups were well-matched regarding age, weight, sex, hospital and ICU length of stay, baseline coagulation labs, and characteristics of liver dysfunction. All patients in the rFVIIa and 3F-PCC/rFVIIa groups achieved an INR ≤1.6 within four hr of first CFC use. Eight patients (36.4%) in the 4F-PCC group met the same endpoint within four hr of administration. Transfusion requirements did not differ before and after CFC administration in all groups. TE complications occurred in eight (16%) patients. Conclusions: CFCs appear to be effective for the normalization of INR in patients with hepatic coagulopathy in the setting of active bleeding or prior to invasive procedures.

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EFFECTIVENESS AND SAFETY OF FOUR-FACTOR PROTHROMBIN COMPLEX CONCENTRATE IN CIRRHOTIC PATIENTS
Audrey Johnson, Caitlin Aberle, John Papadopoulos, Diana Esaias

Learning Objectives: Cirrhotic patients experience a disturbance in both procoagulation and anticoagulation factors, which can often lead to elevations in INR and serious bleeding. Currently, limited pharmacologic options exist for reversal of bleeding related to these coagulopathies. Four-factor prothrombin complex concentrate (4F-PCC) has little data supporting its use in cirrhosis, but has been used to facilitate hemostasis in emergent situations despite this lack of evidence.

Methods: This single centered, retrospective chart review was conducted comparing non-cirrhotic to cirrhotic patients with elevated INR who received at least 1 dose of 4F-PCC. Electronic charts of adult patients at a large, academic medical center were reviewed between January 2013 and May 2015 and data were compiled to assess effectiveness and safety of 4F-PCC in patients requiring reversal of elevated INR. The primary outcome was percent of patients reaching an INR ≤1.5 after the first dose of 4F-PCC. Other outcomes include INR after the first dose of 4F-PCC, time to first INR, time to INR ≤1.5, median INR at 12, 24, 48 and 72 hr, use of blood products, and adverse events. Results: A total of 60 patients were included. The cirrhotic group included 26 patients, while the non-cirrhotic group included 34 patients. 58% were male, median age was 75 with a median APACHE II score of 15, median baseline INR was 2.7, and 47% of all patients were on warfarin. The primary endpoint of percent reduction to INR ≤1.5 was 38% in the cirrhotic group vs. 70% (p=0.019). INR after 4F-PCC was higher in the cirrhotic group vs. the non-cirrhotic group (1.7 vs 1.4, p<0.002). INR at 12, 24, 48, and 72 hr were 1.9, 2.0, 1.9, and 2.0 in the cirrhotic group vs. 1.4, 1.3, 1.3, and 1.3 in the non-cirrhotic group (p=0.008, 0.003, 0.016, and 0.050). Use of blood products did not differ between the two groups. Median ICU length of stay was 6 vs. 3 days (p=0.123). Conclusions: Our study suggests that the use of 4F-PCC may not be as effective and may not have a sustained effect in reducing cirrhosis-induced elevations in INR.

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THE EFFECT OF TRANSFUSION OF CELL SAVER BLOOD ON ACTIVATED CLOTTING TIME IN CARDIAC SURGERY PATIENTS
Todd Dodick, Ross Gaudet, Jennifer Hofer, Michael O’Connor

Learning Objectives: In spite of the fact that cell saver technology has been used to facilitate hemostasis in emergent situations despite this lack of evidence. The purpose of this study is to characterize the efficacy and safety of PCC stratified by approved indication (AI) vs. off-label (OL) status. The hypothesis is that PCC is less efficacious when used for OL indications.

Methods: This retrospective multi-center chart review evaluated all patients who received PCC within the Seton Healthcare Family from October 2013 to March 2015. Patients were categorized as an AI for warfarin reversal and OL for reversal of dabigatran, rivaroxaban, apixaban, or non-anticoagulant coagulopathy, including cirrhosis and trauma. Results: A total of 84 patients were included (AI n= 55; OL n= 29), correlating with an OL prevalence of 34%. Baseline characteristics were comparable. LO use of PCC was less likely to achieve hemostatic efficacy at 24 hr (AI 80.4% vs. OL 57.5%; p<0.01). In univariate logistic regression, LO was associated with a lack of hemostatic efficacy (OR 0.15; 95% CI 0.05–0.43). Patients who received OL PCC had a trend toward increased all-cause, in-hospital mortality (AI 19.2% vs. OL 39.5%; p=0.05). Specificity, morality rates for warfarin (19.2%), novel anticoagulants (28.6%) and non-anticoagulant coagulopathy (71.4%) differed (p=0.02). Hemostatic efficacy was a predictor of mortality (OR 0.03; 95% CI 0.01–0.14). Only one patient experienced an in-hospital thrombotic (TE) event. Conclusions: PCC administered for non-warfarin reversal indications demonstrates reduced hemostatic efficacy. Considering TE risk and associated drug costs, these results suggest the need for thorough prognostication to prevent misuse of PCC, specifically for non-anticoagulant coagulopathy.

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Efficacy and Safety of 4-PCC for Coagulopathy Reversal Stratified by FDA Approval Status
Brady Helmink, Ben King, Truman Milling, Melissa Murphy, Irene Tabas, Manasa Murthy, Carrie Shuman, Mitchell Daley

Learning Objectives: In 2013, 4-factor prothrombin complex concentrate (PCC) was approved by the Food and Drug Administration (FDA) for the reversal of warfarin. Sixty yr after the introduction of warfarin, clinicians finally have an ideal antidote for reversal in life-threatening hemorrhage. Yet, the introduction of PCC has led to increased use for off-label indications, including novel anticoagulant or non-anticoagulant coagulopathy reversal, where supporting evidence is minimal. The purpose of this study is to characterize the efficacy and safety of PCC stratified by approved indication (AI) vs. off-label (OL) status. The hypothesis is that PCC is less efficacious when used for OL indications.

Methods: This retrospective multi-center chart review evaluated all patients who received PCC within the Seton Healthcare Family from October 2013 to March 2015. Patients were categorized as an AI for warfarin reversal and OL for reversal of dabigatran, rivaroxaban, apixaban, or non-anticoagulant coagulopathy, including cirrhosis and trauma. Results: A total of 84 patients were included (AI n= 55; OL n= 29), correlating with an OL prevalence of 34%. Baseline characteristics were comparable. LO use of PCC was less likely to achieve hemostatic efficacy at 24 hr (AI 80.4% vs. OL 57.5%; p<0.01). In univariate logistic regression, OL was associated with a lack of hemostatic efficacy (OR 0.15; 95% CI 0.05–0.43). Patients who received OL PCC had a trend toward increased all-cause, in-hospital mortality (AI 19.2% vs. OL 39.5%; p=0.05). Specifically, morality rates for warfarin (19.2%), novel anticoagulants (28.6%) and non-anticoagulant coagulopathy (71.4%) differed (p=0.02). Hemostatic efficacy was a predictor of mortality (OR 0.03; 95% CI 0.01–0.14). Only one patient experienced an in-hospital thrombotic (TE) event. Conclusions: PCC administered for non-warfarin reversal indications demonstrates reduced hemostatic efficacy. Considering TE risk and associated drug costs, these results suggest the need for thorough prognostication to prevent misuse of PCC, specifically for non-anticoagulant coagulopathy.
at 35–49% or ≥50% of systolic blood pressure, respectively. All echo’s were compared to data from routine pre-transplant echo’s. Results: Over a 2-year period 70 SCT recipients needed PICU admission. The median PRISM score on PICU admission was 11 (IQR 7–14). Echo abnormalities were found in 67% (47/70) of patients. Twenty-four patients (34%) were noted to have elevated RV pressure; of these, 20% (14/70) were at PH while 14% (10/70) had PH. Depressed LV function was noted in 51% (22/47) while moderate to large pericardial effusions were present in 13% (9/70) of patients. Of those with effusions 67% (6/9) needed pericardial drain placement. There was no difference in the incidence of abnormal echo’s in patients with TA-TMA when compared to those without TA-TMA (69% vs. 62%), RR 1.1 (0.8–1.6), PICU mortality for this cohort was 51% (36/70). Patients with abnormal echo’s had a higher mortality (55%, 26/47); however this difference was not significant when compared to those with normal echo’s (43%, 10/23), RR 1.3 (0.7–2.2). Conclusions: Echo abnormalities are common in SCT recipients needing PICU admission with a trend towards higher mortality in those with abnormal echo’s. Hence, utilization of echo screening may allow early detection and timely intervention in this high-risk cohort.

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PREVENTORS OF RE-EXPLORATION FOR BLEEDING AFTER LIVER TRANSPLANT: A 3 YEAR MAYO CLINIC EXPERIENCE
Devang Sanghavi, Bibeik Panu, Rahul Kashyap, Kumar Sarvottam, Julie Heimbach, Vivek Iyer

Learning Objectives: Liver transplantation (LT) is a complex surgery with potential for a number of short term complications including bleeding. The need for re-exploration for bleeding following LT is associated with increased morbidity and costs. There are currently no definitive markers which are predictive of an individual patient’s risk for re-exploration for bleeding following LT and the goal of this study was to identify the pre and intra-operative factors that could help predict this risk.

Methods: Retrospective analysis of all patients who underwent LT from January 2012 to December 2014. A total of 313 patients (including pediatric subjects) comprised the study cohort. A total of 72 patients underwent re-exploration following LT of which 35 patients underwent re-exploration primarily for bleeding (re-exploration group). We compared the demographics, preoperative and intraoperative clinical and laboratory markers between the re-exploration vs. non-re-exploration groups. Results: A number of pre-operative factors including age, sex, MELD, MELD-Na, APTT, INR, total bilirubin, creatinine, eGFR, hemoglobin, ESRD on hemodialysis and platelet count did not differ between the two groups (P > 0.05). Intra-operative transfusion requirements including platelets (P = 0.002), FFP (P < 0.0001), Cryoprecipitate (P = 0.007) and PRBC’s (P = 0.01), amount of ascites (P = 0.004) and 5% albumin infusion (P = 0.02) all positively co-related with a risk for re-exploration for bleeding. The APACHE III score was also significantly higher in the re-exploration group (214.4 vs. 148.6, P < 0.01). In contrast, operating room variables including total crystalloid administration, urine output, autologous RBC transfusion (ml), pH and bicarbonate values did not correlate with the risk of re-exploration.

Conclusions: Our data suggest several important pre-operative and intra-operative variables including MELD, MELD-Na, hemodialysis dependence, urine output, etc. are not predictive of re-exploration risk. The volume of ascites evacuated and volume of intra-operative blood products appear to be the strongest predictors of re-exploration for bleeding.

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RESPIRATORY PATHOGEN EFFECT ON INTUBATED PEDiATRIC PATIENTS AFTER HEMATOPOIETIC STEM CELL TRANSPLANT
Shira Gerza, Christine Duncan, Jerelyn Moffet, Kris Mahadeo, Ira Cheifetz, Robert Tamburro, Courtney Rowan, PALISI Subsection on HSCT

Learning Objectives: Infection is a major risk factor for respiratory failure in the immunocompromised patient. We hypothesize that despite improvements in antimicrobial prophylaxis and therapies, outcomes remain poor for pediatric hematopoietic stem cell transplant (HCT) patients with respiratory failure secondary to infectious organisms. Methods: 12 centers contributed up to 25 pediatric allogeneic HCT recipients requiring mechanical ventilation to a retrospective database. Abstracted data included demographics, diagnoses, respiratory parameters and outcomes. Positive respiratory cultures with source (sputum, tracheal aspirate, bronchial alveolar lavage, etc) were recorded. Outcomes of those with respiratory pathogens were compared to those without. Results: There are 222 patients in the database, ages 1 month to 21 yr, of whom 44% are female; 35% had a respiratory pathogen and 31% of those had more than one organism present. 47% of the pathogens were viral, 34% bacterial, 18% fungal and 1% parasitic. There were 14 genera of bacteria represented, 9 different vira, 7 genera of fungi and 1 parasite. The presence of a respiratory pathogen was associated with a 69% PICU mortality vs 44 %, p = 0.046 (OR 1.8 95% CI 1.01, 3.2). Mortality was independent of the number of organisms present. The presence of a viral pathogen led to a mortality of 70%, a fungal pathogen 78% and bacterial pathogen 60%. Patients with a respiratory pathogen had longer PICU lengths of stay at 20 days (IQR 14.0, 36.8) vs 15 (IQR 6.5, 32.0), p=0.002, longer lengths of mechanical ventilation at 17 days (IQR 10. 29.5) vs 8 (5.17) p<0.0001 and more frequent use of HFOV at 48.7% vs 32.6%, p= 0.02 when compared to those with no respiratory pathogens.

Conclusions: Despite improved antimicrobial therapy and prophylaxis, in this multicenter retrospective cohort of intubated pediatric post HCT patients, the presence of a respiratory pathogen is associated with higher mortality, longer PICU stays and increased duration of mechanical ventilation.

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FLUID OVERLOAD IS NOT ASSOCIATED WITH MORTALITY IN PEDIATRIC HEMATOPOIETIC CELL TRANSPLANT PATIENTS
Julie Fitzgerald, Emily Pinos, Robert Tamburro, Deyin Hsing, Ira Cheifetz, Mara Nitu, Courtney Rowan, PALISI Subsection on HSCT

Learning Objectives: Fluid overload (FO) has been associated with increased duration of ventilation and death. We hypothesized that FO over the first 3 days of intubation would be associated with increased mortality and ventilator days in pediatric hematopoietic cell transplant (HCT) patients with acute respiratory failure. Methods: We performed a retrospective cohort study of 216 allogeneic HCT patients <21yr ventilated ≥1 day between 2009–2013 at 12 US hospitals. The primary outcome was ICU mortality; secondary outcome was ventilator days. %FO was calculated as (%total intake – total output in liters over 3 days)/weight x 100. Chi-square and Wilcoxon rank-sum tests and logistic and linear regression were used to analyze the association of fluid balance and outcomes. Results: Patients were intubated a median of 11 days (IQR 2, 25) and ICU mortality was 60%. Median fluid administration on the day of intubation was 103ml/kg (IQR 72, 146). After 3 days of ventilation, 81% had positive fluid balance, 44% had ≥20% FO and 17% had ≥20% FO. In survivors compared to nonsurvivors, after 3 days of ventilation there was no difference in proportion of patients with positive fluid balance (78% vs. 84%, p=0.3), ≤10% FO (43% vs. 45%, p=0.7), ≥20% FO (15% vs. 19%, p=0.5), or in net fluid balance (median +75 [IQR 6, 138] vs. +81 [IQR 24, 150] ml/kg, p=0.4). Renal replacement therapy (RRT) was used more often in nonsurvivors (43% vs. 28%, p=0.03). In multivariable logistic regression controlling for use of vasoactive infusions and high frequency ventilation as markers of illness severity, neither RRT nor 10% or 20% FO were associated with increased ICU mortality: aOR 1.6, p=0.14; aOR 1.1, p=0.7; aOR 1.0, p=0.9, respectively. Net fluid balance per kg after 3 days of ventilation was also not associated with increased ventilator days (OR 1.0, p=0.5).

Conclusions: FO was not associated with death or duration of ventilation in this cohort of pediatric HCT patients with acute respiratory failure. Mortality was high, and multiple other disease factors aside from fluid balance likely contributed more to poor outcomes in this population.

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EFFECT OF PROCALCITONIN ON MONOCYTE LPS RESPONSE
Katherine Bline, Jennifer Muszynski, Elizabeth Ireson, Jyotsna Nateri, Kristin Greathouse, Lisa Hanson-Huber, Mark Hall

Learning Objectives: Reduced capacity of monocytes to make tumor necrosis factor (TNF) in the setting of ex vivo stimulation with lipopolysaccharide (LPS) has been repeatedly shown to be associated with adverse outcomes from critical illness. Plasma levels of procalcitonin (PCT) are known to be elevated in the setting of bacterial infection and PCT is thought to bind and deactivate LPS.
Hypothesis: PCT can interfere with ex vivo LPS stimulation assay performance, resulting in spuriously low results. **Methods**: Evaluation of the effect of PCT (0.1, 0.5, 2, 10, 50, 100 ng/ml) on monocytes: 1x10⁷ monocytes isolated from healthy adult donors were pretreated for 18 hr with recombinant human PCT at 37°C, washed, and incubated with LPS (1 ng/ml) for 4 hr. Evaluation of the effect of PCT on a clinically-used, standardized whole blood LPS-stimulation assay: whole blood from healthy adult donors was incubated with LPS (500 pg/ml) +/- PCT (as concentrations noted above) for 4 hr at 37°C. For both experiments, control tubes containing the immunosuppressant IL10 (10 ng/ml) or media without PCT were used. All experiments were done with ≥ 3 replicates using different donors. The recombinant PCT was found to be endotoxin free by Endotox assay (≤0.001 EU/ml). TNFα was measured by chemiluminescence. **Results**: There was no relationship between [PCT] and TNFα production capacity by isolated monocytes or whole blood. This suggests that reductions in immune response seen in α production capacity for monocytes [PCT(ng/ml)/median TNF α] were more than 400 and no significant difference between before and after α production (499 ± 91 and 429.9 ± 54). Mean arterial blood pressure were 86.9 ± 19 mmHg and 84 ± 18 mmHg before and after the test, respectively. During the intervention and following observation, arrhythmia or pulmonary complication had not occurred. **Conclusions**: We suggest a novel method of apnea testing which is a simple and easy technique by using ambu bag with PEEP valve to maintain a PEEP during the apnea test. This method shows vital signs of the patients remained hemodynamically stable and prevention of deterioration of respiratory oxygenation.

**419** FLUID OVERLOAD PREDICTS INTUBATION DURATION IN INFANTS AND CHILDREN FOLLOWING LIVER TRANSPLANTATION

Mihaela Damian, Deborah Franzon

**Learning Objectives**: Although each year~500 infants and children receive liver transplantation, there is limited data on perioperative management of these critically ill patients. The objective of the current study was to determine the relationship between fluid overload and length of mechanical ventilation and length of stay in the ICU (LOS) in children following liver transplantation. **Methods**: This was a single center, retrospective observational analysis of infants and children receiving liver transplantation from January 1 to December 31, 2014. 35 patients, age 1 month to 18 yr old (YO)(average 6 YO, median 3 YO), following liver transplantation at Stanford Lucile Packard Children's Hospital were enrolled. All patients were admitted to the PICU after the surgery and they were mechanical ventilated until they had stable hemodynamics and graft function. **Results**: A total of 101,462 SCTs were performed. IC, overall rates, year of low to high, included: SA(19%, 15.4% in 2007 to 23.3% in 2009); MS(8.6%, 6.5% in 2005 to 10.9% in 2010); BI(13.3%, 11.1% in 2008 to 16.9% in 2009); PN(7.2%, 4.7% in 2006 to 9.3% in 2010); any of the IC(32.8%, 29.6% in 2004 to 37% in 2010), respectively. SCTs performed in year 2010(OR=1.5, 95% CI=1.0–2.16, p=0.02) and y2009(OR=1.04, 1.21–2.11,p=0.01) were associated with higher odds for SA when compared to in y2007. SCTs performed in y2010 (OR=1.65, 1.26–2.16, p<0.01), y2008(OR=1.31, 1.03–1.67,p=0.03), y2007(OR=1.43, 1.05–1.94, p=0.02), or y2006 (OR=1.55, 1.03–1.87,p=0.03) were associated with higher odds for MS when compared to y2005. SCTs performed in y2010(OR=1.32, 1.03–1.68,p=0.03), y2009(OR=1.57, 1.20–2.04,p=0.01), or y2006(OR=1.36, 1.07–1.73,p=0.01) were associated with higher odds for BI when compared to in y2008. SCTs performed in y2010(OR=1.84, 1.32–2.56,p=0.01), y2009(OR=1.58, 1.17–2.15,p=0.01), y2008(OR=1.63, 1.19–2.24,p=0.01), or y2007(OR=1.42, 1.09–1.86,p=0.01) were associated with higher odds for PN when compared to in y2006. **Conclusions**: IC are common in hospitalized SCT recipients and increased over time during the study period. Our findings have clinical implications.
fast-tracking strategy, whereas others prefer mechanical ventilation in ICU as their routine patient management in the postoperative period.[1] Generally, the term “early extubation” is applied when the endotracheal tube is removed within 6 to 8 h after the surgery.[2] Fast-tracking and early extubation events have been described in patients undergoing various cardiac surgeries; however, criteria for patient selection have not been validated in a prospective manner.[3] Ultra fast-track extubation (UFE) group was defined by extubation inside operating room right after surgery. Late extubation group was defined by patients who were not extubated in operating room and transferred to post operation cardiac care unit (CCU) to extubate. Results: The mean cardiopulmonary bypass time was 136.8 ± 25.7 min in ultra-fast extubation and 145.3 ± 29.8 min in late extubation patients (P = 0.05). Mechanical ventilation duration (days) was 0 days in ultra-fast and 2.31 ± 1.8 days in late extubation. Length of ICU stay was significantly higher in late extubation group (4.2 ± 1.2 days) than the UFE group (1.72 ± 1.5 days) (P = 0.02). In survival analysis there was no significant difference between ultra-fast and late extubation groups (Log-rank test, P = 0.9). Conclusions: Patients undergoing cardiac transplant could be managed with “ultra-fast-track extubation”, without increased morbidity and mortality.

Research Snapshot Presentations: Infectious Disease

421 VIRUS-ASSOCIATED PNEUMONIA INCREASES MORTIBILITY IN CRITICALLY-ILL CHILDREN
Ilana Harwayne-Gidansky, Joy Howell, Thyssar Ravindranath, Lisa Saiman, John Baird

Learning Objectives: Acute respiratory viral tract infections (ARVI) are an important cause of morbidity in the PICU. However, the association between clinical presentation and illness severity remains poorly described in children requiring intensive care. We hypothesized that in children with ARVI, a clinical diagnosis of pneumonia would be associated with increased severity of illness as defined by respiratory failure, need for invasive mechanical ventilation, PICU and hospital length of stay and in-hospital mortality. Methods: We performed a retrospective review of children ≤2 yr of age, requiring PICU admission with a positive viral PCR test (Respiratory Viral Panel, Biofire) in a single PICU between 2010 and 2013. We described and analyzed the clinical characteristics of infected children. Odds ratios and 95% confidence intervals (95% CI) were computed for categorical variables. Logistic regression was used for the multi-variable analysis. Results: During the study period 340 patients were admitted to our PICU with a positive RT-PCR test. Patients with pneumonia had an increased risk of acute or acute on chronic respiratory failure (OR 3.0, 95% CI 1.8–5.0, p = 0.001), treatment with invasive mechanical ventilation (IMV) (OR = 4.1, 95% CI = 2.4–6.9, p = 0.001), a longer duration of IMV (mean 20.9 days vs. 5.8 days, p = 0.001), and a longer PICU length of stay (mean 16.8 days vs. 11.0 days, p = 0.001). Those with pneumonia had greater in-hospital mortality when compared with other respiratory diagnoses. In a multivariate analysis, children with a neuromuscular condition or cancer were associated with higher odds of being diagnosed with pneumonia (OR = 2.8, p = 0.012, OR 3.0, p = 0.016 respectively). Conclusions: Our data suggest that for children admitted to the PICU, the clinical diagnosis of pneumonia associated with respiratory viral pathogens results in an increase in morbidity and mortality, particularly in medically fragile children such as those with a neuromuscular condition or cancer.

422 IN VITRO TEDIZOLID ACTIVITY AGAINST GRAM-POSITIVE ISOLATES FROM PATIENTS WITH NOSOCOMIAL PNEUMONIA
Mekki Bensaci, Taylor Sandison, David Farrell

Learning Objectives: Nosocomial pneumonia is associated with high mortality despite improved antimicrobial therapy. Gram-positive organisms, such as methicillin-resistant and –susceptible Staphylococcus aureus (MRSA, MSSA), and Streptococcus pneumoniae, are key causative pathogens. Tedizolid (TZD) phosphate, approved for treatment of ABSSSI, is being evaluated for treatment of MRSA, and was at least 4-fold more potent than LZD against all Gram-positive pathogen groups. For S. aureus, MRSA, and MSSA, the range/MIC90 for TZD were 0.03–0.25/0.12 µg/mL (TZD80) and 0.03–0.5/0.25 µg/mL (TZD100). With LZD, range/MIC90 were 0.12–0.8/0.5 µg/mL (LZD80) and 0.12–3.2/1 µg/mL (LZD100) for all S. aureus and MRSA; 0.25–2/1 µg/mL (LZD80) and 0.5–4/2 µg/mL (LZD100) for MSSA. For S. pneumoniae, the range/MIC90 for TZD were 0.015–0.25/0.25 (TZD80) and 0.015–0.5/0.25 µg/mL (TZD100); for LZD, ≤0.12–2/1 µg/mL (LZD80) and ≤0.12–2/1 µg/mL (LZD100). All Gram-positive isolates had MIC ≤0.5 µg/mL; 1 MRSA isolate was LZD resistant. Conclusions: TZD retained potent activity against recent isolates of Gram-positive pulmonary pathogens, including MRSA, and was at least 4-fold more potent than LZD.

423 VALIDATION AND OUTCOMES OF RAPID MOLECULAR DIAGNOSTIC TECHNOLOGY IN CULTURE-POSITIVE STERILE FLUIDS
Janelle Juul, Blake Buchan, Nate Ledeboer, David Milia, William Peppard

Learning Objectives: Virigenic (VG) blood culture (BC) assays identify 16 gram-positive (GP) and negative (GN) bacterial genera or species and 9 associated genetic markers of antibiotic resistance directly from positive BC. Traditional methods require 24–48 h for organism identification and an additional 24–48 h to determine resistance. Rapid identification technologies are associated with reductions in time to optimal antibiotic therapy, length of hospital stay, and 30-day mortality in patients with bloodstream infections. VG is FDA-approved for use with positive BC; however, given the similarities in culture methods between blood and sterile fluid samples, VG is predicted to be reliable for analysis of sterile fluid specimens. Methods: A single-center, retrospective validation study was performed for adult patients with positive sterile fluid cultures between November 2014 and March 2015. The primary outcome was clinical performance of the VG assays for identification of bacteria in sterile fluid inoculated to VersaTREK broth culture. The time to optimal therapy was compared between VG and traditional culture and susceptibility methods. Results: Both cultures of 62 sterile fluids including abdominal (n = 38), pleural (n = 8), and joint (n = 7) were included in the validation study. VG was 98.0% sensitive and 99.0% specific for identification of the organism in cultures containing GP (n = 44) or GN (n = 14) bacteria. Sensitivity for detection of resistance markers, including 10 mecA and 6 vanA/B, was 100%. Five cultures contained both GP and GN bacteria in which VG was only 55.5% sensitive in identifying all bacteria present. Of the 31 patients receiving empiric antibiotics, the mean time to optimal therapy would have been reduced from 5 h to 22 h, p = 0.001. VG results would have prompted broadening of 12.9% and narrowing in 45.2% of patients. Narrowing therapy would have resulted in a cost savings of $83 (12%, p = 0.53) per patient. Conclusions: VG allows for rapid bacterial identification resulting in a potentially significant reduction in time to optimal antimicrobial therapy for patients with positive sterile fluid cultures.
 ATTRIBUTABLE RISK AND TIME COURSE OF COLISTIN ASSOCIATED ACUTE KIDNEY INJURY: FOCUS ON EARLY EVENTS

Todd Miano, Ebbing Lautenbach, F. Perry Wilson, Wensheng Guo, Yuliya Borovskiy, Sean Hennessy

Learning Objectives: Despite colistin’s longstanding reported association with acute kidney injury (AKI), the attributable risk and onset of toxicity are still unknown. Whether colistin causes substantial toxicity during the initial 72 hr of treatment has major implications for empiric treatment decision.

Methods: We conducted a retrospective cohort study in a population of patients treated for multi-drug resistant Pseudomonas, Klebsiella, or Acinetobacter spp. Colistin exposed patients were matched to control patients using propensity scores. AKI was defined according to the Kidney Disease: Improving Global Outcomes (KDIGO) criteria. Incidence rate ratios (IRR) and risk differences (RD) of AKI in the propensity-matched cohort were examined using a multilevel poisson regression model.

Results: The cumulative incidence of toxicity at the end of follow-up was 46.7% in colistin patients vs. 19.8% in controls, (RD 26.9%, 95% CI 1.2–3.8), corresponding to a number needed to harm (NNH) of 3.7. Importantly the onset of colistin toxicity was rapid. AKI was significantly elevated in colistin patients at 72 hr of exposure, (IRR 2.1, 95% CI 1.2–3.8). Significant effect modification of colistin’s toxicity was observed by baseline hemoglobin and chloride concentrations. Conclusions: Colistin is associated with substantial excess AKI that is apparent within the first 72 hr of treatment. This rapid onset toxicity makes empiric use of colistin challenging. These data highlight the dire need for novel antibiotics with activity against MDR gram-negative pathogens.

Conclusions: Colistin’s toxicity varied according to baseline hemoglobin and chloride concentrations, factors that may alter renal oxygenation.

EFFECT OF SEIZURE PROPHYLAXIS IN LACROSSE ENCEPHALITIS

Franklin Huggins, Glorimar Rivera

Learning Objectives: The La Crosse virus (LACV) is a mosquito-transmitted virus responsible for encephalitis. Patients diagnosed with LACV encephalitis are at risk for poor neurologic outcomes and possible long-term complications. Previous studies suggest that approximately 46% of patients with LACV encephalitis will develop seizures, which has been associated with prolonged hospital length of stay (LOS), and mortality. Currently, the treatment of LACV encephalitis is principally supportive care but prophylaxis against seizures has been employed in an attempt to improve morbidity associated with those seizures. There are no data currently describing the impact of prophylaxis on the incidence of seizures, LOS or mortality.

Methods: We retrospectively reviewed medical records from 127 patients admitted during the study period who had positive LACV antibody titers or who had a discharge diagnosis of LACV encephalitis. We collected data on incidence and timing of seizures, administration of antiepileptic drugs, LOS, ICU LOS and mortality. The study was approved by the Charleston Area Medical Center institutional review board.

Results: Patient baseline characteristics were similar between groups. Of the 127 patients that met the inclusion criteria, 29 (22.8%) received seizure prophylaxis and 98 (77.2%) did not. Seizures occurred in 53.1% (52/98) of patients who did not receive prophylactic anti-seizure medications and 6.9% (2/29) patients who received prophylaxis (p <0.001). Median length of stay was the same for both groups at 4 days. There was one death in the study population, in the non-prophylaxis group. Conclusions: In LACV encephalitis, patients who received seizure prophylaxis had a reduced frequency of seizures. However, the use of seizure prophylaxis did not improve patient outcomes in terms of length of stay and mortality when compared to patients who do not receive seizure prophylaxis medications.

EPIDEMIOLOGY AND OUTCOME OF CHILDREN WITH NECROTIZING FASCIITIS

Balagangadhar Totapally

Learning Objectives: Necrotizing fasciitis (NF) is an uncommon but a serious condition in children. The objective of this study was to review the epidemiology and outcome of children with a discharge diagnosis of NF using the Kids Inpatient Database (KID)-2009.

Methods: The KID is one of the databases developed for the Healthcare Cost and Utilization Project which utilize discharge abstracts generated by hospitals for billing. Children aged 1 mo to 21 yr with a diagnosis of NF were analyzed. Descriptive, univariate, and multivariate analyses were performed. Data were weighted to give national estimates. Results: A total of 464 cases of NF were identified out of a 3,035,490 (prevalence-1.5/10,000) discharges. 42% were females, 3% had a compartment syndrome (most in lower extremity), and 49% documented a bacterial infection (15% MRSA, 27% any staphylococcal, 11% Streptococcal, and 5% with gram negative infection). Severe sepsis/septic shock was present 18% of the cases and 17% needed mechanical ventilation. The median (IQR) age, length of stay, and charges were 16 (8–19) yr, 9 (4–20) days, and 58,193 (25,517-150870) dollars, respectively. One or more procedures involving skin incision were done in a majority (75%) of the patients. NF was more prevalent among males and in low income quartile population (p<0.001). The overall mortality rate was 4.8%. On univariate analysis the mortality was higher among females (7.7% vs 2.6%; p<0.001), Hispanics (12.6%), with absence of a diagnosis of a bacterial infection (6.9% vs 1.6%; p<0.01), with presence of severe sepsis/septic shock (19.5% vs 1.6%; p<0.001), and with the need for mechanical ventilation (16.1% vs 2.4%, p<0.001). On multivariate analysis only the gender (females) and the presence of severe sepsis/septic shock were associated with increased mortality. Conclusions: This study describes the prevalence and the mortality rate of NF in children in US. MRSA is the most common bacterial infection associated with NF. The presence of severe sepsis/septic shock and female gender increase the risk of mortality associated with necrotizing fasciitis.
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EGF GENE UPREGULATION PERIPHERAL WHITE CELL GENE expression in children with meningococcal sepsis

Aarsh Rashid, Mike Hubank, Antonia Kwan, Nigel Klein, Syed Ifikhar, Mark Peters, Paul Heath

Learning Objectives: Previously we reported the transcriptional pattern of five children with Meningococcal sepsis (MenS) [1]. We commented on the fall of Oxidative phosphorylation gene expression [2]. To compare the differential gene upregulation of the EGF (Epidermal Growth Factor) pathway in non-survival versus survivors, we now apply transcriptome-wide conditional filtering. Methods: 5 children (P1-P5) with MenS (4 confirmed and 1 clinically assumed) had blood samples taken at admission (designated 0hr), 4, 8, 12 and 48hr (T1-T5). Blood collected was mixed with PAXgene RNA reagent and then frozen at -80°C. RNA was extracted and checked by spectrophotometry and capillary electrophoresis. Dataset filtering was applied, with each patient compared against the rest on a transcriptome wide-basis. DAVID Bioinformatics Resource 6.7 (NIH) analysis was then undertaken to analyse the EGF gene cluster. Results: 33,297 probe sets from 29 Human Gene 1.0 ST Arrays were generated and then compared. The data were log base 2 normalized (ArrayExpress database E-MEXP-3850). Normalized and log2 converted box plots showed a standardized dataset with a maximal signal density at 7.0. Subsequent analysis was represented in the form of heat maps and cluster dendograms. Further statistical filtering was applied to the whole expressed transcriptome, with respect to each patient (P1-P5) and time points (T1-T5) against the rest of the dataset (P-value <0.005). Using DAVID (Identifier Affymetrix Exon Gene ID) EGF upregulation was noted in survivors with enrichment scores of 1.1 (PT2), 2.17 (PT3), 1.93 (PT4) and 2.08 (PT5) versus the non-survivor PT1 who did not demonstrate significant upregulation of the EGF gene cluster. Conclusions: Peripheral white cell microarray time series data in children with MenS, when filtered and then enriched, demonstrated the survival group to have significant upregulation of the functional EGF gene cluster. [1] Transcriptional instability - PLoS ONE 2013 8(3): e60501. doi:10.1371/journal.pone.0060501 [2] Oxidative phosphorylation gene expression - Intensive Care Med. 2015 Apr 29 Epub.

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RESPIRATORY PATHOGENS IN CHILDREN WITH ACUTE RESPIRATORY DISTRESS IN GHANA

Katie Giesler, Frank Baiden, Harry Tagbor, Rachel Moresky, Philip LaRussa, Patrick Wilson

Learning Objectives: Acute respiratory infection is a leading cause of death in children in low- and middle-income countries. Accurate epidemiological data is required for effective clinical management and future vaccine development. We aim to describe the prevalence of a broad panel of common respiratory pathogens in children presenting with acute respiratory distress (ARD) in two district hospitals in Ghana. Methods: Children one month to five yr of age presenting to two district hospitals in Ghana with ARD as defined by tachypnea for age and use of accessory muscles were eligible to participate. 480 children one month to five yr of age presenting to two district hospitals in Ghana with ARD as defined by tachypnea for age and use of accessory muscles were eligible to participate. 480 breaths per minute, 158 beats per minute and 98%, respectively. 54.6% were for 17 common respiratory tract viruses and three bacteria using FilmArray for 17 common respiratory tract viruses and three bacteria using FilmArray respiratory panel nested multiplex PCR. Results: Median age, weight, respiratory rate, heart rate and oxygen saturation were 17.1 mo, 9.4 kilograms, 56 breaths per minute, 158 beats per minute and 98%, respectively. 54.6% were male. 26% of the 480 (61.7%) nasopharyngeal specimens tested detected at least one respiratory pathogen and 46 detected ≥ 2 pathogens (9.6%). Four patients had concomitant viral/bacterial co-infections. Rhinovirus/Enterovirus was the most common microbial pathogen detected (59.5%) followed by Respiratory Syncytial Virus (RSV) (9.2%), Parainfluenza Virus 3 (7.2%), Human Metapneumovirus (6.1%), Coronavirus NL63 (4%), and Coronavirus OC43 (3.2%). The remaining pathogens each represented less than 3%. Most RSV cases (27/32) were detected in the mo of July and August. Conclusions: A majority of children presenting to two district hospitals in Ghana with acute respiratory distress had evidence of a viral respiratory pathogen. The predominant virus detected was Rhinovirus/Enterovirus. RSV rates were very low except for the mo of July and August. Further studies are required to better understand the epidemiology of respiratory pathogens in children living in low- and middle-income countries.

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BACTERIAL ISOLATE COMPARISON FROM ENDOTRACHEAL TUBES AND TRACHEAL ASPIRATES IN PEDIATRIC PATIENTS

Kello Tarquinio, Curtis Travers, Kerry LaPlante

Learning Objectives: Rapid colonization of bacterial biofilm on endotracheal tubes (ETT) contributes to ventilator-associated pneumonia (VAP) pathogenesis. Although tracheal aspirate (TA) samples are often used to diagnose VAP, few studies examine the relationship between ETT biofilm and TA isolates in pediatrics. Our primary objective was to evaluate the association of microbiological isolates from extubated ETTS and TAs in PICU patients. Methods: This prospective observational study was conducted in a single PICU. Consent was obtained from guardians of critically ill children requiring more than 48 hr of intubation. Considering the confounding effect of antibiotics, we compared only TA isolates within 3 days of extubation. Kruskal-Wallis tests with post hoc analyses were performed to compare microorganisms from ETTS and TAs. Results: A total of 166 ETT and 110 TA cultures were analyzed. More than half of intubations (n=96, 57.8%) were due to a respiratory etiology. Intubation duration was a median of 6.0 days (interquartile range (IQR) 4.0 - 9.0). Median ETT size was 3.5mm (IQR 3.5 - 5.0) with frequent suctioning procedures (mean ± standard deviation; 12.8 ± 4.1 times per day). Multiple isolates were identified from 144 ETTS, with S. aureus (n=31, 18.7%), S. epidermidis (n=21, 12.7%), Candida albicans (n=19, 11.5%) and P. aeruginosa (n=14, 8.4%) being the most common. Among 64 TA isolates available within 3 days of extubation, 16 cultures were positively matched with S. aureus (% agreement 81.8%), E. cloacae (97.7%), K. pneumoniae (93.2%), M. catarrhalis (93.2%), P. aeruginosa (97.7%) and S. maltophilia (100%). Percentage agreement for no growth was 59.1%. S. aureus was more frequently identified on smaller ETTS (3.5 mm, IQR 3.0-4.0) and C. albicans on larger ETTS (5.5mm, IQR 4.0-5.5) (p= 0.024). Conclusions: Pathogens on ETT and TA cultures were concordant for S. maltophilia, P. aeruginosa, E. cloacae, M. catarrhalis, K. pneumoniae and S. aureus cultures. Clinicians should interpret “no growth” from TA cultures with caution.

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CHLORHEXIDINE BATHING EFFECTS ON NOSOCOMIAL INFECTIONS IN ICUs: A META-ANALYSIS

Ha Yeon Kim, Sungwon Na, Jeongmin Kim

Learning Objectives: To assess the effects of chlorhexidine (CHG) bathing on the prevention of nosocomial infection in critically ill patients. Methods: We performed a systematic review using a meta-analysis. We searched electronic databases including PubMed, Embase, and the Cochrane database for all publications on daily CHG bathing and central line associated blood stream infection (CLABSI), methicillin-resistant Staphylococcus aureus (MRSA), and vancomycin-resistant enterococcus (VRE) risk. Two reviewers independently assessed studies for inclusion and extracted data. The Cochrane Collaboration methodology was used. Risk ratios (RRs) with 95% confidence intervals (CIs) were estimated. Results: Eighteen trials were included. The RR (95% CIs) for CLABSI, MRSA, and VRE on comparing CHG bathing with conventional care in the meta-analysis were 0.45 (0.37-0.55; p < 0.001), 0.67 (0.59-0.77; p < 0.001), and 0.60 (0.42-0.85; p = 0.004), respectively. The effect of risk reduction was decreased as short-term studies were accumulated in the cumulative meta-analysis. No significant publication bias was found. Conclusions: Daily CHG bathing was associated with reduced risks of CLABSI, MRSA, and VRE acquisition. Especially, in acquisition of MRSA, the preventive effect of CHG bathing was more remarkable in studies with a longer intervention period.

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INFECTIOUS COMPLICATIONS ASSOCIATED WITH PEDIATRIC CARDIAC ARREST: A MULTICENTER REPORT
Faisha Saeed, Pippa Simpson, Liyuan Zhang, Joanne Claviera, Michael Meyer

Learning Objectives: Outcomes differ between pediatric Out-of-Hospital (OH CA) and In-hospital (IH CA) cardiac arrests. Our study describes the infectious complications in children following CA prior to the routine use of interventional hypothermia. Hypothesis: Children with OH CA have a higher incidence of infections after return of spontaneous circulation (ROSC) and worse outcomes compared to children with IH CA. Methods: Retrospective analysis of existing de-identified, multi-institutional database held by Pediatric Emergency Care Applied Research Network (PECARN) collected between July 1, 2003 and December 31, 2004 consisting of 491 CA requiring at least 1 minute of CPR. Excluded subjects included septic shock diagnosis, use of therapeutic hypothermia, or death within 24 hr of arrest. Patients were characterized as having suspected infection if they received antimicrobials or were cultured, and definite infection if culture positive. Chi-square test was used to examine relationship between categorical variables and logistic regression to investigate predictors of outcomes. Results: Study cohort was 269 IH CA and 115 OH CA subjects. More patients were suspected of having an infection post ROSC in IH CA vs OH CA groups (90% vs 74%; p < 0.0001), few had cultures sent (IH CA 34%; OH CA 35%). In those cultured, definite infection rates were similar (IH CA 82%; OH CA 86%). There was no association between suspected infection and mortality (IH CA p = 0.58; OH CA p = 0.53) or between definite infection and mortality (IH CA p = 0.68; OH CA p = 0.68). Definitive infections were associated with a respiratory etiology for CA (Odds ratio 2.6; 95% C.I. 1.4 – 4.9) and CVP monitoring post-CA (Odds ratio 2.1; 95% C.I. 1.1 – 3.9). Conclusions: Antimicrobial usage was prevalent in children following CA, regardless of arrest location. When cultures were obtained, the majority of patients had definitive infection and suggests a potential significant prevalence of infection post-CA. There was no significant difference in infection incidence or association with outcome based on CA location in this study cohort.

RESISTANCE PATTERNS OF UROPATHOGENS IN PATIENTS WITH URINARY TRACT INFECTIONS PRESENTING TO THE ED
Sarah Albers, Elizabeth VanWerr, Rachel Leis, Deidre Rohaley

Learning Objectives: With increasing resistance to antibiotics used for urinary tract infection (UTI) treatment, the 2010 Infectious Diseases Society of America (IDSA) guidelines recommends empiric antibiotic therapy for UTIs be based on local resistance prevalence. The primary objective of this study was to compare resistance patterns for urinary isolates in the emergency department (ED) to the adult inpatient antibiogram. Appropriateness of empiric therapy based on culture results and guideline recommendations were also evaluated. Methods: A single center, retrospective chart review was conducted in adult patients who presented to the ED between July 1, 2013 and June 30, 2014 with a positive urine culture (>100,000 CFU/mL). Patients who were admitted to the hospital, were pregnant, had positive urine culture with no documentation of either a urinary infection or treatment were excluded. The following data were collected: patient demographics and comorbidities; history of hospitalization or antimicrobial regimens; urinary pathogen and susceptibility; the resistance patterns for urinary isolates in the ED were compared to the adult inpatient antibiogram. Results: A total of 335 patients were included with 382 urinary pathogens isolated. The most common organisms identified were E. coli (68%), K. pneumoniae (7%) and Group B Streptococcus (3%). E. coli was susceptible to ciprofloxacin for 89% of isolates in the ED, compared to only 63% in the adult inpatient antibiogram (p=0.001). Approximately 81% of empiric antibiotic selection was appropriate based on culture results. In addition, a more narrow spectrum antibiotic was indicated for all 38 patients who received fluoroquinolones for acute uncomplicated cystitis. Conclusions: An antibiogram specific to the ED may be beneficial to guide empiric antibiotic selection as this study found a significant difference in the resistance rate of E. coli to ciprofloxacin when comparing the ED and adult inpatient populations.

EVALUATION OF NON-INVASIVE CORE THERMOMETRY WITH ZERO-HEAT-FLUX TECHNOLOGY IN FEBRILE ICU PATIENTS
Hildy Schell-Chaple, Michael Mantayh, Kathleen Puntillo, Kathleen Liu

Learning Objectives: Despite the importance of body temperature monitoring in ICU patients, the source, frequency and thermometry methods of body temperature monitoring in ICUs are highly variable. Commonly used continuous core thermometry systems are invasive and have barriers to their use. A recently available non-invasive thermometry system using zero-heat-flux (ZHF) technology may reflect accurate core temperature measurement. This aim of this study was to test the agreement and precision between the non-invasive ZHF technology using the ZM™ SpotOn™ system and established continuous thermometry methods in febrile critically ill adults. Methods: A method-comparison design was used to test levels of agreement and precision of the ZHF technology system compared to established methods used routinely in clinical practice. 36 febrile (≥38.5°C) patients were enrolled in a trial, receiving either 1 gram of acetaminophen or placebo and were monitored over 4 hr. Twenty paired temperatures were measured simultaneously over 4 hr using the ZHF technology thermometry (forehead sensor) and either rectal or urinary thermometry methods and compared using the Bland-Altman method. Differences beyond ±0.5°C were interpreted as clinically relevant. Results: A total of 708 paired measurements from 36 patients were collected with rectal (n=28) and urinary bladder (n=8) thermometry comparisons. Temperature ranged from 36.9 to 39.6°C (rectal), 36.9 to 39.7°C (bladder) and 36.6 to 39.4°C (ZHF forehead). Method differences beyond ±0.5°C were infrequent (rectal: 15%; bladder: 2%). The bias for ZHF-rectal was -0.24 ± 0.29°C with 95% confidence limits of agreement -0.81 to 0.35°C. The bias for ZHF-bladder was -0.02 ± 0.20°C with 95% confidence limits of agreement -0.41 to 0.37°C. Conclusions: The new non-invasive ZHF thermometry system has good agreement and precision and can be considered as an alternative to invasive rectal and urinary bladder thermometry for continuous monitoring in ICU patients with fever.

TRENDS OF DEMAND FOR CRITICAL CARE SERVICES AMONG HIV-INFECTED PATIENTS: A POPULATION-BASED STUDY
Lavi Oud

Learning Objectives: There has been reported decrease in hospitalizations and improved short term outcomes following critical illness among HIV-infected patients. There are no population-level data on the contemporary patterns of demand for critical care services in this population in the United States. Methods: We used the Texas Inpatient Public Use Data File to identify hospitalizations with reported HIV infection for the years 2004–2013, using ICD-9-CM codes 042 & V08. Hospitalizations with ICU admission were identified by presence of unit-specific charges. Reports by the Texas Department of State Health Services were used to derive the annual number of people living with HIV in the state. The annual rates of ICU admission among HIV hospitalizations, volume of ICU admissions, and incidence of ICU admissions were examined. Descriptive statistics, regression analyses, and chi-square tests were used. Results: There were 156,866 hospitalizations with HIV infection, with 48,043 (30.6%) ICU admissions during the study period. The following changes were observed between 2004 and 2013: rate of ICU admission increased from 26.1% to 35% (4.2%/year; p<0.0001); volume of ICU admissions (all) increased by 58.4% (5.9%/year; p<0.0001); volume of ICU admissions <45 yr rose by 4% (0.5%/yr; p=0.4047); volume of ICU admissions ≥45 yr increased by 136% (10.8%/year; p<0.0001); the annual incidence of ICU admission remained 7.6 per 100 people living with HIV infection (p=0.1943). Conclusions: The volume and the rate of ICU admissions among HIV hospitalizations rose considerably over the past decade, with more than 1 in 3 HIV hospitalizations admitted to ICU by 2013. Though demand for critical care services paralleled the corresponding growth in the population living with HIV in the state. The changing demand for critical care resources was driven nearly exclusively by HIV hospitalizations ≥45 yr, likely reflecting increased survival and associated rise in chronic co-morbidity burden among HIV-infected patients. Further studies are warranted to corroborate our findings and examine the sources of the observed trends.
527 Meropenem Assessment Before and After Implementation of Standard Dosing Regimen
Vincent Mahasa, Connor Chan, Ivy Chow
Learning Objectives: Meropenem is traditionally dosed 1 g Q8H. However, alternative dosing such as 500 mg Q6H has been explored to optimize its pharmacodynamic profile. Alternative dosing has shown similarity in % time above MIC, similar clinical cure rate and mortality outcomes with decreased time to resolution of infection of 1.5 days. It also leads to significant cost savings. Our organization has used the alternative dosing strategy since 2008. We sought to characterize the effect of meropenem dosing regimen on clinical outcomes and cost savings. Methods: A multi-centered, retrospective cohort study with superiority design was completed. Patients receiving ≥ 72 hr of meropenem therapy between July 2006 and Aug 2009 were randomly selected. Patients were excluded if they were age < 18 yr, BMI > 40 kg/m², infections needing high meropenem concentrations (meningitis, cystic fibrosis), dialysis patients, infections resistant to meropenem prior to therapy or no renal dose adjustment within 48 hr. Primary outcome was clinical cure rate. A sample size of 186 patients in each arm was needed for 80% power. Results: A total of 1751 patients were assessed for eligibility, of which, 194 and 188 patients were randomly selected to the traditional and alternative dosing arms respectively. Patients in both groups were similar except for a lower rate of urinary infections in the traditional dosing arm 22.4% vs 27.3% for the alternative dosing arm 31.4% (p=.03). Clinical cure rates were 162 (83.5%) and 152 (80.8%) in the traditional and alternative dosing arm respectively (p=NS). The 30-day all cause mortality were 18 (9.2%) for the traditional dosing arm and 27 (14.4%) for the alternative dosing arm (p=NS). length of stay was 24.5 vs 27.7 days (p=NS), and time to defervescence were 2.2 vs 2.1 days (p=NS) for the traditional and alternative dosing arms respectively. A cost savings of $79,417 was realized in the alternative dosing arm cohort. Conclusions: Administration of meropenem 500 mg Q6H did not differ from 1 g Q8H in terms of clinical outcomes, but demonstrated significant cost savings.

437 Ventilator-Associated Pneumonia in Trauma Patients: The Role of Non-Modifiable Risk Factors
Christopher Michetti, Anna Newcomb, Heather Prentice, Jennifer Rodriguez
Learning Objectives: Trauma patients have a high risk and rate of ventilator-associated pneumonia (VAP), and several non-modifiable risk factors (NRFs). Head-of-bed elevation >30° (HOB >30°) lowers VAP rates, but initially is often precluded with acute spine injuries or an open abdomen (more evisceration/fascia retraction). We studied several potential NRFs, including factors preventing HOB >30°. Methods: Data from patients admitted to a Trauma ICU, age ≥15, & intubated for >2 days were retrospectively collected from 2008-2012. Pre-hospital, emergency dept. (ED), and ICU variables were studied including a composite of four discrete factors that preclude HOB >30° (open abdomen, acute spinal cord injury, spine fracture, spine surgery). Endotracheal tubes with subglottic suction were used in the ED but not at the scene. Stepwise backward logistic regression was used to determine variables associated with VAP. Results: There were 374 patients, 77 (21%) with VAP, 297 without VAP. All were intubated at the scene (n=270) or ED (n=104). There was no difference in VAP rate with location of first airway intervention (scene 22.6% vs ED 17%, p=0.33). VAP patients had higher ventilator LOS (15 vs 8d), ICU LOS (13 vs. 9d), and hospital LOS (25 vs 16d) (all p<0.001). Patients without HOB >30° had a higher incidence of VAP (25% vs. 12%, p=0.004) but this did not remain significant on multivariable analysis (OR 1.65 [0.73–3.72], p=0.229), nor when stratified by ventilator LOS ≤ or > 7d. Patients with an esophageal obturator airway (EOA) (OR 5.62 [1.9–16.7], p=0.002) or spine surgery (OR 4.06 [1.14–14.4], p=0.03) had a higher VAP risk, but those with brain injury did not (OR 0.82 [0.45–1.51], p=0.523). Significant NRFs in the multivariable model were Abbreviated Injury Score head/neck >2 (OR 3.11, p=0.007), red cell or plasma transfusion in the 1st two ICU days (OR 2.74, p=0.002), and ventilator LOS (OR 1.12, p=0.0001). Conclusions: Factors that may temporarily preclude HOB >30° in intubated trauma patients were not associated with a higher risk for VAP. Blood transfusion, spine surgery, and AIS head/neck >2 were NRFs for VAP.

438 Evaluation of Clinical Trials Including Geriatrics in the Treatment of HAP
Marilyn Bulloch, Daniel Bulger, Erin McGee, Ashish Patel
Learning Objectives: Geriatrics are the fastest growing segment of our society. By 2030, older Americans will be about 19% of the population. The average life expectancy for a child born in 2012 is 78.8 yr, the longest in history. Geriatrics account for 85% of pneumonia deaths in America. Declining functional status and co-morbidities make them more prone to the acquiring pneumonia while in the hospital or other healthcare settings. Incidences of healthcare associated (HCAIP) and hospital acquired pneumonias (HAP) range from 5 to more than 20 cases/1000 hospital admissions, most occurring in older adults. Unfortunately, it is estimated that <10% of all clinical study patients are over the age of 65. Our objective is to evaluate studies involving treatment for HAP, HCAIP, & ventilator-associated pneumonia (VAP) whom include geriatrics within their study populations. Methods: A literature search was conducted using PubMed. Key words included hospital acquired pneumonia, healthcare associated pneumonia, & ventilator associated pneumonia. Limitations included humans, clinical trials (1/1/85-12/31/14), age > 19 yr, & English language. Articles from the reference lists of pertinent clinical guidelines were also reviewed for inclusion. Studies were excluded if they lacked a primary focus on HAP, HCAIP, or VAP; did not include patients > 65 yr, or did not evaluate medication use. Results: 12,222 studies were reviewed, 87 met inclusion criteria, & 7 studies included geriatrics exclusively. 78% of studies were prospective & 68% subjects were male. The average age was 61. The most studied pneumonias were VAP (56%) & HAP (26%). The most studied antibiotics were vancomycin (18%), imipenem (17%), meropenem (15%), ceftazidime (14%), & piperacillin/tazobactam (13%). As a class, carbapenems made up 30% of studies, aminoglycosides 22%, & fluoroquinolone 18%. Unique antibiotic combinations accounted for 13% of studies. Conclusions: Geriatrics are included in only 7% of all studies evaluating medication use in nosocomial pneumonias. The proportion of geriatrics enrolled in clinical trials should be substantially increased.

439 Pathogen and Risk Factor Variation for Ventilator-Associated Pneumonia in Critically Ill Populations
Desiree Kosmisky, Chris Droeger, Neil Ernt, Kristen Hillebrand, Shaun Keegan, Eric Muller
Learning Objectives: Inappropriate empiric antibiotic therapy increases mortality in patients with ventilator-associated pneumonia (VAP). Although multidrug resistant organism risk factors (MDROrf) are defined, variation in pathogen prevalence between critically ill populations may exist. It was hypothesized that pathogen prevalence differs between ICU populations after adjusting for MDROrf. Methods: This single-center, multiple-ICU, retrospective observational study evaluated critically ill adult patients with bacteriologically-confirmed VAP (bronchoalveolar lavage [BAL] ≥10,000 cfu/mL) over a 2-year period. Patients were grouped by ICU (cardiac, CV; medical, M; neuroscience, NS; surgical, S) to evaluate differences in 1) pathogen prevalence for early (<5 days)- versus late (≥5 days)-VAP adjusting for MDROrf risk factors, 2) MDROrf between ICUs and 3) projected rates of appropriate empiric antimicrobial therapy. Results: Two-hundred forty four patients (172 BALs, 158 patients) were included (6.3% CVICU, 30.8% MICU, 28.3% NSICU, 34.6% SICU). Baseline characteristics, MDROrf, and pathogen prevalence varied significantly between ICUs. 79.2% of pathogens were late-onset and 62.2% (range 44% NSICU-90% MICU) of patients had MDROrf independent of time. Overall rates of MRSA and nonlactose fermenting Gram-negative bacilli (nlGNB) were 40% CVICU, 63.5% MICU, 38.2% NSICU, and 34.9% SICU. MRSA/nlGNB were isolated in 24.1% of patients (0% CVICU-40% SICU) with early-onset VAP and no MDROrf. On multivariate logistic regression, days from admission to BAL (OR 1.05, 95% CI 1.01–1.19) and personal/family MDROrf (OR 2.51, 95% CI 1.21–3.38) were independent predictors for MDROrf. Rates of appropriate empiric therapy with recommended agents were 71% (60% SICU-80% CVICU) in early VAP without MDROrf, and 92.3% (85.7% MICU-98.2% NSICU) in late VAP or early VAP with risk factors. Conclusions: Pathogen prevalence varied
significantly between ICUs. Global empiric coverage recommendations were inadequate in up to 40% of cases. Unit-specific pathogen prevalence and related susceptibility should guide empiric antibiotic therapy.

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RISK FACTORS FOR DEVELOPING AN EARLY SPACE PULMONARY ISOLATE IN CRITICALLY ILL TRAUMA PATIENTS
Stephen Lemon, Chasen Croft, Stacy Voils, Philip Elron, Aimee LeClaire, Alicia Mohr, Scott Brakenridge, Russell Findlay

Learning Objectives: The empiric treatment of early hospital-acquired pneumonia (within the first 5 days of hospitalization) often does not include adequate antimicrobial coverage for multidrug resistant organisms, specifically Serratia, Pseudomonas, Acinetobacter, Citrobacter and Enterobacter (SPACE) species. The purpose of this study was to identify risk factors for an early SPACE organism pneumonia in critically ill trauma patients to improve the success of empiric antimicrobial therapy.

Methods: A retrospective case-control study of 183 critically ill adult trauma patients admitted to the trauma ICU from November 1, 2009 to September 30, 2013 who had a respiratory culture obtained within the first 5 days of hospitalization was conducted. Univariate and multivariate analyses were completed to identify independent risk factors for early SPACE pneumonia.

Results: Seventy-one patients (39%) had a pulmonary isolate with a SPACE organism within the first 5 days of hospitalization. The multivariate analysis showed that intubation in the field (OR 1.85; 95% CI, 1.004 to 3.393; p <0.05) was an independent risk factor for early pulmonary isolation of a SPACE organism.

Conclusions: Within the first 5 days of hospitalization, critically ill trauma patients who are intubated in the field and develop a pneumonia should be considered at risk for SPACE organism and appropriate empiric antimicrobial therapy should be administered.

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SYSTEMATIC REVIEW OF CLINICAL DECISION RULES PREDICTING BACTEREMIA IN EMERGENCY DEPARTMENT PATIENTS
Patrick Eckert, Avooru Gideon, David Scordino, Katie Lobner, Jamil Bayram

Learning Objectives: Blood cultures ordered in the Emergency Department (ED) are rarely positive and alter management infrequently. To use blood cultures more efficiently, we conducted a systematic review identifying clinical decision rules (CDR) for bacteremia in the general adult ED population and evaluated their methodological quality.

Methods: We searched Pubmed, Embase, Web of Science, Scopus, and Cochran in August 2013 to identify studies deriving, validating, and implementing CDRs and independent clinical predictors (ICP) of bacteremia in adult ED patients. Predictor variables were from the history, physical examination, or common diagnostic tests. The primary outcome was true-positive blood cultures. Two independent reviewers chose studies for inclusion. They extracted data using the PRISMA guidelines for reporting of systematic reviews and independently assessed methodological quality according to 20 predefined criteria. Odds ratios were reported for ICPs of bacteremia, and c-statistics were extracted data using the PRISMA guidelines for reporting of systematic reviews and independently assessed methodological quality.

Results: Seventy-one patients (39%) had a pulmonary isolate with a SPACE organism within the first 5 days of hospitalization. The multivariate analysis showed that intubation in the field (OR 1.85; 95% CI, 1.004 to 3.393; p <0.05) was an independent risk factor for early pulmonary isolation of a SPACE organism.

Conclusions: Within the first 5 days of hospitalization, critically ill trauma patients who are intubated in the field and develop a pneumonia should be considered at risk for SPACE organism and appropriate empiric antimicrobial therapy should be administered.

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DISCRETE DYNAMICAL MODELING OF INFLUENZA INFECTION SUGGESTS AGE-DEPENDENT DIFFERENCES IN IMMUNITY
Ericka Mochan-Keef, Alisa Urbano, David Swigon, G. Bard Ermentrout, Robert Parker, Gilles Clermont

Learning Objectives: Immunosenescence, an age-related decline in immune function, is a major contributor to morbidity and mortality in the elderly. Older hosts exhibit delayed onset of immunity and prolonged inflammation after an infection, leading to excess damage and greater likelihood of death. Our study applies a rule-based model to infer which immune responses are most changed in an aged host. Discrete models are better suited to deal with the inter-individual variety observed in this experimental model.

Methods: Two groups of BALB/c mice (age 12–16 wks and 72–76 wks) were infected at 2 inocula: a survivable 50 PFU dose and a lethal 500 PFU dose. Data were measured at 10 points over 19 days in the subthalial and 6 points over 7 days in the lethal, after which all mice had died. We developed a Boolean model to describe the interactions between virus and 21 immune components including cells, chemokines, and cytokines from innate and adaptive immunity. Each age group has its own set of rules using Boolean operators to describe the complex series of interactions that activate and deactivate immune components.

Results: Our model accurately simulates the immune response for both ages and both inocula included in the data (95% accurate for younger mice, 94% accurate for older mice). Data varies primarily in the onset of immunity, particularly the inflammatory response, which leads to a 2 day delay in clearance of the virus from the aged host in the subthalial cohort. Most rules governing behavior of innate immunity components differ between young and old mice, in accord with experiments, which show distinct temporal patterns for cytokines and chemokines across age groups. Rules for infected cells, NK cells, and CTLs are constant between ages, however.

Conclusions: Discrete, rule-based models allow the data-driven discovery of important interactions between components of host-virus response to influenza infection. Although there is overlap, many of the rules driving the immune response to influenza are distinct between young and older hosts, possibly suggesting that immunomodulatory strategies should be age-dependent.

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EMERGENCY DEPARTMENT UROSEPSIS-IMPACT OF POSITIVE OR EQUIVOCAL UA ON EMERGENT SURGICAL CONSULTATION
Dena Abuelroos, Mansoor Siddiqui, Raymond Jackson, David Berger

Learning Objectives: Our objective is to retrospectively evaluate uroseptic emergency department (ED) patients who undergo abdominal imaging, and to evaluate if positive versus equivocal urinalysis yields any difference in the rate of emergent surgical consultations.

Methods: We identified adult (>17 yr) ED patients presenting between January 2009 and December 2012 with an ICD-9 code for urinary obstruction, sepsis, infection or calculus. Patients were included only if they had undergone abdominal cat scan or ultrasound ordered by ED provider, had 2 or more Systemic Inflammatory Response Syndrome (SIRS) criteria, and negative blood cultures. UAs were reviewed for positive or equivocal signs of infection. Two individuals (DA, MS) performed data abstraction, trained to distinguish among negative, equivocal, and positive UA. The Senior Author (DB) reconciled differences. We defined a positive UA as the presence of nitrite and/ or bacteria without squamous epithelial cell contamination (SECC). We defined an equivocal UA as the presence of one or more of the following with SECC: positive nitrite, positive leukocyte esterase, pyuria, and bacteria. We report proportions with Odds Ratios and 95% confidence intervals. Results: Of the 1142 patients identified, we excluded: 80 for negative UA; 167 for fewer than two SIRS criteria; 320 for positive blood culture; and 37 for incomplete data. Of the 538, 245 (46%) had positive UA of which 105 (43%) required emergent surgical consultation. Of the 293 (54%) equivocal UA patients, 138 (47%) required emergent surgical consultation. The Odds Ratio of a positive UA requiring emergent consultation was 3.88 (95% CI, 2.12 to 7.12). Conclusions: This retrospective study reveals no statistically significant difference between positive and equivocal UA results in the subset of uroseptic ED patients requiring emergent surgical consultation. This finding highlights the clinical relevance of an equivocal UA. Limitations of this study include that it is a convenience sample from a single institution, and that UA interpretation is subjective.
**DISSEMINATED COCCIDIOIDOMYCOSIS IN CHILDREN**

Jessica Lee, Mary Anne Tablizo, James McCarthy, Ana Lia Graciano

**Learning Objectives:** Coccidioидомицоз is a soil fungus native to the San Joaquin Valley of California. Initial symptoms are non-specific, leading to delayed diagnosis. Disseminated disease, although rare in children, can be devastating. We describe the clinical presentation, treatment and outcome of coccidioidomycosis in children admitted to a tertiary Pediatric Intensive Care Unit (PICU) located in the San Joaquin Central Valley.

**Methods:** Retrospective review of charts, laboratory and imaging records of all coccidioidomycosis patients admitted to the PICU between January 1st, 2010 and December 31st, 2014. Results: Seven patients (4 males, 3 females) were admitted to the PICU, mean age 6 yr (0.5–18 yr). All patients had at least one previous medical visit; four had been previously hospitalized for pneumonia and one for "viral meningitis". Disseminated disease (central nervous system, cardiac, mediastinal, and/or bone disease) was present in all cases. Diagnosis was made by enzyme linked immunosassay, immunodiffusion, complement fixation, fungal culture and/or histopathology. Patients underwent surgical debridement and excision of fungal lesions. All patients received intravenous amphotericin. Six patients received both amphotericin and an azole antifungal. Three patients refractory to amphotericin received intravenous caspofungin and voriconazole. One patient had fungal meningoencephalitis and also received intrathecal amphotericin and interferon gamma. Treatment continued until the normalization of cerebrospinal fluid and clinical and radiologic resolution of the disease. Mean length of treatment was 16 mo (3–29 mo). Mean PICU length of stay was 19 days (2–78 days) and mean hospital length of stay was 94 days (7–196 days). Two patients died during their PICU stay. Conclusions: Despite being in an endemic area, coccidioidomycosis diagnosis and subsequent treatment is often delayed due to lack of recognition. Risk factors for disseminated disease in previously healthy children are not known. Further studies elucidating immune factors and effectiveness of combination antifungals are needed.

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**COMPARISON OF DURATION OF ANTIBACTERIAL THERAPY FOR THE TREATMENT OF STENTROPHOMONAS PNEUMONIA**

Vincent Mahasa, France Carriere, Greg Egan

**Learning Objectives:** Data on optimal treatment duration for stentrophomonas maltophilia (S. Maltophilia) pneumonia infections are largely based on anecdotal evidence and case reports. Most cases are treated for 14 to 21 days or longer. We sought to describe the differences between two patient groups with S. Maltophilia pneumonia treated for either a short course (14 days or less) and a long course (15 days or more) of antibiotics.

**Methods:** A multi-centered, retrospective cohort study was completed. Patients ≥18 yr of age admitted to the hospital from Jan 1, 2011 to July 31, 2014 with a diagnosis of pneumonia and a positive sputum culture for S. Maltophilia were included. Exclusion criteria were any patients receiving less than 3 days of antibiotic therapy. Primary endpoint was recurrence rates of pneumonia. Secondary endpoints were clinical cure and in-hospital mortality.

**Results:** A total of 190 patients with positive sputum culture for S. Maltophilia were assessed for eligibility, of which, 105 patients met the inclusion criteria. There were 70 patients in short course arm and 35 patients in the long course arm. Patients in the long course arm had longer length of stay 156 days vs 85 days, longer length of ventilation 158 vs 52 days and longer treatment duration with antibiotics 20 days vs 10 days compared with the short course arm. Recurrence rates were 1% for both arms. Clinical cure rates were 71% and 77% (p=NSS) for the short and long course arms respectively. In hospital mortality were 44% in the short course compared to 31% in the long course arm (p=NSS). Conclusions: There was no difference seen in recurrence rates between short and long course antibiotic treatment of S. Maltophilia pneumonia.

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**EPIDEMIOLOGY AND SEASONAL VARIATION OF NECROTIZING FASCIITIS IN A 12- YEAR PERIOD**

Hassan Al-Thani, Mohammad Asim, Insolvisagan Mudali, Ayman El-Menyar, Ruben Peralta Rosario, Nissar Shaikh

**Learning Objectives:** Necrotizing Fasciitis (NF) is a surgical emergency with significant morbidity and mortality. We studied the epidemiology and seasonal variation of NF in Qatar over 12 yr.

**Methods:** We retrospectively reviewed adult patients admitted to the surgical ICU with provisional diagnosis of NF at Hamad General Hospital (HGH) between January 2000 and December 2013. Patient demographics, presentation, microbiology, treatment, and outcome were recorded.

**Results:** We identified 327 patients with a provisional diagnosis of NF admitted in the study duration. The number of cases peaked in 2012 (n=52), 2010 (n=43), 2007 (n=31) and in 2003 (n=28). Hospitalization rate decreased over the year; with an annual percentage decrease of 3.7 % per year. The crude mortality rate was 26 % highest was in 2010 (49%) which decreased progressively from the year 2012 onwards. The Case Fatality Rate (CFR) among Qataris was higher, especially in Qatari females. Gram negative infections were more common in 2010, in which year the mortality rate was peaked. Almost half of the septic shock patients died in 2010 which reduced to 33% in 2012. Average surgical debridement performed was peaked in 2012. Trends in polybacterial infections showed three peak periods during 2006, 2010 and in 2012. In 2012, both Streptococcus (47%) and Staphylococcus infections (34%) were at their peak. Gram negative monobacterial infections accounted for one out of three cases in 2010. Notably, the mortality rate was higher in this duration. There was peak admissions during May (11%), August (10%), March and December (10%, in both). The most of the admissions occurred winter (28%) and spring (29%). Conclusions: There were significant differences in patient characteristics and type of causative organisms as well as treatment patterns between 2002 and 2013. Although the frequency of hospitalizations increased, mortality and septic shock decreased over the time. This could be partly explained by improvements in early diagnosis, wound care and critical care. There was no evidence for significant seasonal variation in NF admissions.

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**INCIDENCE OF AKI WITH CONCOMITANT VANCOMYCIN AND Beta-LACTAMS IN CRITICALLY ILL PATIENTS**

Melanie Smith, Katherine Lusardi, Jacob Painter, Drayton Hammond

**Learning Objectives:** Critically ill patients with suspected infections often receive vancomycin and an anti-pseudomonal beta-lactam for empirical coverage of drug-resistant organisms. Various antibiotic combinations have been associated with acute kidney injury (AKI) development. This study determined the incidence of AKI between concomitant vancomycin and piperacillin/tazobactam (PTZ) or cefepime (FEP) in adult, critically ill patients during or within 72 hr after combination therapy was completed. Methods: This was a single center, retrospective, matched-cohort study of MICU and SICU patients admitted from 2012 to 2014. Patients received at least 48 hr of concomitant vancomycin and PTZ or FEP while admitted to an ICU. Demographics, comorbidities, and SOFA and APACHE IV scores were obtained from medical records along with outcomes such as length of stay (LOS), duration of AKI and need for renal replacement therapy (RRT). Rank sum, Signed rank, McNemar, and Fisher exact tests were performed as appropriate. To examine the rate of AKI development, the average treatment effect was calculated. Results: In total, 122 ICU patients were included, with 49 and 73 receiving PTZ and FEP respectively. Overall, 37 patients developed AKI (30.3%). Before matching, AKI was similar between PTZ and FEP groups (32.7% vs. 28.8%). In 43 matched pairs, there was no difference in AKI between PTZ and FEP groups (32.6% vs. 41.9%; p=0.0782). The average treatment effect between the groups was insignificant, showing no association between beta-lactam choice and AKI (p=0.761). There were no secondary outcomes with significant differences in the matched cohorts: ICU LOS (9.7 d vs. 10.3 d), hospital LOS (18 d vs. 19.5 d), AKI duration (3.8 d vs. 7.8 d, p=0.546), and need for RRT (6.1% vs. 11%, p=0.277). Conclusions: After adjusting for variability in demographics and comorbidities, no difference existed in rate of AKI or other outcomes between critically ill patients receiving concomitant vancomycin and PTZ or FEP therapy. AKI development should not be considered when choosing an empirical beta-lactam antibiotic for critically ill patients.
present study is to provide incidence estimates of vancomycin-intermediate or -resistant S. aureus (VISA, VRSA), vancomycin-resistant enterococcus (VRE), and glycopeptide-intermediate or -resistant S. aureus (GISA, GRSA) among hospitalized patients in the USA and to examine the profile of this cohort. Methods: We performed a retrospective analysis of the Nationwide Inpatient Sample for yr 2004 to 2010. Occurrence of VISA, VRE, VRE, GISA and GRSA among hospitalized patients was identified by using ICD-9-CM codes. The demographic characteristics of this cohort and the annual variations in incidence estimates were computed. Results: A total of 177,729 hospitalizations had a VISA, VRE, VRE, GISA or GRSA. During this same period a total of 264,869,967 hospitalizations occurred in the entire USA. The yearly incidence estimates ranged from a low of 12,471 in the year 2004 to a high of 38,825 in the year 2010. The incidence ratios of occurrence of a VISA, VRE, VRE, GISA or GRSA for every 100,000 hospitalizations across the entire USA was: 33.26 (year-y 2004), 46.87 (y2005), 58.25 (y2006), 58.72 (y2007), 62.81 (y2008), 100.84 (y2009), & 105.94 (y2010). Trend analysis showed a gradual increase in the occurrence of these infections per 100,000 hospitalizations annually over the study period. Nearly 56% of all infections occurred amongst patients older than 65 yr of age. About 60% of those with infections were females. The in-hospital mortality rate (IHMR) in this cohort was 5.7% (10,063 deaths). Racial distribution included: Whites (69.2%), Blacks (14.6%), Hispanics (10.3%), Asians/Pacific Islanders (2.7%), Native Americans (0.6%), and Other races (2.6%). Conclusions: It has been a gradual increase in incidence of vancomycin resistance in hospitalized patients. Elderly patients are at higher risk for these types of infection. The IHM rate is considerable. The findings are important because of limited treatment options available for these resistant infections.

449 BACTERIAL COLONIZATION OF SUBGLOTTIC SECRETIONS OCCURS RAPIDLY FOLLOWING EMERGENT INTUBATION
Luke Basdeo, Orlando Turner, Jensen Hyde, John Gunter, Sibaji Shome, Sana Akbar, James Timlin

Learning Objectives: Micro-aspiration of colonized subglottic secretions is a common complication of mechanical ventilation and contributes to prolonged intubation and ventilator associated pneumonias (VAP). Previous clinical trials using ET tubes with paratracheal ports found that frequent aspiration of subglottic secretions reduces the incidence of VAP. However, the effect of emergent intubation on the incidence bacterial colonization is unknown. To address this question, we performed serial cultures of subglottic secretions in a prospective observational trial of 22 patients emergently intubated for altered mental status (AMS) and respiratory failure. Methods: We identified 22 patients emergently intubated with the Hi-Lo ET tube for altered mental status and respiratory failure. Patients with pulmonary infiltrates, suspected sepsis or having received two or more doses of prophylactic antibiotics were excluded from the study. After informed consent, secretions obtained from the subglottic region were serially cultured at 12hr and Days 1, 2, and 3. Primary Endpoint: To determine the association of early bacterial colonization and incidence of prolonged (>48hr) intubation. Secondary endpoints included the incidence and type of colonizing bacteria, duration of intubation, hospital mortality and referral to long term skilled nursing facilities. Results: Table-1: Age % Colonization _MRSA _E- Coli _M Catarrhalis _Duration Intub 48 hr _56 _18.2 18.2 9.0% 9.1% 26>5hr _48 hr _57 _72.3 _18 18.2 27.2% 18.2% 98>25 hr P<0.03 P<0.009 Bacterial colonization with MRSA or Gram (-) bacteria was (1) documented in 45% of emergently intubated patients within 12hr; (2) 72% of patient requiring >48hr intubation (P<0.03); and (3) associated with prolonged mechanical ventilation (P<0.009). Of the patients requiring comfort care or skilled nursing facility, 73% were colonized within 12hr. Conclusions: Summary: Colonization of subglottic secretions occurs rapidly following emergent intubation and contributes to prolonged intubation.

450 EMPRIC ANTIBIOTICS FOR GRAM-NEGATIVE BLOOD-STREAM INFECTIONS IN B-LACTAM ALLERGIC ICU PATIENTS
Nicholas Peters, Jesse Jacob, Alley Killian

Learning Objectives: Numerous studies have shown that appropriate empiric antibiotic therapy improves mortality and patient outcomes. When patients have a β-lactam allergy in the ICU it leaves clinicians with limited antibiotic treatment options. Aztreonam does not cross-react with β-lactams, although resistance has been increasing. There is little published data on patient outcomes with aztreo-nam in the critically ill. Thus, aztreonam may not be the most appropriate empiric option for infections in the ICU. We hypothesize that ICU patients who receive alternative antibiotics as compared to aztreonam for gram-negative bacilli blood-stream infections (BSI) will have an increase in the rate of appropriate empiric anti-biotic therapy. Methods: Retrospective, cohort study in adult ICU patients in two academic hospitals with a documented β-lactam allergy and gram-negative bacilli (Escherichia coli, Klebsiella pneumonieae, Pseudomonas aeruginosaa, Enterobacter spp, or Acinetobacter spp.) BSI between January 1, 2009 and January 1, 2015. The primary outcome was the rate of appropriate empiric antibiotic therapy. Secondary outcomes include in-hospital mortality, ICU and hospital length of stay (LOS), and descriptions of allergies. Results: A total of 41 patients met study inclusion criteria, 11 received aztreonam and 30 received an alternative antibiotic. There was no difference in the primary outcome between the two treatment groups (27% aztreonam vs. 30% alternative antibiotic group, p=0.68). The most common reasons for inappropriate empiric therapy were inappropriate dosing (51% in both groups) and inappropriate timing (41% in both groups). In-hospital mortality, ICU LOS, and hospital LOS were no different between the treatment groups. There was no description of the type of allergy in 59% of patients. Conclusions: There was no statistically significant difference between treatment groups for the rate of appropri-ate empiric antibiotic therapy. Due to inappropriate dosing and timing there was a low rate of appropriate empiric treatment in both groups.

451 THE EFFECT OF VANCOMYCIN AND LINEZOLID ON THE TREATMENT AND OUTCOMES OF PRESUMED MRSA PNEUMONIA
Justin Kinney, Lia Pop, Andrew Lowe

Learning Objectives: Methicillin-resistant Staphylococcus aureus (MRSA) is a chal-lenging to treat multidrug-resistant pathogen that frequently causes pneumonia, particularly in the ICU. There is a debate currently over whether vancomycin or line-zolid is superior in the treatment of MRSA pneumonia due to several key differences between the two medications. Recent literature has found evidence supporting and discrediting both therapies making it difficult to know which is a better choice, or if there is one. The primary purpose of this research project is to evaluate if there is a dif-ference in mortality between vancomycin and linezolid when treating MRSA pneu-monia. Methods: Retrospective chart review from a single acute care hospital with a total of 65 patients having presumed pneumonia and positive MRSA lung cultures. They were grouped in either the vancomycin or linezolid arm based on the treatment received. Demographics and ICU admittance were extracted from the medical record as well as outcomes such as length of stay, duration of therapy, and survival. Results: 65 patients qualified for the study: 40 in the vancomycin arm and 25 in the linezolid. There was no difference between groups in both population demographics or ICU admittance. The rate of acute kidney injury in the vancomycin population was com-parable to that of thrombocytopenia in the linezolid arm (12.5% vs. 12%, p=0.50). The length of stay for the vancomycin and linezolid groups (M=27.4 days SD=24.1; M=26.3 days SD=23.2; p=0.72), as well as the duration of therapy (M=14.3 days SD 16.1; M=13.7 days SD=9.6; p=0.87), were alike. The mortality rates for the vanco-myacin and linezolid groups were 17.5% vs. 12.0%, p=0.40.Conclusions: This data suggest there is no difference in the outcomes studied when comparing vancomycin and linezolid. Based on this and current literature, there is not enough evidence to support the use of linezolid as empiric treatment for this infection. Linezolid should be reserved for the treatment of MRSA pneumonia in patients’ who do not qualify for vancomycin therapy or have vancomycin resistant infections.

452 COMPARISON OF HIGH DOSE VERSUS STANDARD DOSE OSELTAMIVIR IN CRITICALLY ILL PATIENTS WITH INFLUENZA
Zachary Noel, Melissa Thompson Bastin, Ashley Montgomery-Yates, Alexander Flannery

Learning Objectives: High dose oseltamivir (i.e. 150 mg twice daily) has been recom-mended by the World Health Organization and others for the treatment of critically
ill patients with severe influenza. The clinical issue has been complicated by drug shortages of oseltamivir during the last four influenza seasons. While animal data form the basis for the high dose recommendation, pharmacokinetic data from critically ill patients demonstrate levels far exceeding those necessary. However, the clinical outcomes of oseltamivir dosing in the critically ill remain understudied. The purpose of this study was to compare the clinical outcomes among critically ill patients with influenza who received high dose oseltamivir compared with those patients receiving standard dose. **Methods:** This was a retrospective cohort analysis of patients admitted to our Medical Intensive Care Unit (MICU) with confirmed influenza between January 1, 2007 and March 31, 2014. Patients were stratified into standard dose versus high dose oseltamivir groups based on oseltamivir dosage and renal function. The primary outcome measured was duration of mechanical ventilation. Secondary outcomes included changes in PaO2/FiO2 ratio from days one to five of therapy, ICU length of stay (LOS), overall LOS, and ICU survival. **Results:** The median duration of mechanical ventilation was 12.5 (8–32) days in the high dose group and 9.0 (4–11) in the standard dose group (n=57; unadjusted p=0.025). When adjusted for clinically relevant predictors of disease severity including age, duration of therapy, APACHE II, and receipt of ECMO, no significant differences between groups were detected in duration of mechanical ventilation (p=0.625), oxygenation days 1–5, ICU LOS (p=0.124), or hospital LOS (p=0.759). **Conclusions:** As compared with standard doses of oseltamivir, higher dose oseltamivir was not associated with improvement in any clinical outcomes measured, including duration of mechanical ventilation, oxygenation, ICU LOS, and hospital LOS. Using standard doses allows intensivists to be good stewards of potentially scarce resources without impacting outcomes.

### 453 PROCALCITONIN AND C-REAETIVE PROTEIN IN PEDIATRIC ACUTE RESPIRATORY FAILURE

Sarah Steward, Jennifer Muszynski, Katherine Bline, Josey Hensley, Lisa Steele, Lisa Hanson-Heber, Mark Hall

**Learning Objectives:** The sensitivity, specificity, and half-life of the biomarkers procalcitonin (PCT) and C-reactive protein (CRP) for identification of bacterial infection in critically ill children are poorly understood. Hypothesis: a combinatorial approach using both PCT and CRP will be superior to either biomarker alone in children with acute respiratory failure. **Methods:** Enrollment in this prospective observational study is open to newly intubated children expected to require invasive mechanical ventilation for >48 hr. Subjects have plasma PCT and CRP measured within 48 hr of intubation and again on post-intubation day 3. All subjects undergo airway culture, with other cultures obtained at the discretion of the clinical team. Bacterial infection is defined as any growth of a pathogen or presence of septic shock by consensus criteria. Biomarker accuracy is evaluated by ROC curves. Data represent median (interquartile range). **Results:** 65 children (33 male) have been studied to date (age: 7 [2–43] mo, PRISMINCI score: 8 [4–12], length of mechanical ventilation 6 [4–8] days). 44 subjects had bacterial infection (6 with septic shock) while 21 subjects did not (10 with viral test). Initial individual biomarkers had poor accuracy (PCT: AUC 0.64, sensitivity 60%, specificity 67% with optimal cutoff of 0.57 mg/mL; CRP: AUC 0.64, sensitivity 54%, specificity 78% with optimal cutoff of 28.2 mg/L). Examining both biomarkers together (PCT > 0.57 mg/mL and/or CRP > 28.2 mg/L) improved sensitivity to 86% with specificity of 62%. The rate of PCT decline in those with initial PCT > 0.57 mg/mL and correct empiric antibiotic therapy (n=18) was 35 (28–46) % per 24 hr. **Conclusions:** Our preliminary data suggest that an approach using both PCT and CRP may be better than either biomarker alone in identifying critically ill children with bacterial infection. The half-life of PCT in this population also appears to be longer than the 24 hr previously reported in the literature. These data may inform the development of protocols for biomarker-directed approaches to antibiotic use in the PICU.

### 456 IMPRODUCTION OF A BUNDLE FOR PREVENTION OF VENTILATOR-ASSOCIATED PNEUMONIA IN A DEVELOPING COUNTRY

**FRANCISCO MOLINA, Elizabeth Ramirez, Marfemy Rojas, Cecilia Saldarriaga, Natalia Aritizabal, Marcela Cortes, Pablo Villa, Carlos Agudelo**

**Learning Objectives:** In developing countries ventilator-associated pneumonia (VAP) rates are considerably higher than developed countries. There are several reports about prevention of VAP in developing countries, however these experiences have not reached the rates reported in developed countries. We presented the results of a bundle for the prevention of VAP implemented in an ICU in Medellín, Colombia. **Methods:** The implementation of a bundle for prevention of VAP in an adult medical/surgical, major teaching, 12-bed ICU began in July 2013. The bundle included: head-of-bed elevation to 45°, oral hygiene with chlorhexidine 2%, cuff pressure, continuous subglottic suctioning and daily sedation vacation and weaning evaluation. A daily checklist was used by infection control team. Compliance and VAP rates were reported, on a quarterly basis, to the ICU staff. Preventive (6 mo) and postinterventional (3 mo) rates of VAP were evaluated. **Results:** The rate of VAP declined from 9.7 x 1000 ventilator days in the pre-intervention period to 4.6 x 1000 ventilator days in the post-intervention period, with a decrease of 53%. The global compliance with the bundle increased from 76% at baseline to 90% at the end of the follow-up. Daily sedation vacation and weaning evaluation was the intervention with the lower compliance at the end of the follow-up (52%). Head-of-bed elevation to 45°, oral hygiene with chlorhexidine 2% and cuff pressure reached compliance over 95% at the end of the follow-up. **Conclusions:** The bundle for prevention of VAP implemented in ICUs from developing countries can reach rates similar to those reported in developed countries.

### 455 RESISTANCE PATTERNS AND CLINICAL PREDICTORS OF PEDIATRIC BACTEREMIA AT A TANZANIAN HOSPITAL

**Christine Joyce, Adolphine Hokoro, Joy Howell, Paul Christos, Robert Peck**

**Learning Objectives:** The mortality of children in resource-limited hospitals remains unacceptably high, with sepsis playing a large causative role. Broad-spectrum antibiotics are often initiated without knowledge on bacteria type or resistance patterns. With concern for emergence of resistant organisms, targeted therapy is crucial. Clinical presentation may be useful in guiding decision making. **Methods:** This retrospective chart review evaluated all blood cultures performed in pediatric inpatients aged 0–12 over 1 year at a Tanzanian hospital. Positive cultures and resistance patterns were recorded. Chi-square and Fisher's exact tests. Given the study's exploratory nature and small sample size, all p-values <0.25 were reported for hypothesis-generating purposes. **Results:** A total of 585 blood cultures were reviewed from 523 patients; 51 cultures were positive (20 gram positive, 31 gram negative), indicating a bacteremia prevalence of 8.7%. Of those tested against the first line regimen of ampicillin and gentamicin, 60% (14/23) were resistant. Of those tested against the second line regimen of Ceftriaxone, 75% (3/4) were resistant. Of the gram positives, 75% (15/20) were Staph Aureus. Of these, 33% (5/15) were Methicillin Resistant; one was resistant to Vancomycin. Of these, 33% (5/15) were Methicillin Resistant; one was resistant to Vancomycin. Of these, 33% (5/15) were Methicillin Resistant; one was resistant to Vancomycin. Of these, 33% (5/15) were Methicillin Resistant; one was resistant to Vancomycin. **Conclusions:** Our analysis of culture results suggests a high prevalence of resistant organisms. Our exploratory analysis indicates that sickle cell disease, persistent fever and abnormal WBC count may be important predictors of true bacteremia.

### 457 ANTIMICROBIAL TREATMENT AND MORTALITY RISK FOR CARBAPENEM-RESISTANT KLEBSIELLA PNEUMONIAE PNEUMONIA

**Sarah Welch, Elizabeth Neuner, Simon Lam, Seth Bauer, David van Duin, Cober Eric, Stephanie Bass**

**Learning Objectives:** Studies investigating carbapenemase-producing Klebsiella pneumoniae (CRKP) bloodstream infections suggest better outcomes when two or more drugs with activity against the isolate are used. Unfortunately, lung penetration is poor with these drugs. Clinical outcomes in a real-world setting are needed to establish optimal therapeutic regimens in patients with CRKP pneumonia. **Methods:** A retrospective case-control study was conducted to primarily determine the influence of combination antimicrobial therapy on mortality at 30 days. Secondary objectives included describing the influence of baseline characteristics, definitive tigecycline-based therapy and colistin-based therapy, initial
A multidisciplinary team, which included frontline staff, was formed to implement a robust CHG bathing strategy. Multi-modal education was given daily bathing.


describing the rationale for CHG bathing, contraindications, bathing instructions, and a process utilized to create a temporary period of drug tolerance in patients who acutely need specific antibiotic therapy. There is a paucity of published data that evaluates a uniform antibiotic desensitization process, particularly among various antibiotics in critically ill patients. Methods: A retrospective, observational chart review was performed to evaluate an antibiotic desensitization protocol utilized in the ICU at an academic medical center between September 1, 2012 and December 31, 2014. All patients included in the review underwent a step-wise standardized protocol while being monitored in the ICU. Potential cases were excluded if there was no deviation from the protocol. Patients who had undergone multiple cases of desensitization had each instance counted as separate events. The primary outcome of interest was the percentage of desensitization attempts that were successfully completed. Data regarding the safety of the desensitization process were evaluated, including: adverse reactions, the administration of rescue medications, and reasons for any cessation of protocol. Results: A total of 23 unique desensitizations were undertaken in 13 patients. Twenty-two of the 23 (95.7%) cases of desensitization were successful. Adverse events were recorded in 7 of the 23 (30.4%) cases. The adverse events were generally mild in nature, with the most common being itching occurring in 6 cases (26.1%) and a rash or redness in 4 patients (17.4%). Rescue medications included diphenhydramine (7) and hydrocortisone (1) and were administered in response to these mild adverse events. The desensitization process had to be discontinued in one instance after a patient experienced bronchoconstriction. Conclusions: A step-wise standardized antibiotic desensitization protocol proved to be both effective and safe for many patients and may be a treatment option for individuals whose antibiotic choices are limited by IgE hypersensitivity.

ASSOCIATION BETWEEN PRE-OPERATIVE CEFAZOLIN DOSE AND SURGICAL SITE INFECTION IN OBESE PATIENTS

William Peppard, David Eberle, Danielle Mabrey, John Weigelt

Learning Objectives: Obesity in the U.S. has increased in incidence and is a well-known risk factor for surgical site infections (SSIs). Taking pharmacokinetic properties into account, it is expected that higher doses of pre-operative cefazolin prophylaxis are required for obese patients. American Society of Health-System Pharmacists (ASHP) guidelines state that preoperatively, patients >80 kg should receive 2 g of cefazolin and patients >120 kg should receive 3 g. These are weak recommendations based off small, single-centered studies lacking clinical outcome data. In contrast, our institutional guidelines, implemented prior to the release of current ASHP guidelines, suggest using a 3 g dose for patients ≥100 kg. Methods: A retrospective, single center, observational study evaluated the incidence of SSIs in patients >100 kg who received a preoperative cefazolin dose of either 2 g or 3 g. Primary outcome was the SSI rate, secondary included risk factors for SSIs, and the SSI rate in the subset of patients >120 kg. Results: 439 patients were evaluated, 154 in the 2 g group and 285 in the 3 g group. Baseline demographics were similar between groups, exceptions being patients in the 3 g group were more likely to be younger, admitted to the orthopedic service, weigh more, and be current or former smokers. Mean duration of follow-up for both groups was 77 days. Unadjusted SSI rates were 8.4% and 7.7% (OR 1.10, CI 0.54–2.25, p=0.79), for the 2 g and 3 g groups, respectively. When logistic regression was adjusted with propensity scores using 10 strata, and duration of follow-up factored in, the groups still did not differ (OR 0.85, CI 0.38–1.93, p=0.70). The only variable associated with SSI was the use of implants/hardware, the rates of which were 50.5% and 79.4% for the non-SSI and SSI groups, respectively. Subset analysis yielded similar rates of SSI for ≥120 kg and <120 kg groups (6.9% and 8.6%, p=0.539). The dose of cefazolin was not associated with rate of SSI in either group. Conclusions: In otherwise similar obese surgical patients, the dose of pre-operative cefazolin (either 2 g or 3 g) is not associated with the rate of SSI.

DOSE AND SURGICAL SITE INFECTION IN OBESE PATIENTS

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EVALUATION OF A STANDARDIZED ANTIBiotic DESENSITIZATION PROTOCOL

Kelsey Aker, Gregory Petz, Keith Olsen

Learning Objectives: Antibiotic-induced IgE hypersensitivity reactions can result in potentially life-threatening complications. Step-wise antibiotic desensitization is a process utilized to create a temporary period of drug tolerance in patients who acutely need specific antibiotic therapy. There is a paucity of published data that evaluates a uniform antibiotic desensitization process, particularly among various antibiotics in critically ill patients. Methods: A retrospective, observational chart review was performed to evaluate an antibiotic desensitization protocol utilized in the ICU at an academic medical center between September 1, 2012 and December 31, 2014. All patients included in the review underwent a step-wise standardized protocol while being monitored in the ICU. Potential cases were excluded if there was any deviation from the protocol. Patients who had undergone multiple cases of desensitization had each instance counted as separate events. The primary outcome of interest was the percentage of desensitization attempts that were successfully completed. Data regarding the safety of the desensitization process were evaluated, including: adverse reactions, the administration of rescue medications, and reason for any cessation of protocol. Results: A total of 23 unique desensitizations were undertaken in 13 patients. Twenty-two of the 23 (95.7%) cases of desensitization were successful. Adverse events were recorded in 7 of the 23 (30.4%) cases. The adverse events were generally mild in nature, with the most common being itching occurring in 6 cases (26.1%) and a rash or redness in 4 patients (17.4%). Rescue medications included diphenhydramine (7) and hydrocortisone (1) and were administered in response to these mild adverse events. The desensitization process had to be discontinued in one instance after a patient experienced bronchoconstriction. Conclusions: A step-wise standardized antibiotic desensitization protocol proved to be both effective and safe for many patients and may be a treatment option for individuals whose antibiotic choices are limited by IgE hypersensitivity.

EXCESS RISK OF ACUTE KIDNEY INJURY FROM LIPOSOMAL AMPHOTERICIN B AND IV CONTRAST CO-ADMINISTRATION?

John O'Horo, Omar Abu Saleh, Jasmine Marcelin, Douglas Osmon

Learning Objectives: Acute kidney injury (AKI) is associated with poor short and long term outcomes in the critically ill. Patients with systemic mycoses are often evaluated with CT scans using intravenous (IV) contrast, and treated with liposomal amphotericin B. Each of these agents are independently associated with AKI, therefore we hypothesized that co-administration may result in an additional risk of AKI than either alone. Co-administration of nonsteroidal anti-inflammatories (NSAIDS) and IV contrast is associated with an 8% risk of AKI, and screening to prevent co-administration is currently recommended in Canadian Association of Radiologist guidelines. We sought to evaluate if co-administration of liposomal amphotericin B and IV contrast was a risk factor for AKI and thus should be
simply screened. **Methods**: We queried our unified data platform for all patients who received liposomal amphotericin B in the past two yr. We then identified all CT scans that utilized IV contrast performed in this cohort to identify coadministration events within 24 hr of each other. Records were reviewed to look for AKI as determined by AKIN criteria within 72 hr, other nephrotoxins, and if there was a change in renal function that persisted beyond hospitalization. **Results**: 36 patients were identified who met inclusion criteria as described above. Of those, 18 (50%) developed AKI without any other obvious reason for AKI. Of those, 4 (22%) did not return to baseline renal function at time of discharge. **Conclusions**: This rate of AKI is higher than is typically reported for CT scans utilizing IV contrast, and higher than seen with NSAID-IV contrast administration. Although this is a retrospective cohort study with a small number of patients, these findings suggest that co-administration may be a modifiable risk factor for AKI. Further controlled research should be done to determine if liposomal amphotericin B co-administered with IV contrast is a risk factor for AKI and thus should be screened or potentially avoided in patients receiving liposomal amphotericin B.

461 IMPROVING ACCESS AND MAINTENANCE OF CENTRAL VENOUS CATHETERS TO DECREASE CLABSI IN THE ICU
Todd Dodick, Ross Gaudet, Emily Landon, Michael O’Connor

**Learning Objectives**: While central venous catheters remain an essential tool to provide care to critically ill patients, catheter-related bloodstream infections (CRBSIs) remain a source of considerable morbidity and mortality in ICUs. Our institution undertook a multi-faceted initiative designed to reduce CRBSI rates centered on access and maintenance of CVCs after insertion. **Methods**: From July 2011 to June 2012 our institution designed and implemented an initiative to reduce CRBSIs by focusing on access and maintenance of CVCs, insertion practices, supplies, documentation, and education. Computer-based training modules were produced for insertion and access/maintenance, and physicians and nurses were trained in these practices. A supply bundle was designed containing all necessary supplies for sterile insertion of a CVC, and a navigator was designed in the EMR for documentation of line insertion. The access/maintenance CBT was the first to be implemented and the RNs were all assessed for a supervised demonstration of proper practices. **Results**: Following completion of a computer-based training module for access/maintenance of CVCs, the CRBSI rate decreased from 1.06/1,000 catheter days for fiscal year 2011 to 0.53/1,000 catheter days from August - November ’11, a period during which the only change to our practice was the training of nurses and other providers in line care. This decrease was sustained throughout the study period, with no further decrease following implementation of other interventions. The final CRBSI rate for fiscal year ’12 was 0.60/1,000 catheter days. This difference was statistically significant with p<0.015. **Conclusions**: Focusing on the access and maintenance of CVCs in our ICUs, we were able to significantly decrease CRBSI rates in our institution. While many interventions have been suggested to decrease CRBSI rates in the literature, the routine access and maintenance of CVCs has, to our knowledge, thus far been neglected. Our data illustrates that by emphasizing this source of potential literature, the routine access and maintenance of CVCs in our ICUs, we were able to significantly decrease CRBSI rates in our institution.

462 INTER-PROB: INTERVIEWING SUBSTITUTE DECISION MAKERS ABOUT PROBIOTICS
Melissa Shears, France Clarke, Peter Dodek, Jackie O’Brien, Laurie Meade, Denise Foster, Orla Smith, Sangeeta Mehra

**Learning Objectives**: Beliefs of substitute decision makers (SDMs) of critically ill patients related to probiotics have not been well studied. We aimed to understand perspectives held by SDMs of critically ill patients invited to participate in a peer-reviewed multicenter trial: PROSPECT pilot trial. **Methods**: Using rigorous development and testing methods, we generated a 2 page, feasible instrument, administered to SDMs approached for enrollment of their loved one into PROSPECT during the consent encounter. For SDMs enrolled in Inter-Prob, we collected age, sex, ethnicity, and urban or rural residence. We documented self-reported probiotics familiarity, probiotic consumption, and rationale for consent decision. **Results**: Between June 2014 and February 2015, 104 SDMs of patients eligible for PROSPECT were approached for Inter-Prob participation in 8 centers. The Inter-Prob consent rate was 103/104 (99%), and the PROSPECT consent rate was 89/103 (86%) in this cohort. SDMs were 53 (±16) yr old, 60 (59%) were female, 77 (76%) were white, and 82 (85%) lived in an urban area. 57% of SDMs reported familiarity with probiotics; 60% of SDMs reported past use, and 44% reported current use. There were no differences between SDMs who consented (N=89) or declined (N=14) PROSPECT regarding familiarity with probiotics (p=0.14), prior probiotic use (p=0.21) or likelihood of urban living (p=0.69). The most common reasons for PROSPECT consent were potential patient benefit (37%), desire to contribute to medical research (20%), and potential benefit to other patients (17%). Reasons for declining PROSPECT were belief that the patient would not have agreed (25%), not wanting to alter the treatment plan (21%), belief that the patient was too sick to receive other treatment (18%) and other reasons including uncertainty about the patient’s wishes (18%). **Conclusions**: We found no difference in characteristics of SDMs who consented or declined the PROSPECT Trial for their critically ill loved one. SDM consent decision rationale was related to personal beliefs regarding benefits to the patient, as well as predictions of patient’s wishes.

463 AN UNUSUAL MANIFESTATION OF A COMMON BUG! Bipal Saha, Bushra Syed, Smira Shah, Gigi Diamond, Sunil Sapru

**Learning Objectives**: Pseudomembranous colitis due to Clostridium difficile (C. diff) is a common cause of nosocomial diarrhea. Extra-intestinal manifestation is rare, with an incidence rate between 0.6 to 1.08%. We present a case of lung abscess and empyema due to C. diff in a patient without any preceding gastrointenstinal symptoms or recent antibiotic use. **Methods**: A 59 yr old female presented with fever, malaise, bilateral leg swelling and progressively worsening shortness of breath for 2 weeks. She denied chest pain, cough, sputum production, palpitation, orthopnea, paroxysmal nocturnal dyspnea. There was no sick contact, recent hospitalization or antibiotic use. Physical examination revealed reduced breath sound at the left lung base and pedal edema. Labs revealed a WBC count of 9.3 and a BNP of 3287 pg/ml. CTA chest showed moderate left sided pleural effusion and small right sided effusion. ECHO showed an EF of 30–35%. She was treated for heart failure with partial resolution of dyspnea but no improvement of the effusion on repeat imaging. She became febrile up to 103F with worsening leukocytosis. Thoracentesis yielded 1.3L of bloody exudative pleural fluid. The fluid cytology and cultures were negative. An open left thoracotomy and pleural decortication for empyema was done and an abscess was found. Cultures grew Clostridium difficile. She was treated with IV vancomycin and IV metronidazole with rapid clinical improvement. **Results**: Most reported cases of extra-intestinal C. diff infection have been acquired as a nosocomial infection. Common sites includes abdominopelvic cavity, perianal area, blood stream infection and wound infection. Brain abscess, osteomyelitis, splenic abscess, pylonephritis and empyema have also been reported but are extremely rare. Interestingly, unlike intestinal C. diff infection many isolated strains are non toxigenic in extra-intestinal infection. **Conclusions**: Pulmonary infection with C. diff is extremely rare. The virulence factors that cause extra colonic infection are still unknown. To our knowledge, this is the first case of monomicrobial lung abscess due to C. diff.

464 IMPACT OF HIGHER TARGET VANCOMYCIN TROUGH LEVELS ON INCIDENCE OF VANCOMYCIN-INDUCED AKI
Markull Bulloch, Lyndsi Paumen, Stephen Eure, Joseph Stewart

**Learning Objectives**: In 2009, consensus guidelines on vancomycin use & monitoring were published by the Infectious Diseases Society of America (IDSA), the American Society of Health-System Pharmacists (ASHP), & the Society of Infectious Disease Pharmacists (SIDP) which recommended increasing the target vancomycin trough to 15–20 mg/L in order to minimize both treatment failure & toxicity. Previous studies have associated vancomycin with nephrotoxicity, but the extent of the impact of the 2009 guideline recommendations on vancomycin-induced nephrotoxicity is not well known. The purpose of this study was to evaluate the effects of higher vancomycin dosing on kidney function since the adoption of the 2009 consensus guidelines. **Methods**: Medical records of adult patients who received ≥ 72 hr of vancomycin in 2008 & 2012 were reviewed. The primary objective was to compare vancomycin-induced nephrotoxicity before & after the implementation of the 2009 consensus guidelines. Patients on hemodialysis at baseline were excluded. Comparisons between the 2 groups were performed using descriptive statistics & contingency table analysis with a Chi-square
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MICROBIOLOGY OF VENTILATOR-ASSOCIATED PNEUMONIA IN A HETEROGENEOUS ICU POPULATION IN QATAR
Husain Ali, Saifude George, Fahmi Khan, Nisar Shaikh, Jameela Al-Ajmi

Learning Objectives: Awareness of microbiology of ventilator-associated pneumonia (VAP) is essential for selecting optimal antibiotic therapy, tracking trends in local antimicrobial resistance pattern & improving clinical outcomes. The aim of our study was to analyze the microbiology of VAP in our ICU setup. Methods: We conducted a retrospective review of all adult patients with VAP in medical (MICU), surgical (SICU) & trauma-ICU (TICU) between January 2010 & December 2012. Patients ventilated for >48 hr were clinically diagnosed with VAP if they had new & persistent chest infiltrates, signs of systemic infection (fever, altered WBC count) & purulent endotracheal aspirate. Microbiological data were reviewed for all patients with VAP. Results: 106 patients had been clinically diagnosed with VAP out of which 52 were from TICU, 27 from SICU & 27 from MICU. Respiratory specimen collected for gram stain & culture-sensitivity was either deep tracheal aspirate or bronchoalveolar lavage. Single organism was isolated from respiratory specimens of 52 patients (49%), 22 organisms isolated from another 52 patients (49%) & no organism was isolated from 2 patients. Distribution of culture isolates were: 39 (36.8%) Pseudomonas, 25 (23.5%) Klebsiella, 24 (22.6%) Enterobacter, 23 (21.7%) Acinetobacter, 21 (19.8%) Staphylococcus, 16 (15.1%) Hemophilus, 5 (4.7%) Streptococcus, 4 (3.8%) Stenotrophomonas & 13 (12.5%) other organisms. 43 (40.6%) patients had atleast one organism which was multidrug resistant. 30-day mortality was 23.6% (N=25). Organism specific mortality was: Acinetobacter 30.4%, Stenotrophomonas 25%, Staphylococcus 23%, Pseudomonas 17.9%, Enterobacter 16.7%, Hemophilus 12.5%, Klebsiella 12% & Streptococcus 0%. Mortality in patients with sensitive & resistant microbes was 16.4% & 32.6%, respectively. Conclusions: In our analysis of microbiology of VAP, gram-negative organisms were the most frequent culture isolates; Pseudomonas species was the most common. Highest mortality was observed in patients with Acinetobacter isolates & least in Streptococcus group. Resistant microbes had higher mortality than sensitive ones.

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ANEURYSMAL SUBARACHNOID HEMORRHAGE PATIENTS WITH ELEVATED 20-HETE HAVE HIGHER LINDEGAARD RATIOS
Elizabeth Crago, Jonathan Yabes, Jeffrey Balzer, Leah Trulzi, Andrew Ducruet, Paula Sherwood, Samuel Poloyac

Learning Objectives: A primary factor contributing to poor outcomes after aneurysmal subarachnoid hemorrhage (aSAH) is the development of cerebrovascular complications which often result in hyperemia or secondary ischemia. Transcranial Doppler (TCD) is a noninvasive tool used to identify arterial constriction after aSAH. Preclinical evidence supports the role of 20-hydroxyeicosatetraenoic acid (20-HETE) in microvascular reactivity and dysregulation after aSAH. We examined this association in aSAH patients by evaluating the relationship between 20-HETE and the TCD derived Lindegaard ratio (LR). Methods: This prospective longitudinal study included 24 adult aSAH patients (age 21–75 yr) with a Fisher grade >1 and the presence of a ventriculostomy drain and without pre-existing debilitating neurologic disability. Cerebral spinal fluid (CSF) was drawn every 12 hr for up to 14 days from the onset of aSAH. TCD’s were completed and LR calculated daily by trained study staff. Results: Patients were placed into high and low 20-HETE groups using trajectory analysis (PROC TRAJ; SAS). Linear mixed effects models with subject-specific effects was used to assess for differences in LR by HETE categories (high and low) controlling for time. Results: There were 11 patients in the high HETE group and 14 patients in the low HETE group. The average CSF 20-HETE values were 0.27 +/- 0.58 ng/ml and 0.08 +/- 0.07 ng/ml respectively. LR’s demonstrated significant differences at time points beyond 200 hr (~8 days) after injury with later time point LR’s averaging 5.7+/-.2.1 in the high 20-HETE patients compared to 2.08+/-.07 for the low 20-HETE patients. 20-HETE levels typically peaked prior to the increase in LR. Conclusions: Data suggest that higher 20-HETE levels are associated with higher LR after aSAH. Research is ongoing to identify if 20-HETE may be a useful biomarker in predicting cerebrovascular complications after aSAH. (Funded by R01NR004339.)

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ANESTHETIC INFUSIONS FOR REFRACTORY STATUS EPILEPTICUS IN CHILDREN
Robert Tasker, Howard Goodkin, Kevin Chapman, Nicholas Abend, Ivan Sanchez Fernandez, Tobias Loddenkemper

Learning Objectives: Refractory status epilepticus (RSE) is defined as continued seizure activity despite administration of two antiepileptic drugs (AEDs). The aim of this study is to describe the use of anesthetic agents in the treatment of pediatric patients presenting with convulsive refractory status epilepticus (RSE). Methods: Prospective observational cohort study (June 2011 to June 2013) in 9 tertiary pediatric hospitals in the United States (Pediatric Status Epilepticus Research Group [pSERG], Seizure 2014;23:87–97), of pediatric patients (1 month to 21 yr) with RSE who had not responded to two AED classes and went on to continuous administration of an anesthetic agent for seizure control. Results: Out of 111 cases of RSE (median age 4 yr), 54 (28 males) underwent anesthetic treatment. 83% were mechanically ventilated and ICU length-of-stay was median 10 days. Up to four ‘cycles’ of serial anesthetic therapy was used and seizure control was achieved in 94% by the second cycle. Seizure duration in controlled cases was 5.9 (1.9 – 34) hr for the first cycle, and 30 (4 – 120) hr if a second cycle was required (P<0.05). Midazolam was the most frequently used first-line agent (78%) and pentobarbital was the most frequently used second-line agent after midazolam had failed (82%). An electroencephalographic (EEG) endpoint was used in more than half the cases, and there was no difference in midazolam dose using a clinical or EEG endpoint: 0.30 (0.13 – 0.88) mg/kg/hr vs 0.23 (0.17 – 0.35) mg/kg/hr. However, higher dosing was used when burst suppression was the endpoint, i.e., 1.00 (0.55 – 1.50) mg/kg/hr (P<0.05). In the 12 non-responders requiring a second anesthetic agent, midazolam was used for 24 (12.5 – 38.5) hr before transition to effective pentobarbital infusion rate (median 3.0 [1.5 – 4.0] mg/kg/hr). Conclusions: Midazolam and pentobarbital remain the mainstay of anesthetic treatment for RSE in pediatric patients, and the majority of cases are controlled by a median of 30 hr using these agents.

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DELIRIUM RISK IN SURGICAL INTENSIVE CARE PATIENTS ON CHRONIC TREATMENT WITH GABAPENTIN OR PREGABALIN
Silvia Perez-Prosto, Lisa Harinstein, Natalya Makarova, J. Hara, Marc Popovich

Learning Objectives: Gabapentin and pregabalin are commonly prescribed for chronic pain management and a withdrawal syndrome has been reported after abrupt cessation. Critically ill patients may be unable to continue on them due to inability to tolerate oral route or development of renal insufficiency. The aim of this study is to determine the risk of postoperative delirium in patients on chronic treatment with gabapentin or pregabalin (GABAP) compared with patients not on therapy prior to admission to the surgical intensive care unit (SICU) after non-cardiac surgery. Methods: We performed a retrospective study of patients admitted to the SICU at Cleveland Clinic. Data was obtained from APACHE database, and Perioperative Health Documentation System registry. We included adults
ICU when the drugs are abruptly held.

The chronic use of gabapentin or pregabalin prior to SICU admission compared with no use was not associated with an increase in delirium in the comparison with patients not on chronic GABA medications. After controlling for potential confounding variables, use of GABA medications prior to admission compared with no use was not significantly associated with an increase in delirium (50% vs. 47%). The odds ratio of experiencing delirium for patients on chronic GABA medications compared to patients not on chronic GABA medications was 1.2 (95% CI, 0.9, 1.7, p=0.3).

Conclusions: The chronic use of gabapentin or pregabalin prior to SICU admission compared with no use was not associated with an increase in delirium in the ICU when the drugs are abruptly held.

Intracerebral hemorrhage (ICH) is a major cause of morbidity and mortality in adults. The incidence and the impact of need of ventriculostomy (VT) in patients with ICH are unclear. We sought to examine the impact of having VT during hospitalization was identified. The outcomes of those with VT vs without VT included: IHM (32.2% vs 18.1%), HC ($238,611 vs $67,451) and mean LOS in days (19.4 vs 7.2), respectively. After adjustment for several patient and hospital level confounding factors, those who had VT were associated with higher odds for IHM (OR=2.10, 95%CI=2.00–2.20, p<0.0001), significantly higher HC (Estimate=+1.059, 95%CI=+1.022–1.097, p<0.0001, positive estimate implies higher) and longer LOS (e=0.7429, 0.7164–0.7694, p<0.0001) when compared to those who did not have VT. Conclusions: In this large cohort of adults hospitalized with ICH, those who underwent VT were associated with higher risk of mortality and considerable resource utilization.

A MODIFIED ICH SCORE: INTRAVENTRICULAR EXTENSION WITHOUT HYDROCEPHALUS DOES NOT INCREASE MORTALITY

Ali Mahta, Ausim Azizi, Hooman Kamel, Paul Katz

Learning Objectives: Objectives: 1) To test the hypothesis that intraventricular extension of spontaneous intracerebral hemorrhage in the absence of hydrocephalus is not associated with increased mortality or severe disability. 2) To modify current ICH scoring system for a possible better prognostication. 3) To assess whether shorter time interval from development of hydrocephalus to ventriculostomy is correlated with the functional outcome or not.

Methods: Methods: A retrospective consecutive cohort study of patients with primary spontaneous intracerebral hemorrhage (ICH) who were admitted to a single institution was performed. Multivariate logistic regression analysis was used to assess correlation of each variable with functional outcome measured as modified Rankin Scale (mRS). A modified ICH scoring system was proposed based on the information obtained from the first part. For those patients who underwent ventriculostomy, the time interval from development of hydrocephalus to ventriculostomy was assessed in regards to mRS. Results: Results: A total number of 164 patients met our inclusion criteria and entered the study. Only three variables met statistical significance for their association with increased mortality or severe disability (mRS ≤ 5). These variables including hydrocephalus (p=0.002); hematoma volume (p=0.003) and initial Glasgow Coma Scale (p=0.017) were considered in our modified ICH scoring system. Conclusions: Conclusion: The presence of intraventricular extension of ICH in the absence of hydrocephalus does not increase mortality or severe disability. The shorter time interval from development of hydrocephalus to ventriculostomy may not improve functional outcome. Our new modified ICH score is a simple and accurate way to predict mortality or severe disability in ICH.

NEED FOR VENTRICULOSTOMY PREDICTS POOR OUTCOME IN ADULTS HOSPITALIZED WITH INTRACEREBRAL HEMORRHAGES

Muthu Bhaskaran, Roy Aparna, Nalliah Romesh, Veerasathpurush Allareddy, Veerajalandhar Allareddy

Learning Objectives: Intracerebral hemorrhage (ICH) is a major cause of morbidity and mortality in adults. The incidence and the impact of need of ventriculostomy (VT) in patients with ICH are unclear. We sought to examine the impact of having VT on outcomes (in-hospital mortality-IHM, hospital charges-HC, and length of study-LOS) in adults who were hospitalized due to ICH. We hypothesize that the need for VT in adults hospitalized with ICH is a predictor for poor outcomes. Methods: The Nationwide Inpatient Sample for the yr 2004 to 2010 was used. The study was granted IRB exempt status. All patients aged ≥18 yr who were hospitalized primarily due to ICH were selected. Amongst this cohort, performance of VT during hospitalization was identified. The outcomes of interest were IHM, HC and LOS. The primary independent variable was performance of VT. The associations between outcomes and primary independent variable were examined by multivariable logistic and linear regression models. The confounding effects of age, sex, race, insurance status, co-morbid burden, type of intra-cerebral hemorrhage, and hospital characteristics were adjusted in the regression models. Results: During the study period a total of 1,323,441 patients were hospitalized due to ICH. Of these, 79,406 (6.3%) had VT. Males accounted for 54.7% of all hospitalizations. The mean age of those who had VT was 58 yr (compared to 67.8 yr in those without VT). Outcomes of those with VT vs without VT included: IHM (32.2% vs 18.1%), HC ($238,611 vs $67,451) and mean LOS in days (19.4 vs 7.2), respectively. After adjustment for several patient and hospital level confounding factors, those who had VT were associated with higher odds for IHM (OR=2.10, 95%CI=2.00–2.20, p<0.0001), significantly higher HC (Estimate=+1.059, 95%CI=+1.022–1.097, p<0.0001, positive estimate implies higher) and longer LOS (e=0.7429, 0.7164–0.7694, p<0.0001) when compared to those who did not have VT. Conclusions: In this large cohort of adults hospitalized with ICH, those who underwent VT were associated with higher risk of mortality and considerable resource utilization.

HIGH PLASMA MICRORNA-26A IS ASSOCIATED WITH GOOD OUTCOME FOLLOWING SUBARACHNOID HEMORRHAGE

Sherry Chou, Basak Icli, Sarah Clark, Gabriella Santos, Steven Feske, MingMing Ning, Eng Lo, Mark Feinberg

Learning Objectives: Subarachnoid hemorrhage (SAH) remains a highly morbid form of stroke, leading to >27% of all stroke-related yr of life lost before age 65. Mechanisms of SAH-related early brain injury and vasospasm remain poorly understood, and there are no clinical biomarkers that reliably predict long term outcome after SAH. MicroRNA (miR)-26a is released in response to hypoxia and regulates smooth muscle cell differentiation and promotes angiogenesis. We hypothesize that higher levels of miR-26a is associated with better outcome in human SAH. Methods: We prospectively enrolled consecutive SAH subjects, banked serial CSF/plasma samples, and evaluated functional outcome by modified Rankin scores (mRS) via scripted telephone follow-up every 3 mo. Good functional outcome is defined as mRS=2. Angiographic vasospasm is defined as ≥50% reduction in caliber of any vessel on post-SAH day 7 cerebral angiogram. In 56 SAH subjects we compared CSF and plasma miR-26a by quantitative PCR on post-SAH days 1, 3 and 5 between outcome groups. Data are normalized using log-transformation and then compared using student’s t-test. Logistic regression is used to adjust for known confounders. Results: Study population has mean age of 55, 62% has Hunt and Hess (HH) grade ≥3. Good outcome at 6 mo is associated with higher plasma levels of SAH day 7 cerebral angiogram. In 56 SAH subjects we compared CSF and plasma miR-26a by quantitative PCR on post-SAH days 1, 3 and 5 between outcome groups. Data are normalized using log-transformation and then compared using student’s t-test. Logistic regression is used to adjust for known confounders. Results: Study population has mean age of 55, 62% has Hunt and Hess (HH) grade ≥3. Good outcome at 6 mo is associated with higher plasma levels on post-SAH day 3 (p=0.0007) and day 5 (p=0.04). After adjusting for important clinical predictors of outcome (HH grade, age), plasma miR-26a on post-SAH day 3 remains strongly associated with outcome (p<0.0001). Plasma miR-26a levels were not associated with vasospasm. MiR-26a is present in CSF and is elevated in SAH compared to controls (p<0.0001), but CSF miR-26a levels showed no association with functional outcome or vasospasm status. Conclusions: Higher plasma miR-26a level at post-SAH day 3 is independently associated with 6-month SAH outcome. Mechanistic experiments are necessary to determine whether miR-26a expression is neuro-protective in SAH. Validation studies in larger, independent cohorts are necessary to validate miRNA-26a as a prognostic SAH biomarker.

ROLE OF TEMPERATURE AND HUMIDITY IN ANEURYSMAL SUBARACHNOID HEMORRHAGE ONSET: A COMPARATIVE ANALYSIS

Robert Kowalski, Paul Nyquist

Learning Objectives: Established risk factors for aneurysmal subarachnoid hemorrhage (aSAH) include hypertension, female sex and older age. Recently associated risk has been identified with certain environmental stressors. We sought to assess the role of colder temperatures, increased humidity and other weather elements relative to patient risk factors in predicting aSAH onset. Methods: An multivariate analysis of Individuals admitted to the Johns Hopkins Hospital with a diagnosis of aSAH, and

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non-aSAH controls from the Baltimore City and County area in the Behavioral Risk Factor Surveillance System (BRFSS). The analysis cohort included 933 aSAH patients and 2,453 matched non-aSAH controls in a period of 3,329 days from 1993 to 2009. Of all subjects 61% were female, mean age was 49.5 ± 16.8 yr, and 27% were black. Results: Independent predictors of aSAH admission included female sex (odds ratio 2.134; 95% confidence interval 1.801–2.549; p<0.001), black race (odds ratio 2.071; 95% confidence interval 1.739–2.465; p<0.001), and history of hypertension (odds ratio 1.432; 95% confidence interval 1.194–1.696; p<0.01). Meteorologic factors that predicted aSAH included maximum daily temperature >70°F (odds ratio 1.248; 95% confidence interval 1.055–1.479; p=0.010), higher maximum daily relative humidity (odds ratio 1.012; 95% confidence interval 1.003–1.021; p=0.009) and higher minimum daily humidity (odds ratio 1.016; 95% confidence interval 1.000–1.012; p=0.037). Cold weather predicted aneurysm rupture in subsets of women and white individuals, but not in men and blacks. Elevated humidity predicted aSAH for all groupings. Conclusions: Cold temperatures and elevated humidity independently predict onset of aneurysmal subarachnoid hemorrhage along with known patient risk factors. Effect of lower temperature on aSAH incidence is greater in women and white individuals than in men and those who are black. These findings may guide hospital acute care planning during inclement weather. Sex and racial differences in temperature impact on this stroke type warrant further study.

473 VENTRICULAR CSF PROTEOMICS IN PATIENTS WITH ACUTE BRAIN INJURY
Carlos Andres Santacruz Herrera

Learning Objectives: Acute brain injury is associated with changes in ventricular cerebrospinal fluid (vCSF) proteome. Quantitative analysis of vCSF proteins could help identify biomarkers of worse long-term neurologic outcome in these patients. Methods: The study was approved by the hospital Ethical Committee and included 25 consecutive patients (50 ± 15 yr) who required an intravenous or arterial femoral or radial arterial pressure monitoring and/or CSF drainage for subarachnoid hemorrhage (48%), brain trauma (24%), intracerebral hemorrhage (12%) or other problems (16%). Admission Glasgow Coma Scale score was 8 ± 5. The ICU mortality rate was 38%. A control group included 7 patients undergoing elective clipping of an unruptured cerebral aneurysm. Proteins were identified and quantified from 0.25 ml vCSF samples by mass spectrometry (Triple TOF, AB Sciex, Concord, Canada) and 2D high-performance liquid chromatography (HPLC, NanoLC Ultra, Elksigen, Dublin, CA). Clusters of proteins were analyzed by principal component analysis. Change in hemorrhage (n= 9) and peri-hemorrhagic edema (n = 9) volume was assessed blindly by radiologists using digital CT-scan with automated segmentation and manual tracing tools (LiveWire Software, Carestream Health Inc., Rochester, NY). Neurological outcome was assessed using the Glasgow Outcome Scale (GOS). Results: Patients with acute brain injury had a similar number of expressed proteins (119 ± 55 vs. 134 ± 25, p=0.50) to control patients, but principal component analysis showed significantly different distributions of protein clusters, with a higher relative expression of alpha-1 antitrypsin (A1AT/alb) (0.25 ± 0.16 vs. 0.17 ± 0.10, p<0.05) and a lower relative expression of apolipoprotein E (ApoE/alb) (0.07 ± 0.08 vs. 0.15 ± 0.01, p<0.01). There was a negative correlation between A1AT expression and changes in hemorrhage and edema volume at day 3 (∼= 0.80, p<0.01), and a positive correlation between Ap Conclusions: Alterations in vCSF proteome are present in patients with acute brain injury. vCSF ApoE expression could be a predictive biomarker of worse long-term neurologic outcome in these patients.

474 ASSESSMENT OF 23-VALENT PNEUMOCOCCAL VACCINE RESPONSE IN CRITICALLY-ILL NEUROSURGICAL PATIENTS
Scott Mueller, Laura Baumgartner, Robert Neumann, Luis Cava, Robert Maclarren, Tyree Kiser, Douglas Fish, Edward Janoff

Learning Objectives: Administration of the pneumococcal polysaccharide 23-valent vaccine (PPSV23) to qualified patients prior to hospital discharge is a standard of care. This study aims to assess immunogenicity and safety of PPSV23 in critically-ill neurological patients when given within the first 6 days of admission. Further, we aim to assess immune status by response to the PPSV23.

Methods: Informed written consent was obtained prior to PPSV23 administration. Blood was collected prior to and 14–35 days post PPSV23 administration. IgG concentrations to 14 pneumococcal serotypes were analyzed using a quantitative multiplex bead assay. We defined an absolute response and a relative immune response as a post PPSV23 serotype specific IgG concentration of >1.3 mg/mL and a 4-fold increase in serotype specific IgG from baseline, respectively. A response to >9 of 14 serotypes characterized the patient as a responder. Fisher exact test was used to compare response proportions to historic control (80% response rate). Results: To date, 18 patients finished the study. Absolute and relative response occurred in 9 (p=0.002 vs control) and 4 (p=0.001 vs control) patients, respectively. Three and 15 patients had an absolute response to all 14 and 8 of the tested serotypes, respectively. Two and five patients had a relative immune response to all 14 and 8 of the tested serotypes, respectively. The median number of serotype specific responses were 9.5 and 3.5 for absolute and relative response definitions, respectively. There were no adverse events attributed to PPSV23 administration. Conclusions: Critically-ill neurosurgical patients exhibited a blunted response to the PPSV23. This population displayed an immune-depressed phenotype to a PPSV23 antigen challenge. IgG functionality and durability remains unknown. PPSV23 appears safe but marginally immunogenic in this population.

475 EVALUATION OF A SINGLE BRAIN DEATH EXAM POLICY AT A LARGE URBAN HOSPITAL
Tabassum Khan, Jack Fountian, Jr., Rondi Gelbard, Vishal Patel, Adam Webb, Anuradha Subramanian

Learning Objectives: Timely declaration of brain death (BD) is important to organ donation. Formerly, our institution’s BD policy required two clinical exams at least 6 hr apart. This led to a delay in the determination of BD and prevented us from reaching our goal organ donor conversion rate (ODCR). The American Association of Neurology states that only one clinical BD exam is required for BD declaration. We therefore adopted a single exam policy in 2014. The purpose of this study was to evaluate the effect of a single exam policy on time to BD declaration and ODCR. Methods: This was a retrospective review of all patients declared clinically brain dead between October 31, 2010 and June 31, 2015. The study population was divided into two cohorts based on the number of BD exams performed: cohort 1 consisted of patients that underwent two BD exams and cohort 2 consisted of patients that underwent one BD exam. Demographic and outcome factors were recorded. Results: A total of 116 patients were included in this study: 78 patients in cohort 1 and 38 patients in cohort 2. The mean time from initiation of brain death testing was 10.3 ± 4.4 hr in cohort 1 and 0.74 ± 1.6 hr in cohort 2 (p<0.05). There was no significant difference in the demographic characteristics between the two groups. A significantly higher percentage of patients in cohort 2 received ancillary tests (39.5% vs. 16.7%, p<0.05). A total of 4/22 (18.2%) donors in cohort 2 had one or more lungs recovered, compared to 3/54 (7.4%) in cohort 1. Overall ODCR was similar across the two groups. Conclusions: A single brain death exam leads to more timely declaration of brain death, potentially increasing the pool of eligible organ donors. While ancillary testing increased after implementation of our single BD policy, this did not lead to a delay in declaration. While single BD testing does not appear to increase ODCR, a single BD policy may contribute to more efficient BD testing, a greater number of procured lungs and an increased number of eligible donors.

476 NONINVASIVE CARDIAC OUTPUT MONITORING TO EVALUATE NEUROCARDIAC INJURY AFTER SUBARACHNOID HEMORRHAGE
Marilyn Hravnak, Khalid Yousef, Yue-Fang Chang, Elizabeth Crago, Theodore Lagatutta

Learning Objectives: Patients with aneurysmal subarachnoid hemorrhage (aSAH) frequently display elevated cardiac troponin-I (cTnI), often with transient regional wall motion abnormalities, both of which often resolve in the days after bleed. However, their impact and duration on continuous systemic perfusion is unclear. Thus, we examined the association between elevated cTnI and non-invasive continuous cardiac output (NCCO) parameters in the early (days 1–3) and intermediate (days 4–6) phase post-aSAH.

Methods: This longitudinal study recruited aSAH patients
ASSOCIATION OF OSMOLALITY, BRAIN VOLUME, AND CLINICAL, NEUROLOGIC CHANGES IN HEPATIC ENCEPHALOPATHY

Eric Liotta, Anna Romanova, Bryan Lizza, Brandon Francis Francis, Andrew Naidech, Shyam Prabhakaran, Farzaneh Sorond, Matthew Maas

**Learning Objectives:** Cerebral edema is life-threatening in severe hepatic encephalopathy (HE). We hypothesize that acute changes in serum osmolality are associated with brain volume and neurologic examination changes. **Methods:** We retrospectively identified severe HE patients with serial CT head scans. We measured total intracranial cerebrospinal fluid (CSF) volume and used CSF volume change as a biomarker of brain volume change. We collected serum osmolality and chemistry values nearest each CT. We collected hourly Glasgow Coma Scale (GCS) assessments and identified if renal replacement therapy (RRT) or hypertensive saline therapy (HTS) occurred during a scan pair. We assessed associations with Spearman correlation and compared groups with Mann-Whitney U test. **Results:** 26 patients with 82 pairs of CTs were included. Median (IQR) absolute change in CSF volume was 11.2 (4.8–17.0) mL and Δ(46%) pairs had a reduction in CSF volume. Initial median serum osmolality was 299 (297–317) mOsm/L, and median absolute change in osmolality was 8 (4–14) mOsm/L, sodium 3 (1–5) mEq/L, glucose 25 (12–48) mg/dL, blood urea nitrogen (BUN) 4 (1–9) mg/dL, and calculated osmolar gap 4 (2–7) mOsm/L. 31 (38%) pairs had reduction in osmolality. Osmolality change was associated with CSF volume change (r=0.79, p<0.0001) with weaker associations for sodium (r=0.55, p<0.0001), BUN (r=0.47, p<0.0001), and osmolar gap (r=0.39, p=0.0004). CSF volume change (r=0.66, p<0.0001) and serum osmolality change (r=0.49, p<0.0001) changes were associated with GCS changes. 51 scan pairs had HTS with concurrent HTS and 15 had RRT without HTS. Those without HTS had greater decline in osmolality (-11 [-20 to -4] vs. 5 [-3 to 12] mOsm/L; p=0.0001), CSF volume (-10.8 [-27.2 to -6.9] vs. 4.1 [-3.0 to 14.6] mL; p<0.0005), and GCS (0 [-2 to 0] vs. 0 [0 to 3]; p=0.031). **Conclusions:** Changes in cerebral edema, represented by CSF volume, are associated with changes in total serum osmolality and changes in neurologic examination. Avoiding acute declines in serum osmolality may minimize exacerbation of cerebral edema and clinical neurologic deterioration in severe HE.

EFFICACY AND SAFETY OF CLEVIDIPINE AND NICARDIPINE IN POST-NEUROSURGERY PATIENTS

Ola Elnoubary, Teena Abraham, Joseph Samide, Meggie Yuen, Erin Oh, Nasser Saad, Francesco Ciummo, Bashar Fahoum

**Learning Objectives:** Clevidipine and nicardipine are titratable dihydropyridine calcium channel blockers that are used for blood pressure control in post-operative patients. The only data comparing the two agents involved post-cardiac surgery patients and showed no difference in mortality or maintaining patients within blood pressure targets. In prospective observational studies, both agents were shown to be safe and efficacious for blood pressure control in post-neuro-surgical patients, however no head-to-head comparison was made. The purpose of this retrospective study is to compare the efficacy and safety of nicardipine and clevidipine in post-neurosurgery patients. **Methods:** In this retrospective trial, adult patients who underwent a neurological procedure and received clevidipine or nicardipine were included. This trial received Institutional Review Board approval. Primary efficacy endpoints were change in systolic blood pressure (SBP) and number of patients at target SBP within 60 min of start of infusion. Concomitant administration of other antihypertensive medications and time to target SBP were also examined. Primary safety endpoints included hypotension, tachycardia and all-cause in-hospital mortality. **Results:** A total of 791 patients were screened between June 2012 and June 2015 and 63 patients were included in the analysis. Baseline characteristics were similar between both groups. There was no significant difference in drop in SBP within the first hour of infusion (-21.4 ± 18.3 mmHg vs -16.2 ± 16.8 mmHg, p=0.29) or the number of patients at target SBP after one hour (58.8% vs 65.2%, p=0.77) between clevidipine and nicardipine. A difference was noted with respect to fluid status as individuals in the clevidipine group had a net fluid balance of -537.9 ± 1582.9 mL vs 456.3 ± 1063.0 mL in the nicardipine group (p=0.05). Our study also showed no difference in the time in min to target SBP, patients receiving concomitant antihypertensives, and safety profiles. **Conclusions:** Clevidipine and nicardipine have similar efficacy and safety profiles for blood pressure control in post-neurosurgery patients.
Measurements of C-reactive protein (CRP), transthyretin (TTR), tumor necrosis factor receptor alpha 1 (TNFR1α), glutamine, and nitrogen balance were performed over 4 preset time periods during the first 14 post bleed days (PBD) in addition to daily caloric intake. Factors associated with glutamine and HAIs were analyzed with multivariable regression. HAIs were tracked daily for time-to-event analyses. Poor outcome 3 mo after SAH was defined as a modified Rankin score > 3. Results: There were 77 patients with an average age of 55 ± 15 yr. HAIs developed in 18 (29%) on mean PBD 8 ± 3. Serum glutamine levels significantly declined from admission to PBD 14 (P = 0.001). In a multivariable linear regression model adjusting for age, clinical and radiographic severity, and caloric intake, negative nitrogen balance (P = 0.02) and TNFR1α (P = 0.04) were independently associated with glutamine levels. Admission Hunt Hess grade (P = 0.04) and lower glutamine levels (P = 0.02) predicted time to first HAI, after adjusting for age, caloric intake, body mass index and mechanical ventilation. On univariate analysis, lower mean glutamine levels were associated with poor outcome (185 ± 93 mcg/mL vs. 232 ± 92 mcg/mL, P = 0.04); however, was not found to be an independent predictor of poor outcome after adjusting for age, clinical severity and HAI. Conclusions: Serum glutamine levels after SAH are influenced by inflammation and associated with an increased risk of HAI, which is associated with long term outcome. Future studies should investigate interventions aimed at modulating the inflammatory response and preserving glutamine levels in an effort to mitigate the risk for HAI the first 14 days after SAH.

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SEIZURES IN HOSPITALIZED ADULTS WITH ICH ARE ASSOCIATED WITH INCREASED HOSPITAL RESOURCE UTILIZATION

Muthu Bhaskaran, Natalia Martinez-Schlurmam, Sankeerth Rampa, Veerasathpursh AllaReddy, Veerajandhara AllaReddy

Learning Objectives: Patients with intracranial hemorrhages [ICH] are at an increased risk of seizures. The incidence and outcomes associated with occurrence of seizures in adults hospitalized due to ICH is unclear. We sought to examine the impact of developing seizures on hospitalization outcomes (in-hospital mortality [IH], length of study [LOS], and hospital charges [HCh]) in adults who were hospitalized due to ICH. Methods: We performed a retrospective analysis of the Nationwide Inpatient Sample for the years 2009 to 2010. All patients aged >18 yr who were hospitalized primarily due to ICH were selected. Amongst this cohort, occurrence of a seizure episode during hospitalization was identified. The outcomes of interest were IHM, LOS, and HCh with the primary independent variable being a seizure episode. The associations between outcomes and primary independent variable were examined by multivariable regression models. The confounding effects of age, sex, race, insurance status, co-morbid burden, type of ICH, and hospital characteristics were adjusted in the regression models. The study was granted IRB exempt status. Results: A total of 1,323,441 adults were hospitalized due to ICH. Of these, 113,816 patients (8.6%) had a seizure. Males accounted for 51.7%. The mean age of those with seizures was 64.3 yr (vs 67.4 yr in those without seizures). The IHM was 17.7% (vs 19.1%); HCh = $101,057 (vs $76,036); mean LOS was 10.5 days (vs 7.7 days) in those with and without seizures respectively. Following adjustment for several confounding factors, those who developed seizures were associated with significantly higher IHM (Estimate[c]=0.2362, 95%CI:0.2164–0.2561, p=0.0001, positive estimate implies higher) and LOS (c=0.2467, 95%CI=0.2311–0.2622, p=0.0001) when compared to those who did not develop seizures, however, there was no significant statistical difference in HCh between the two groups. Conclusions: Occurrence of seizures in hospitalized adults with ICH is associated with significantly higher hospital resource utilization. Aggressive seizure preventive strategies in this cohort may optimize outcomes.

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PHARMACISTS’ IMPACT ON DOOR-TO-NEEDLE TIME IN ACUTE ISCHEMIC STROKE

Joe Bodkin, Stephanie Bennett, Elizabeth Donahue, Megan Rech

Learning Objectives: Treatment with intravenous tissue plasminogen activator (tPA) for acute ischemic stroke (AIS) has been shown to reduce long-term disability when administered to eligible patients. Due to the time-sensitive nature of AIS, consensus guidelines recommend a door-to-needle (DTN) time of 60 min from onset of stroke symptoms. Multiple methods have been implemented to help reduce the DTN time. Despite these initiatives, providers may still have difficulty meeting the 60 minute goal. The purpose of this study was to assess whether the addition of a pharmacist to a stroke response team decreased DTN time in patients receiving tPA for AIS. Methods: This was a single center, retrospective cohort study of patients presenting to the emergency department with suspected AIS who received tPA from October 2012 to December 2014. Patients were grouped based on the presence of pharmacist at bedside. Demographics, comorbidities, stroke assessment scales (National Institute of Health Stroke Scale and Modified Rankin Scale), and timing related to the stroke or administration of tPA were collected, along with outcomes such as length of stay, discharge disposition, and incidence of intracranial hemorrhage. Results: Sixty-two patients received tPA, of which 35 patients had a pharmacist at bedside and 27 did not. The presence of a pharmacist significantly reduced the average DTN time (54 ± 26 min vs 78 ± 31 min, p=0.001). The time from imaging to medication administration was significantly reduced (31 ± 20 min vs 51 ± 29 min, p=0.002). There was no difference in clinical outcomes between groups. A post-hoc analysis showed that pharmacist presence significantly increased the ability to achieve the DTN goal of 60 min (68% vs 26%, p = 0.001; OR 4.235, 95%CI 3.314–4.246). Conclusions: Pharmacist presence at bedside during the management of AIS significantly reduced DTN time and improved the percentage of patients achieving a DTN time less than 60 min.

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PROTHROMBIN COMPLEX CONCENTRATE VS. FRESH-FROZEN PLASMA IN WARFARIN-ASSOCIATED ICH

Mindee Hite, Kevin Silinskie

Learning Objectives: Warfarin-associated intracranial hemorrhage (ICH) is associated with a high mortality rate. Rapid reversal of anticoagulation is essential in these cases of life-threatening bleeding. In these situations, our current hospital guidelines recommend the concomitant administration of prothrombin complex concentrates (PCC) and vitamin K. The aim of the study was to evaluate the impact of a 4-factor PCC-based reversal protocol as compared to a historical control fresh-frozen plasma (FFP)-based reversal protocol in patients with warfarin-associated ICH. Methods: The study was retrospective, before-after comparison of warfarin reversal therapies in 34 warfarin-associated ICH patients with an international normalized ratio (INR) >1.4 treated with either a 4-factor PCC-based protocol (n=21) or a historical FFP-based control protocol (n=13). The PCC protocol group received a combination of vitamin K and 4-factor PCC. The FFP protocol group received a combination of vitamin K and FFP. Chi square and nonparametric tests were used for analysis. Results: Patient demographics were similar between the groups. INR at presentation was similar between groups (FFP 2.7 [2.3–3.7] vs. PCC 2.4 [2.0–3.2], p=0.22). The time to reversal of baseline INR to ≤1.3 was significantly shorter in the PCC group (FFP 556 [387–705] min vs. PCC 203 [145–357] min, p=0.001). Following administration of the protocol agent, 76.9% and 95.2% of patients achieved an INR ≤1.3 in the FFP and PCC, respectively (p=0.27). Post-administration INR values were statistically lower in the PCC group (FFP 1.3 [1.2–1.4] vs. PCC 1.2 [1.1–1.2], p=0.02). Hematoma expansion occurred in 30.8% of the FFP patients as compared to 14.3% of the PCC patients (p=0.39). No thromboembolic events occurred in either group. Twenty percent of patients died during the initial hospitalization in both groups. Conclusions: Patients with warfarin-associated ICH who received PCC achieved faster, more reliable, and more complete normalization of coagulation parameters as compared to those who received FFP.

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NEXT GENERATION GENE EXPRESSION ANALYSIS SHOWS DECREASED EXPRESSION OF TRANSPORTERS FOLLOWING TBI

Solomon Adams, Jeffrey Cheng, Michael Diduch, Monica Daood, Robert Clark, Patrick Kochanek, Anthony Kline, Philip Empey

Learning Objectives: ATP-binding cassette and solute carrying transporters play a role in drug pharmacokinetics and are associated with outcomes following traumatic brain injury (TBI), but the impact of TBI on transporter expression in the brain is poorly understood. We used next generation gene expression analysis to comprehensively evaluate the magnitude and timing of expression changes in an experimental model of pediatric TBI. Hypothesis: mRNA expression is decreased following TBI.
Nevertheless, delta/theta wave ratio was higher in intubated subjects (3.38 ± 0.87 vs 2.79 ± 0.42, p<0.001). REM sleep was only seen in 9.7% of all studies. Risk factors that contribute to poor sleep quality in the critically ill. Both groups had poor sleep quality and efficiency although sleep deprivation was measured with arterial line, or if no arterial line then phyygmonanometer, and collected from bedside monitors. Continuous NCCO assessment included cardiac index (CI), stroke volume index (SVI), venricular ejection time (VET), cardiac contractility (ds/dt), heart rate (HR). Mixed model linear regression was performed to assess SO2 association with both SBP and NCCO over time (log NCCO used due to non-normal distribution) from days 1–3 post-aSAH with covariates of age and gender. Results: Both left and right SO2 were positively associated with log CI (p=0.042 and p=0.056 respectively) and log CO (p=0.028 and p=0.043 respectively), but negatively associated with SBP (p=0.049). Conclusions: Our finding that SO2 is better associated with NCCO parameters than with SBP may be of importance in hemodynamic monitoring of aSAH patients, but will need to be evaluated in a larger sample FUNDING: NIH R01NR014221.

IRL-1620 PROVIDES NEUROPROTECTION AND ENHANCES ANGIOGENESIS IN DIABETIC RATS WITH CEREBRAL ISCHEMIA

Anil Gulati, Mary Leonard, Monica Husby

Learning Objectives: Type 2 Diabetes Mellitus (T2DM) is associated ischemic stroke. We found that endothelin B (ETB) receptor agonist, IRL-1620 (IRL), provides neuroprotection and enhances neurovascular remodeling in normal rats, however, diabetic rats with ischemic stroke have not been investigated. Methods: A T2DM model using HFD/streptozotocin in rats was used. The right middle cerebral artery was occluded using an intraluminal filament model (MCAO). Vehicle or IRL (5µg/kg, i.v.) were administered at 4, 6, and 8hr on days 0, 3, and 6 post-MCAO. Specific ETB antagonist BQ-788 was administered 15 min prior to saline/IRL injections. Animals were sacrificed at day 7, and neurologic evaluations, TTC staining, and immunohistochemistry were conducted. Results: Survival rates for the IRL group were significantly higher in both non-diabetic and diabetic rats compared to the vehicle group. Furthermore, the IRL group performed significantly better on neurologic evaluations compared to the vehicle group, in both non-diabetic and diabetic rats. In both non-diabetic (80.81%) and diabetic (69.58%) rats a significant reduction (p=0.02; p=0.04) in infarct volume was seen in the IRL group compared to the vehicle group. Moreover, in both non-diabetic and diabetic rats there were significantly more (p=0.05; p=0.02) PECAM-positive vessels/30µm brain slice in the IRL group (9.1 ± 0.8;9.75±.4) versus vehicle-treated rats (5.3 ± 0.4;7.1 ± 0.4). Immunofluorescence staining revealed a significant increase in ETB receptor expression for non-diabetic (p=0.0001) and diabetic IRL-treated rats (p=0.04), compared to the vehicle rats. Co-localization of VEGF-positive cells and PECAM-positive endothelial cells was significant higher in diabetic IRL rats (15.5 ± 1.1%) compared to vehicle rats (10.2 ± 0.81%; p=0.0009). Administration of BQ-788 attenuated the effects of IRL. Conclusions: Our results highlight that IRL-1620, administered at 4, 6, and 8hr on day 0, 3, and 6 post-MCAO, is an effective treatment for cerebral ischemia in T2DM, significantly reducing infarct volume, improving neurologic and motor function, and enhancing angiogenesis.
intravascular coagulation (DIC) syndrome, and it is widely used in clinical situations. Recently, it has been reported that rTM also has an anti-inflammatory effect. Hypothesis: rTM may improve the neurologic function after heatstroke in mice. **Methods:** Male C57BL/6j mice were subjected to heat exposure (41 ± 0.5°C) for 60 min. After HE, normal saline (Ns) or rTM (6 mg/kg) was administered intraperitoneally for 5 days. Exp. 1: The rotorod performance test was used to evaluate the motor function after HE. Mice were treated once a week for 6 weeks. Then, they were divided into two groups (Ns and rTM) and subjected to HE. The rotorod test was performed at 1, 3, 5, 7 and 9 weeks post HE. Exp. 2: In this experiment, animals were sacrificed at 1 week (Ns and rTM) or 3 weeks (Ns and rTM) post HE and the brains were collected separately (cortex, stem and cerebellum). Cytokine concentrations (TNF-α, IL-6, IL-10) were measured using ELISA methods. **Results:** The rotorod score initially decreased in the third week compared to the first week in the Ns group, then improved from 5 weeks post HE, whereas no decrease was observed in the rTM groups and significant differences were observed at 3 weeks post HE (p < 0.05). The TNF-α concentration at 1 week post HE in the stem was significantly low (p<0.05) in the rTM groups compared with the Ns group. There were no significant differences in the IL-6 and IL-10 concentrations. **Conclusions:** These results suggest that the administration of rTM suppresses inflammatory cytokines at 1 week post HE and improves the neurologic function. rTM may contribute to early rising after heatstroke in the clinical setting.

**ACCURACY OF SEIZURE IDENTIFICATION WITH AMPLITUDE-INTEGRATED EEG AND COLOR DENSITY SPECTRAL ARRAY**

Genevieve Du Pont-Thibodeau, Sarah Sanchez, Abbas Jawad, Nicholas Abend, Vinay Nadkarni, Robert Berg, Alexis Topjian

**Learning Objectives:** Non-convulsive seizures are common in critically ill children with acute encephalopathy and are associated with worse outcome. We previously found that color density spectral array (CDSA) seizure identification in post cardiac arrest and critical care patients was robust and showed promise in improving EEG interpretation by an encephalographer. Therefore, we hypothesized that CCM providers would have higher accuracy rates identifying seizures using combined aEEG and CDSA than aEEG alone. **Methods:** CCM providers underwent a 30 minute tutorial on aEEG and CDSA interpretation. Following the tutorial, they were asked to identify seizures on 100 images displaying two-hr of aEEG images and 100 images of the same two-hr aEEG images including CDSA. Images were obtained from de-identified post cardiac arrest patients. The gold standard for seizure occurrence was conventional EEG interpretation by an encephalographer. **Results:** 12 CCM fellows, 5 nurses and 6 attendings had an aEEG seizure identification sensitivity of 77.1% (95% CI: 73.6%-80.3%), specificity of 64.9% (95% CI: 62.5%-67.2%), positive predictive value (PPV) of 87.9% (95% CI: 85.9%-89.7%) and positive predictive value (PPV) of 46% (95% CI: 43.0%-49.1%). aEEG+CDSA seizure identification sensitivity was of 77.6% (95% CI: 74.3%-80.9%), specificity of 68.8% (95% CI: 66.2%-70.7%), PPV of 88.8% (95% CI: 86.9%-90.9%) and a PPV of 48% (95% CI: 45.8%-52.1%). The addition of CDSA to aEEG did not improve seizure detection accuracy. However, participants felt more confident when using both tools combined. PPV was higher when status epilepticus images vs. all images were presented (95.4% [95% CI: 93.9%-96.4%] vs aEEG; 95.3% [95% CI: 93.9%-96.4%] with aEEG+CDSA). **Conclusions:** aEEG offers reasonable sensitivity and negative predictive value for seizure identification by CCM providers in children post cardiac arrest. aEEG combined with CDSA does not appear to improve accuracy over aEEG alone.

**CSF CONCENTRATION OF VANCOMYCIN COMPARED TO SERUM DURING CONTINUOUS INFUSION IN ADULT PATIENTS**

Jessica Louie, Gary Davis, Chad Condice, Vanessa Stevens, Donald Alexander, Erin Lingenfelter, Saifdar Ansari, Russell Benefield

**Learning Objectives:** Vancomycin (vanc) is indicated for treatment of serious or severe systemic and central nervous system (CNS) infections. External lumbar drains (ELD) or external ventricular drains (EVD) function to divert cerebrospinal fluid (CSF) in critically ill neurological patients. Assessment of vanc entry into the CNS, would involve measurements of the CSF-to-serum drug concentration (conc) during vanc continuous infusion (CI). To expand on two previous studies, this study aimed to evaluate CSF and serum vanc conc over 72 hr and therefore assess vanc penetration into the CNS. **Methods:** This was a prospective, non-randomized, observational, pharmacokinetic study of vanc CSF penetration in adult patients admitted to the University of Utah Hospital Neuro Critical Care Unit. Inclusion criteria were: 18–65 yr of age, started on vanc CI after a loading dose (LD) for prevention or treatment of infection, had an EVD or ELD in place for at least 24 hr, and had an estimated creatinine clearance of ≥80 mL/min. Exclusion criteria were: weight >120kg or <40kg, pregnancy, cystic fibrosis or ICU length of stay <72 hr. CSF and serum was sampled for vanc conc at 24, 48 and 72 hr of CI vanc, with the primary objective of determining CSF penetration of vanc. **Results:** Eight patients were included in analysis, 7 with EVD and 1 with ELD in place. Three patients had confirmed CNS infections and only 1 patient had detectable CNS conc from this group. A total of 4 patients had detectable CNS conc. These conc ranged from 1.1 to 2mg/L while serum conc ranged from 17.5 to 39.9 mg/L. CNS conc were undetectable in all but 1 patient at 24 hr and detectable in the 4 patients at 48 and 72 hr. The median vanc LD in the subgroup with detectable concentrations was 21.3 mg/kg delivered by 44 mg/kg/day via CI. Four patients received steroids during the study with one patient receiving multiple doses of steroids. Three of these patients had detectable CSF conc including the patient with multiple doses of steroids. **Conclusions:** CSF penetration of vanc can be limited and <10% of serum conc following a LD and CI.
brain injured patients. The aim of this study was to evaluate the efficacy and safety of intravenous (IV) infusion of 4°C Normal Saline (NS) for fever control in brain injured patients. **Methods:** Patients with brain injury and fever (core temperature > 38°C) despite acetaminophen, ibuprofen (if not contraindicated) and cooling blanket were given either 500 cc or 1000 cc IV bolus of 4°C NS. In addition to core temperature before and after the infusion, the following were measured before the infusion (T0), directly after (T1) and 24 hr (T2): Serum Sodium (Na), Serum Chloride (Cl), and Serum Bicarbonate (Bicarb) levels. Ratio of arterial oxygen partial pressure to fractional inspired oxygen (P/P) was also measured before and directly after the infusion to determine effect of infusion on oxygenation. Shivering was assessed by bedside nurse. **Results:** Thirty boluses (divided equally between 500 cc and 1000cc) were given to 25 patients. Average volume given was 750 cc (9.1 cc/kg) ± 254 cc (3.5 cc/kg). Average Temperature decreased from 39.2 (±0.6) °C to 38.3 (±0.6) °C (p < 0.0001). Serum Na levels were 140 ±6 mmol/L at T0, 140 (±5) mmol/L at T1 (p = 1.0), and 141 (±6) mmol/L at T2 (p = 0.5). Serum Cl levels were 106 (±6) mmol/L at T0, 108 (±6) mmol/L at T1 (p = 0.2), and 107 (±7) mmol/L at T2 (p = 0.6). Bicarb levels were 21 (±4) mmol/L at T0, 21 (±4) mmol/L at T1 (p = 1.0), and 22 (±4) mmol/L at T2 (p = 0.3). P/F ratio was 344 (±164) before and 344 (±186) after the infusion (p = 1.0). There were 4 episodes of shivering (13%). **Conclusions:** Infusion of chilled (4°C) Normal Saline for fever control in brain injured patients was found to be effective and well tolerated. We propose that the effect of this cooling method on fever control and neurologic outcome be studied in a prospective randomized study with larger numbers of patients.

493 EVALUATION OF PROTHROMBIN COMPLEX REVERSAL STRATEGIES IN PATIENTS WITH WARFARIN-ASSOCIATED ICH

Sperky Kotsianas, Kristy Greene, Anne Winkler, William Asbury, Adam Webb, Karleen Chester

**Learning Objectives:** Despite the recent approval of target specific oral anticoagulants, warfarin continues to be prescribed for the prevention and treatment of venous thromboembolic disease. One of the most devastating adverse effects of warfarin is intracranial hemorrhage (ICH). Prothrombin complex concentrates (PCCs) are becoming part of first line international normalized ratio (INR) reversal strategies at many hospitals for patients with warfarin-associated ICH. To date, however, data comparing regimens that contain a three factor PCC (3F-PCC) vs a four factor PCC (4F-PCC) are limited. The purpose of our study was to compare the time to and extent of INR reduction following the use of a 3F- or 4F-PCC reversal strategy in patients with a warfarin-associated ICH. **Methods:** This was a retrospective, multi-center, chart review at three academic medical centers. Patient charts were reviewed between January 2011 and December 2014 and included if they received 3F- or 4F-PCC for a warfarin associated ICH. **Results:** A total of 91 patients were included in the study. Fifty patients received 3F-PCC and 41 received 4F-PCC. The initial INR (mean ± SD) for the 3F-PCC and 4F-PCC groups was 3.44 ± 1.99 and 3.86 ± 2.50, respectively (p = 0.509). Concurrent reversal agents included intravenous vitamin K (96% 3F-PCC vs 98% 4F-PCC; p = 0.053), FFP (82% 3F-PCC vs 44% 4F-PCC; p = 0.001), activated factor VII (8% 3F-PCC vs 9% 4F-PCC; p = 0.064), and aminocaproic acid (10% 3F-PCC vs 5% 4F-PCC; p = 0.362). Thirty-four of 50 patients (68%) receiving 3F-PCC and 38 of 41 patients (93%) receiving 4F-PCC had an initial INR of ≤ 1.5 following administration (p = 0.003). The time to first INR following PCC administration was 217 ± 247 min and 208 ± 187 min for 3F- vs 4F-PCC, respectively (p = 0.329). **Conclusions:** Significantly more patients achieved a target INR of ≤ 1.5 within 4 hr following a 4F-PCC vs 3F-PCC reversal strategy.

494 IMPACT OF DEDICATED NEUROCITICAL CARE ON PATIENT OUTCOMES AFTER ANEURYSMAL SUBARACHNOID HEMORRHAGE

Satoshki Egawa, Toru Hifumi, Kenya Kawakita, Masanobu Okuuchi, Atsushi Shindo, Masahiko Kawanishi, Takashi Tamiya, Yasuhiro Kuroda

**Learning Objectives:** Although the efficacy of neurocritical care (NCC) implementation for patients with aneurysmal subarachnoid hemorrhage (SAH) has been reported, there are no reported studies of NCC efficacy in improving neurologic outcomes across different SAH grades. This study aimed to evaluate the impact of NCC on hospital outcomes for patients admitted with SAH, including an exploratory subgroup analysis to determine which patients were likely to benefit from NCC. **Methods:** The authors retrospectively evaluated the records of patients with SAH admitted to our hospital between January 1, 2001 and March 31, 2014. Discharge outcomes were compared between patients admitted from January, 2001 to December, 2006, prior to the introduction of NCC (no NCC group), and from January, 2007 to March 31, 2014 (NCC group). To reduce vasospasm, NCC was conducted for 14 days regardless of SAH grade. The primary outcome was the incidence of a good neurologic outcome (GO), as assessed using the modified Ranking Scale (mRS) at discharge (discharge mRS score < 3). The secondary outcome was that of delayed cerebral ischemia (DCI). GO was defined as an mRS score of 0–2, and poor neurologic outcome was defined as an mRS score of 3–6. NCC efficacy was evaluated using multivariate logistic regression models and in a subgroup analysis according to patient Hunt and Kosnik (H&K) grading. **Results:** Among the 234 patients included in this study, the mean age was 61.7 yr, and 67 were male. NCC was initiated for 151 patients (64.5%). In a univariate analysis, the NCC group demonstrated significantly better outcomes than the no NCC group (ORs, 58.3% vs. 41.0%, respectively, p = 0.01; DCI, 8.6% vs. 18.9%, respectively, p = 0.01). Multiple logistic regression analyses showed that NCC for patients with SAH was not significantly associated with GOs or DCI reduction (p = 0.07 and p = 0.08, respectively). In the H&K grade I–II subgroup analysis, NCC was an independent predictor of GOs (odds ratio, 4.54; 95% confidence interval, 1.08–22.17; p = 0.04). **Conclusions:** NCC may improve neurologic outcomes in SAH patients with H&K grade I–II.

495 PROMINENT NEUROINFLAMMATORY RESPONSE TO MURINE LATERAL FLUID PERCUSSION INJURY

Elizabeth Newell, Brittnay Todd, Jo Mahoney, Xinyu Bing, Polly Ferguson, Alexander Bassuk

**Learning Objectives:** TBI is a leading cause of death and disability in the US and there are currently no targeted pharmacologic therapies. Using the lateral fluid percussion injury (FPI) model, we aim to characterize the murine inflammation response to TBI and determine if specific components of the IL-1 pathway are critical to TBI pathogenesis. **Methods:** Adult C57BL6 mice were exposed to FPI. Using real time PCR, IL-1α, IL-1β, and TNF expression were measured. Blood brain barrier breakdown and microglial response were assessed by immunohistochemistry. Lesion volume was measured from serial H&E stained sections. BV-2 cells were treated with LPS (100 ng/ml) or media for 20 hr and IL-1β release was quantified by ELISA. **Results:** At 6 hr post-TBI, IL-1β expression was increased in ipsilateral parietal cortex (15.11 fold vs. 1.29, p < 0.05), ipsilateral hippocampus(76.29 fold vs. 1.07, p < 0.01), and brainstem (56.42 fold vs. 1.01, p < 0.05). IL-1α was also increased; ipsilateral parietal cortical (4.16 fold vs. 1.18, p < 0.05), ipsilateral hippocampus (5.16 fold vs. 1.12, p < 0.01), and brainstem (5.47 fold vs. 1.01, p < 0.01). Finally, TNF was increased in ipsilateral parietal cortical (6.35 fold vs. 1.18, p < 0.05), ipsilateral hippocampus (29.04 fold vs. 1.18, p < 0.01), and in brainstem (10.12 fold vs. 1.04, p < 0.01). Blood brain barrier breakdown was evident and a pronounced microglial response was seen at 3 and 21 days post-TBI. In vitro, LPS stimulated BV2s released increased IL-1β (41.38 pg/ml vs 3.11 pg/ml, p < 0.01). At 21 days post-TBI, substantial tissue loss was noted. **Conclusions:** The IL-1 and TNF pathways were rapidly activated following FPI. FPI resulted in tissue injury with blood brain barrier breakdown, cell death and tissue loss. A prominent microglial response was seen acutely and persisted for 21 days following TBI. Stimulated BV2s released significant amounts of IL-1β suggesting microglia may be an important source of IL-1 production following TBI. Studies using pharmacologic and genetic blockade of the IL-1 pathway are ongoing to determine if components of this pathway are involved in TBI pathogenesis and represent potential therapeutic targets.

496 VASOPRESSORS IN REFRACTORY STATUS EPILEPTICUS—RISK FACTORS AND CLINICAL IMPACT

Navid Tabibzadeh, Umer Mukhtar, Umer Shoukat, Syed Shah, Ilya Levin, Andres Fernandez, Fred Rincon, Matthew Vibbert

**Learning Objectives:** Refractory status epilepticus (RSE) is a seizure that requires treatment with anesthetic agents when first and second order antiepileptic drugs have failed. Patients in RSE frequently require vasopressors (VP) for medication-induced hypotension related to sedative agents. Among RSE patients the risk
MULTI-FACETED APPROACH TO REDUCING DELIRIUM IN A MEDICAL INTENSIVE CARE UNIT
Jennifer Cortes, Allison Harse, Garbo Mak, Brandly McKelvey, Bela Patel, Khalid Almoosa

Learning Objectives: Delirium is responsible for increased mortality and prolonged ICU and hospital length of stay (LOS). Preventing and/or ameliorating delirium is paramount to the patient’s survival and recovery process. The purpose of this quality improvement initiative is to decrease the incidence of delirium through early recognition and preventative strategies. Methods: We prospectively studied mechanically ventilated ICU patients with no prior history of delirium or dementia at a large academic medical center. Over a 3 month period in 2014, baseline pre-intervention delirium incidence was assessed in patients using the Confusion Assessment Method for the ICU (CAM-ICU). Total sedation use, ICU LOS, and vent hr were also collected. Interventions to reduce delirium occurred over a one year period and included education to ICU staff on the recognition and assessment of delirium, implementation of an analgesia-based sedation algorithm, improvement of the ICU environment by reducing noise, and early patient mobility. Post-intervention data were then collected for 3 mo in 2015. Results: A total of 35 patients were studied in the pre-intervention group and a separate cohort of 35 patients was assessed in the post-intervention group. There was a significant difference in the primary outcome, percentage of patients that developed delirium, pre-intervention (48.5%) compared to post-intervention (26%); p=0.04. There was also a significant reduction in the total milligram use of midazolam post-intervention, 761 mg vs. 3504 mg pre-intervention (p=0.001). The median ICU LOS (6 vs. 4.5 days) and median total ventilator hr (86 vs. 60) were reduced in post-intervention group compared to pre-intervention group, although not statistically significant. There was no difference in the incidence of patients mobilized, 58.1% vs. 41.9%, p-NS. Conclusions: Our results support the role of targeted education to the medical staff, judicious use of sedatives with reduction in benzodiazepines, environment controls, and mobilizing patients to reduce delirium incidence in mechanically ventilated ICU patients.

LACOSAMIDE FOR TREATMENT OF STATUS EPILEPTICUS: A SAFE AND EFFECTIVE OPTION
Kushak Suchdev, Hardik Doshi, Deeptri Zutshi, Dennis Parker, Gregory Norris

Learning Objectives: Status Epilepticus (SE) is a common neurologic emergency with a high morbidity and mortality. Treatment of SE usually includes a benzodiazepine followed by 1st generation anti-epileptic drugs (AEDs) like phenytoin. With the advent of newer agents like lacosamide (LCM), more options are available which have better tolerability than older AEDs. However the efficacy of newer AEDs for termination of SE is limited by lack of evidence in literature. Our objective was to determine whether LCM was an effective therapeutic option for SE. Methods: A Retrospective chart review was completed in 79 patients admitted for SE between 2011 and 2013. All patients received intravenous LCM. Baseline characteristics including age, gender, etiology of SE, history of epilepsy, past AED use, type of SE, as well as the order of AEDs given and when SE was terminated were collected. Termination of SE was determined clinically or electrographically and was defined by cessation of SE without recurrence within 24 hr. Results: Of 79 patients, 49 (62%) were males. In 53% of patients SE was generalized convulsive. LCM was used as a first line agent up to a fifth-line agent for SE, loading dose of LCM varied from 200-400mg. Overall In 57% (45/79) of patients, SE resolved after IV dose of LCM. Termination of SE was within first 6hr in 30 patients, 6-12hr in 12 and between 12-24hr in 3 patients. 8 of 14 patients (57%) who had LCM as a first-line agent had termination of SE. 18 of 26 patients had termination when LCM was used as 2nd agent, 11 of 19 patients (58%) who received LCM as 3rd agent had termination of SE. When used as a 4th or 5th agent, 5 out of 14 (35%) and 5 out of 6 (50%) responded. No adverse effects were reported in our group. Conclusions: LCM has been shown in small case reports as an effective and safe option for SE. In our series, it is more effective when used earlier in the management of SE. Failure of termination when used later may reflect the refractory nature of SE rather than loss of efficacy. Further prospective controlled studies are needed to better identify its efficacy and tolerability.
of Transcranial Color-Coded Doppler ultrasonography (TCCD) has shown increased in blood flow velocities in the basal cerebral arteries. It is unclear whether this indicates cerebral hyperperfusion, vasospasm or both. Methods: A prospective observational study was conducted between October 2014 and May 2015. We evaluated women admitted to our intensive-care unit with eclampsia diagnosis. Daily TCCD was performed, the evaluation consists in assessing the mean flow velocity (MFV) of the right middle cerebral artery (RMCA), left middle cerebral artery (LMCA), extracranial internal carotid artery to calculate the Lindegard Ratio (LR). All patients underwent Magnetic Resonance Imaging (MRI). Results: The diagnosis occurred in 8 patients. The mean age was 25±10.4 yr, with body mass index 28.2±4.9 kg/m². The patients showed moderately elevated mean arterial pressure (MAP) during admission (105±10 mmHg) and (104±18 at 24hr and 107±13 mmHg at 48hr). Also, MFV at admission RMCA 81.6±34.1 cm/s with LR 3.3, LMCA 80.8±27.4 cm/s with LR 3.4. At 24 hr RMCA 96.9±33.2 cm/s with LR 2.8, LMCA 108.6±54.9 with LR 2.9. And at 48 hr RMCA 113±25 with LR 3.4 LMCA 105±24.8 cm/s with LR 2.2. None of the results were statistically significant interhemispheric difference at admission (p=0.22), 24 hr (p=0.02) and 48 hr (p=0.21). Although a trend to increase MFV after 48 hr of index event, none were statically significant (RCMA p=0.2, LMCA p=0.22). Neuroimaging showed characteristic changes of PRES in all patients. Conclusions: The data indicate that cerebral hemodynamics are impaired in eclampsia patients with a trend to increase after 48 hr of the index event. The finding of PRES in all patients confirms that it could be a core component of eclampsia patients.

501 QT INTERVAL ADAPTATION TO HEART RATE IS IMPAIRED IN PEDIATRIC EPILEPSY FOLLOWING STATUS EPILEPTICUS

Angela Chun, Aishwarya Kohhare, Linh Nguyen, Bubolz Beth, Caridad Deluca, Yi-Chen Lai

Learning Objectives: QT interval adaptation to heart rate (QT dynamics) represents a fundamental electrophysiological observation. Impaired QT dynamics have been observed in cardiac disorders with propensity for ventricular arrhythmias, possibly reflecting an increased arrhythmic risk. Here we sought to investigate whether status epilepticus (SE) could alter QT dynamics and to identify potential contributing factors in children. Methods: We retrospectively reviewed Texas Children's Hospital emergency center (EC) visits with primary diagnosis of SE from 1/1/2011 to 12/31/2013. 12-lead EKGs were excluded if: 1) obtained within 24 h of EC visit, 2) no cardiac medications, 3) no history of heart disease or ion channel defects. Children with SE were categorized as epileptic (E, n=14) or non-epileptic (NE, n=16). Aged gender and ethnicity-matched control children (C, n=30) met the inclusion criteria and had no seizure history. Ten QT and RR intervals per EKG were manually measured from Lead II. QT dynamics were assessed by the QT/RR relationships using linear regression analysis. Comparisons of clinical factors between epileptic and non-epileptic groups were performed using Student’s t test or Fisher exact test. Values are expressed as mean±SEM. Results: Of the 435 children presenting with SE, 30 met inclusion criteria. Compared with control, SE groups had weaker linear QT/RR relationships (C: r2 = 0.83, NE: r2 = 0.66, E: r2 = 0.61). The epileptic group also had a flatter slope (C: 0.29±0.01, NE: 0.28±0.02, E: 0.17±0.01, p<0.0001). Between epileptic and non-epileptic groups, we observed no differences in clinical factors except age (NE: 25.9±8.9 mo, E: 90.8±19.0 mo, p=0.01), SaO2 (NE: 97.7±0.2%, E: 97.1±0.9% p<0.01), and chronic anti-epileptic drugs (AED) use at presentation to EC. Conclusions: We found that children with epilepsy exhibited impaired QT dynamics following SE, possibly mediated by age, SaO2 and chronic AED use. Decreased QT adaptation to heart rate may be a predisposing factor to arrhythmias. Studies are ongoing to further examine the mechanism of SD after TBI and its impact on patient outcomes.

502 MAGNETOENCEPHALOGRAPHY SCANNING ALTERS SALIVARY CORTISOL, ACTH, AND S100B IN PRE-SCHOOL CHILDREN

Karanwier Jeand, Radomir Slominski, Yannick Boni, Anqi Zheng, Cynthia Rowenhau

Learning Objectives: Stress responses to critical illness are studied using neuroendocrine and immune biomarkers, but cannot be collected non-invasively. Blood sampling causes pain-related stress in young children. We used magnetoencephalography (MEG) scanning as a novelty stimulus to develop non-invasive biomarkers using salivary samples. Methods: ELISA assays for salivary cortisol (ng/ml), ACTH and S100β (pg/ml) were optimized for 30 African-American (AA) and 11 Caucasian (C) children (1–4 yr) in salivary samples collected at awakening (AMI), pre-, and post-MEG scanning. Western immunoblot analyses with purified ACTH and S100β proteins were used as standard lane markers to confirm detection of salivary ACTH and S100β. All values are reported as median and interquartile range (IQR); data were analyzed by StatPlus (AnalystSoft, Walnut, CA) and GraphPad Prism 6.0 (La Jolla, CA). Results: Higher cortisol levels occurred in AA vs. C children pre-MEG (16.4 (2.14–14.0) vs. 2.9 (2.0–5.2), p=0.01) associated with higher AM ACTH levels in AA vs. C children (1.9 (0.2–3.6) vs. 0.01 (0.9–0.05), p=0.04). In AA children, AM cortisol values correlated with AM ACTH (r=0.7, p=0.01) and AM S100β (r=0.9, p<0.0001). In logistic regression models, pre-MEG Cortisol (R2=0.62, p=0.007) depended on race (p=0.001), cortisol AM (p=0.04) & ACTH pre (p=0.10); AM ACTH (R2=0.55, p=0.04) depended on race (p=0.06), S100B AM (p=0.02), gender (p=0.11) & maternal education (p=0.19); pre-MEG ACTH (R2=0.7745, p=0.0015) depended on race (p=0.001), insurance type (p=0.01), gender (p=0.005), and age (p=0.009). Conclusions: We report the first-ever data on salivary ACTH and S100B levels in pre-school children. Salivary ACTH and S100β levels appear to explain the higher salivary cortisol levels occurring in African-American children in the afternoon and evening hr. These novel measures may also indicate higher exposure to chronic stress, greater reactivity to the novel MEG environment, and possibly HPA axis dysregulation in AA vs. C children. Salivary biomarkers are relatively non-invasive and can be used to examine the HPA axis in critically ill children.

503 SYSTOLIC DYSFUNCTION FOLLOWING MODERATE-SEVERE TRAUMATIC BRAIN INJURY

Vijay Krishnamoorthy, Danielle Losier, Morgan Graves, Kee Hang Kevin Luk, Edward Gibbons, Ali Rowhani-Rahbar, Monica Vavilala

Learning Objectives: Traumatic brain injury (TBI) is a major public health problem. While the association between other neurologic injuries, such as subarachnoid hemorrhage and systolic dysfunction (SD) is established, the effects of TBI on SD are not known. Early detection of SD may allow goal-directed treatment of hypotension, thereby improving cerebral blood flow early after injury. Our study’s aim was to determine the incidence of SD following moderate-severe TBI and describe the relationship between SD and early clinical outcomes. Methods: We conducted a prospective cohort study, with the following major inclusion criteria: 1. Age ≤65, 2. Primarily isolated moderate-severe TBI, and 3. Minimal comorbidities. Echocardiograms were performed by a physician certified in echocardiography at <24 hr, at 3 days, and at 7 days following injury. Systolic function was assessed using the simplified Quinones method to calculate ejection fraction (EF); SD was defined as EF<50%. Descriptive statistics were used to compare groups with and without SD. Results: Echocardiograms were performed on 33 subjects with moderate-severe TBI. Subjects had a median age of 56 yr (range 19–63), were 90% male, and had a median admission Glasgow Coma Scale of 6 (range 3–11). Eight subjects (24.2%) were found to have early SD. The median EF for those with SD was 39% (range 21%–45%) and the median EF for those without SD was 59% (range 52%–75%). Early hypotension was recorded in 56% of subjects with SD as compared to 36% in those without SD. Conclusions: Systolic dysfunction is common following moderate-severe TBI, and a majority of patients with SD experienced early hypotension. Future studies should examine the mechanism of SD after TBI and its impact on patient outcomes.

504 ISCHEMIC STROKE IN CRITICALLY ILL CANCER PATIENTS: WITH AND WITHOUT CONVENTIONAL MECHANISMS

Jeong-Am Ryu, Oh Young Bang, Jeong Hoon Yang, Gee Young Suh, Joongbhum Cho, Chi Ryang Chung, Chi-Min Park, Kyeyongman Jeon

Learning Objectives: A few studies have reported mechanisms of ischemic stroke (IS) in the critically ill cancer patients. We investigated the clinical characteristics and precise mechanisms of IS in critically ill cancer patients. Methods: All patients were retrospectively evaluated who underwent brain magnetic resonance imaging (B-MRI) for suspicion of IS with acute abnormal neurologic symptoms or signs developed in the oncology medical ICU of Samsung Medical Center.

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from March 2010 to February 2014. We compared clinical feature, risk factors, B-MRI patterns, and laboratory findings between patients with the cryptogenic (cancer-related stroke) and conventional stroke mechanism (CSM). Results: Over the study period, a total of 88 cancer patients underwent B-MRI scanning for suspicion of IS. 43 (49%) patients had a final diagnosis of IS. 27 (63%) patients had the cryptogenic mechanism and 16 (37%) patients had the CSM. The levels of D-dimer were higher in the cryptogenic group (median level of 10.00 [3.77–17.72] μg/dL) than CSM group (median level of 2.60 [1.50–3.74] μg/dL). The area under the curve for prediction of cryptogenic mechanism was 0.802 (95% CI, 0.652–0.908) for D-dimer. In multivariate analysis, D-dimer levels of > 3.9 μg/dL (adjusted OR 27.453; 95% CI, 1.382–545.322) and the diffusion-weighted imaging (DWI) lesion pattern of multiple vascular territories (adjusted OR 37.610; 95% CI, 2.364–598.329) were significantly associated with the cryptogenic group in critically ill cancer patients. Conclusions: The levels of D-dimer and the DWI lesion pattern may be helpful to evaluate precise mechanism and treat IS in critically ill cancer patients.

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PATTERNS OF CEREBRAL HEMORRHAGE AND INFARCTION COMPLICATING PEDIATRIC ECMO
Kerri LaRovere, Sanjay Prabhu, Rogelio Garcia-Jacques, Jessica Chao, Robert Tasker

Learning Objectives: Children with cerebral hemorrhage and infarction during extracorporeal membrane oxygenation (ECMO) have reduced survival rates and worse outcomes. In this study we have classified patterns of acute brain injury detected on portable head CT during ECMO, and determined clinical factors associated with these patterns. Methods: Medical record review of 176 children treated with ECMO for cardiac or respiratory disease, or to aid cardiopulmonary resuscitation (ECPR) between January 2010 and July 2015. Demographic, clinical, electrophysiologic (EEG) and radiologic data were assessed and classified into patterns of cerebral hemorrhage and infarction. Results: 73/176 (41%) children underwent 113 CT scans, and 50/73 (68%) had acute pathology; Survival rate for the entire cohort was 44%. There was no difference in proportion with abnormality according to survival, type of ECMO, cannula location, diagnosis, or indication for ECMO. Congenital heart disease was the most common diagnosis. Indications for ECMO were 1/3 ECPR, 1/3 cardiac and 1/4 respiratory. Two main CT patterns were intracranial hemorrhage alone (21/50 cases), or infarction in 29/50 cases (10 global, 15 focial/multifocal arterial territories, 3 watershed, 1 venous distribution). No significant laterality of lesions was seen for either group. Arteries involved were, in rank order, middle cerebral artery (MCA, 13/15), then posterior cerebral artery (8 cases), and the anterior cerebral artery (5 cases). Clinical recognition of focal infarction occurred at 17 days (range 0 – 27 days) from cannulation, which was longer compared to 1 day (0 – 19 days) for multifocal, and 1 day (0 – 9 days) for global ischemia (p=0.07). Suppression pattern and seizures on EEG were detected in a significant number of children with infarction patterns (p=0.003). Conclusions: Common patterns of acute brain injury during ECMO reflect the circumstances for support and risk for bleeding. Focal infarction is MCA predominant, and occurs later in the ECMO course than other CT patterns of injury. Surveillance for seizures may be important for those developing ischemic lesions.

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CEREBELLAR INFLAMMATION AND DYSFUNCTION IN A RABBIT MODEL OF CEREBRAL PALSY
Shilpa Narayan, Zhi Zhang, Elizabeth Nance, Sujatha Kannan

Learning Objectives: Increasing evidence has shown that in addition to its motor functions, the cerebellum is involved in higher cognitive functions, with functional connectivity to the frontal cortex. We have previously shown that intrauterine lipopolysaccharide (LPS) exposure induces white matter injury and increased microglial activation in the cerebrum, resulting in deficits consistent with clinical findings seen in cerebral palsy (CP). However, the presence and role of cerebellar neuroinflammation is not yet elucidated. Our hypothesis is that exposure to intrauterine LPS results in inflammation of the immature cerebellum and impaired cerebellar function. Methods: Time-pregnant New Zealand white rabbits underwent a laparotomy and endotoxin or saline administration at gestation day 28 as previously described by us. Cerebellum from CS and endotoxin groups at postnatal day (PND) 1 and 5 were evaluated for presence and morphology of microglia by immunohistochemistry and Neurolucida, and inflammatory response in the cerebellum was quantified by PCR and ELISA. Cerebellar learning was determined using an eye-blink conditioning response, comparing CP and age matched control groups. Targeting activated microglia in the cerebellum for therapeutic intervention was evaluated by determining the localization and distribution of dendrimer nanodevices in the cerebellum, as seen by fluorescent microscopy. Results: Increased and persistent microglial activation, as evidenced by increased numbers and morphologic changes, was found in the cerebellar white and deep grey matter in newborn kits with CP. A significant improvement in the non-conditioned response was noted in healthy control rabbits at the end of the eyeblink training period indicating appropriate cerebellar learning. Conclusions: Cerebellar inflammation and injury may play an important role in impaired learning and cognition in neurodevelopmental disorders such as autism and CP. Future directions include targeting activated microglia in the cerebellum using dendrimer based nanodevices for improving cerebellar learning and cognitive function.

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BRAIN AND SYSTEMIC IMMUNE RESPONSES IN A RABBIT MODEL OF PEDIATRIC TBI
Lindsey Rasmussen, Zhi Zhang, Manda Sarawat, Courtney Robertson, Sujatha Kannan

Learning Objectives: Increased brain levels of inflammatory cytokines have been found following TBI in humans and animal models. However, the progression of the immune response and interactions between the brain and peripheral immune system after TBI in the developing brain are less well studied. Methods: Rabbit kits (n=64) from the same litter were randomly divided into naive (no intervention), sham (craniotomy alone), and TBI (controlled cortical impact; 6mm impactor tip; 5.5 m/s, 2mm depth) groups. Brain and spleen were collected at 4 time points post-injury. The mRNA levels of pro- and anti-inflammatory cytokines were analyzed by PCR. Immunohistochemical analysis was done on spleen and brain. Results: Pro and anti-inflammatory cytokine levels in the brain were differentially regulated in a time dependent manner post-injury. Peak expression of TNF-α and IL-10 occurred 3 days after injury. IL-1β expression was upregulated at all times. This was associated with increased expression of Indoleamine 2,3 dioxygenase (IDO), the rate limiting enzyme in the tryptophan-kynurenine pathway. Interestingly, there was no significant change in splenic inflammatory cytokines in TBI as compared to control or sham at any time. A trend towards decreasing levels of all cytokine mRNA levels at 6hr was seen in the spleen. A trend towards increasing cytokine mRNA levels in the sham rabbits was seen at each time. No histologic difference after TBI was noted in splenic architecture or macrophage infiltrate when spleens were stained for F4/80. Conclusions: Following pediatric TBI, inflammatory cytokines were differentially regulated in the brain, but not in spleen. The increased IDO in the brain suggests a shift of tryptophan metabolism away from serotonin towards the kynurenine pathway following TBI. The peripheral immune response may be suppressed or redirected to the injured brain following TBI. The tendency toward increased peripheral inflammatory response in sham, but not severe TBI, may suggest that severe TBI does not trigger a typical peripheral inflammatory response which may be necessary for repair in milder TBI.

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COMPARISON OF LURASIDONE VERSUS QUETIAPINE FOR THE TREATMENT OF DELIRIUM IN CRITICALLY ILL PATIENTS
Brandon Huang, Jessica Elefritz, Charles Hunley, Nduka Okorie, Marlena Fox

Learning Objectives: Atypical antipsychotics are commonly used to treat ICU delirium however QTc prolongation is a clinical concern with this class of medications. Lurasidone may be associated with a lower incidence of QTc prolongation than other agents. The purpose of this study was to compare the efficacy and safety of lurasidone to quetiapine for treatment of ICU delirium. Methods: A single-center, prospective, observational cohort study was conducted to compare time to resolution of delirium in critically ill patients treated with quetiapine or
lurasidone for ICU delirium between November 2014 and July 2015. Included patients were ≥ 18 yr old, admitted to the Medical or Cardiovascular ICU, and received quetiapine or lurasidone for ≥ 72 hr. The primary outcome was time to delirium resolution from start of study medication. Secondary efficacy outcomes included delirium free days, length of stay (LOS), and mortality. Safety was evaluated by incidence of QTc prolongation defined as a change in QTc interval of >60 msec. Outcomes were compared using Fisher’s exact test for categorical variables and Student’s t-test or Mann-Whitney U test for continuous data. Results: Thirty patients met inclusion criteria (quetiapine n=20, lurasidone n=10). Patients in the lurasidone group had a higher QTc interval at baseline and shorter duration of use 5.5 (4.0-6.5) days vs. 11 (7-16) days, \( p=0.007 \). There were no differences between groups in exposure to QTc prolonging medications. No difference was seen in the primary outcome of time to delirium resolution (80.7 vs. 76.6 hr, \( p=0.828 \)). Delirium free days (1.1 vs. 2.3 days), ICU LOS (12.0 vs. 14.2 days), and ICU mortality (30% vs. 20%) were similar, but hospital LOS was shorter in the lurasidone group 13.0 (11.0-22.0) days vs. 20 (16.0-27.0) days. No difference was seen in the incidence of QTc prolongation (10.0% vs. 10.0%). Conclusions: Similar duration of delirium was seen in ICU patients treated with quetiapine or lurasidone, although success rate remained low for both groups. Additionally, the incidence of QTc prolongation was similar with both agents.

**509 SYNAPTIC CHANGES IN THE MEMORY CIRCUITS AFTER EXPERIMENTAL DIFFUSE TRAUMATIC BRAIN INJURY**

Sarah Ogle, Matthew Law, Steven Johnson, P. Adelson, Jonathan Lifshitz, Theresa Currier Thomas

**Learning Objectives:** Traumatic brain injury (TBI) leads to the disruption of synaptic (circuit) connections with subsequent rebuilding (synaptogenesis) during recovery. The circuits within the hippocampus (HC) and medial prefrontal cortex (mPFC) are heavily involved in cognition and emotion and are susceptible to injury following TBI. Post-TBI synaptogenesis is thought to manifest in altered cognitive, emotional and somatosensory function. Thrombospondins (TSP) and the sub types TSP-1 and TSP-2 are predominantly secreted from activated astrocytes and are expressed heavily during developmental synaptogenesis and then levels diminish in adulthood. TSP differentially stimulate synaptogenesis via the α2δ-1 subunit on neuronal voltage-gated calcium channel receptors. After neurologic insult, TSPs have demonstrated to increase and experimental knockout of TSP expression correlates with poor functional recovery in rodent stroke models. We hypothesize that after diffuse experimental TBI, TSP-1 and 2 expression will coincide with changes in synaptic marker expression in memory circuits over time. **Methods:** For this study, adult male Sprague-Dawley rats underwent sham or midline fluid percussion injury. Analysis included quantification of: neuronal architecture of Golgi stained tissue using Neurolucida 3D reconstruction of the HC (dentate gyrus) and mPFC; protein expression of TSPs and synaptic molecules in HC and mPFC; protein expression of TSPs and synaptic markers in HC and mPFC, using automated capillary western at different time points over a 2 month period post-TBI. **Results:** Preliminary data demonstrated a significant increase in TSP-1 gene expression at post injury day (PID) 2. Protein analysis of TSP and synaptic markers is ongoing. Silver/ Golgi staining in the HC demonstrated significant increase in neuronal degeneration at PID 2 & 7 with subsequent resolution. **Conclusions:** Understanding post-TBI synaptic events is critical to developing treatment strategies aimed to improve connectivity and prevent post-TBI neurologic dysfunction.

**510 PROPOFOL SEDATION IN PEDIATRIC PATIENTS AND THE EFFECT ON CEREBRAL OXIMETRY**

Elizabeth Nakaee, Jennifer Hanak, Archana Ramesh, Cheryl Lefaiver, Stephanie Tolestino, Vinod Havalad

**Learning Objectives:** Propofol is a hypnosedative drug that has rapid onset and short half-life, allowing for safe sedation during bedside procedures in pediatrics. It has been shown that cerebral autoregulation (physiologic mechanism to maintain constant cerebral blood flow during changes in blood pressure) may be disrupted by propofol. Thus, children receiving propofol sedation who experience a decrease in mean arterial blood pressure (MAP) may be at risk for cerebral hypoperfusion. The purpose of this study was to examine the relationship between MAP and cerebral oximetry, as measured by Near Infrared Spectroscopy (NIRS), in pediatric patients undergoing propofol sedation. **Methods:** This prospective, observational study was conducted at a single center PICU. Patients aged 1 to 18 yr, undergoing propofol sedation for bone marrow biopsy, lumbar puncture, or intrathecal chemotherapy, were selected for inclusion. Patients were excluded if unable to safely place NIRS probes or if there was an intracranial disease process within 2 weeks of enrollment. During sedation, vital signs were recorded every 2-3 min including: non-invasive blood pressure, heart rate and pulse oximetry. During sedation, NIRS readings were not used to guide management. **Results:** Eighteen patients were enrolled over 18 mo: 14 lumbar punctures, 3 bone marrow biopsies and 1 lumbar puncture plus bone marrow biopsy. The median change in MAP from the beginning of sedation to the end was -14.8 with an interquartile range of 21.2. The median change in cerebral NIRS measurement was 4 with an interquartile range of 9.3. There was no correlation between cerebral oximetry values and MAP as measured by Pearson’s coefficient, \( r=0.397 \), \( p=0.885 \). **Conclusions:** Our data demonstrate a significant decrease in MAP during propofol sedation without a significant change in cerebral NIRS. Though we cannot definitively conclude that cerebral autoregulation is not disrupted by propofol, we can state that cerebral oxygenation is not negatively affected by propofol sedation despite significant decreases in mean arterial blood pressure.

**511 SODIUM ABNORMALITIES AFTER SEVERE PEDIATRIC TRAUMATIC BRAIN INJURY**

Mohammad Quraishi, Veetali Li, Sangita Trivedi, Amanda Hasserger

**Learning Objectives:** Traumatic brain injury (TBI) continues to be a major cause of death and disability in the United States. Common sodium abnormalities due to hypothermal-pituitary dysfunction after severe TBI include central neurogenic diabetes insipidus (DI), syndrome of inappropriate antidiuretic hormone secretion (SIADH), and cerebral salt-wasting syndrome. This study was performed to test the hypothesis that certain characteristics of patients with severe TBI were associated with higher risk of sodium abnormalities. **Methods:** Retrospective chart review of 1 month to 18 year old patients with severe TBI admitted to a Level-1 Trauma center in a tertiary-care pediatrics hospital from January 2008 to December 2012. **Results:** A total of 122 patients were included in the study. Head injuries were more common in males than in females, 58% versus 42%. Subdural hematoma (SDH) was the most common CT finding associated with sodium dysregulation. Patients with SDH had almost 4-fold higher odds of sodium abnormalities than patients with any other CT finding (OR 3.96, 95% CI 1.26–12.49). The most common abnormality, hyponatremia from suspected SIADH, was seen in 52% of SDH. When compared to patients with no sodium abnormality after TBI, the median Glasgow coma scale (GCS) for patients with hyponatremia was 2.56 lower (IQR1-3-0.15-4.5). Patients who developed SIADH had a median GCS of 5.5 (IQR1-3-3.24-7.7) points lower than those who did not develop SIADH. Patients who developed DI had a median GCS 8.26 points lower than those who did not develop DI (IQR1-3-5.16-12.9). An initial GCS less than 9 had 85% sensitivity and 77% specificity for the development of SIADH, ROC-AUC 0.828 (95% CI 0.699,0.957). [All p-values< 0.05.] **Conclusions:** Patients with SDH were more likely to develop sodium abnormalities than severe TBI patients with other CT findings. Initial GCS had associations with higher odds of hyponatremia. As the initial GCS score decreased, the odds of SIADH and then DI increased. GCS had excellent predictive power for SIADH after severe pediatric TBI.

**512 MYASTHENIC CRISIS: EPIDEMIOLOGY, ECONOMICS AND OUTCOMES–A SINGLE CENTER RETROSPECTIVE ANALYSIS**

Avinash Kumar, Kevin Scharfman, Vikram Tiwari

**Learning Objectives:** Myasthenic crisis accounts for the majority of MG admissions to the ICU. The mainstay therapy is intravenous immunoglobulin (IVIG) or plasmapheresis and supportive care. We seek to describe the management, costs and care flow maps of MG patients admitted to our institution. **Methods:** This is an IRB-approved, retrospective cohort study of patients admitted to a tertiary neuro ICU. We included adults (age > 18 yr), with a diagnosis of MG...
and patients who received plasmapheresis or IVlg therapy in the ICU. The demographics and clinical data were summarized for patients in the IVlg and plasmapheresis cohorts. We compared ICU and hospital LOS, discharge disposition, readmissions and gross hospital cost data for patients in both cohorts. Results: Our final cohort included 153 hospital encounters for 82 individual patients (46 Female) admitted between 2006–14. There was no significant difference in the baseline demographics between the cohorts. The mean hospital LOS was 10.87±2.6 d. (41/152 (20%) encountered required mechanical ventilation - the median duration of MV was 7.5 d (range 1–34), 13 patients had multiple crisis readmissions (Range 2–18 readmissions). This cohort was socially and economically challenged: 5 divorced and 8 single patients. 7 of 13 were Medicaid patients. Interestingly all 13 were discharged home under self-care each time . The mean hospital costs for patients in the IVlg cohort was $5,000 lower than in the plasmapheresis cohort. There was no statistically significant difference between the two groups in the limited financial analysis. Conclusions: Conclusion: Myasthenic crisis are associated with significant resource utilization in a frequently economically disadvantaged population. Evidence based care pathways and financially viable models of care need to be explored for this resource heavy diagnosis.

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CRITICAL ILLNESS POLYNEUROPATHY AND MYOPATHY IN THE PICU
Shauna Burkholder, Lee Burkholder, Matthew Prowse, Joe Watt, Ari Joffe

Learning Objectives: Critical illness polyneuropathy and myopathy (CIPNM) is common in adults. We aimed to prospectively determine the incidence of CIPNM in children. Methods: Children in intensive care who were ventilated for ≥10d were eligible after informed consent. Physical examination for weakness and deep tendon reflexes (DTRs), nerve conduction and electromyography (NCS/EMG) were performed. Primary outcome was incidence of CIPNM, with 95% Confidence Intervals. Fishers-Exact and logistic regression was used to determine potential risk factors and outcomes associated with CIPNM. Results: Of 53 eligible children, 15 consented, 1 withdrew, and 1 had limb ischemia precluding NCS/EMG testing, leaving 13 included patients on d10-14, and 5 on d21-25. Patients had high severity of illness: d1 PELOD 21 (IQR 11–31), d10 PELOD 12 (IQR 3.5–12), ventilator days 20 (IQR 16–27), ECLS 8 (62%), RRT 5 (39%), PICU and hospital length of stay 24 (IQR 21–40) and 47 (IQR 24–64) days, and mortality 4 (31%). Most were exposed to potential risk factors for CIPNM, including steroids (9, 69%), neuromuscular blockers (7, 54%), TPN (12, 92%), hyperglycemia (9, 69%), ARDS (9, 69%), and septic shock (10, 77%). On d10-14, 3 (23%) had weakness, 4 (31%) reduced/absent DTRs, and 4 (31%; 95% CI 12–58%) polyneuropathy. On d21-25, 1 (20%) had weakness, 2 (40%) reduced/absent DTRs, and 2 (40%; 95% CI 12–77%) polyneuropathy (both with polyneuropathy on d10-14). None had myopathy. Predictors of CIPNM included reduced/absent DTRs (p=0.001), and younger age (regression coefficient -0.024 per month; p=0.044). There was no association between CIPNM and the other risk factors examined nor with outcomes of length of stay, failed extubation (5/15, 38%; p=0.12), or mortality. Conclusions: In this very sick cohort of ventilated children, early (d10-14) critical illness polyneuropathy (CIP) was common, while myopathy was not. Reduced/absent DTRs may predict CIP, and younger age may be a risk factor for CIP. This study did not have power to assess for other risk factors or outcomes associated with CIPNM.

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CEREBRAL AUTOREGULATION IN SURVIVORS OF CARDIAC ARREST TREATED BY HYPOTHERMIA
Ilaria Alice Grippa, Jacques Creteur, Jean-Louis Vincent, Fabio Taccone

Learning Objectives: Severe brain damage is frequent among survivors from cardiac arrest (CA). Targeted temperature management (TTM) may be neuroprotective, but assuring adequate perfusion plays a pivotal role. Little is known about cerebral autoregulation (CAR) in such patients. Aim of this study is to evaluate CAR in survivors of cardiac arrest treated by TTM. Methods: This is an ongoing prospective study including adult (>18 yr) comatose CA survivors undergoing TTM (<32–34°C for 24 hr). Exclusion criteria are: traumatic CA, previous sepsis; previous neurologic disease; drug intoxication; major arrhythmias; hypercapnia (>45 mmHg); extra-coroporeal membrane oxygenation support. Left middle cerebral artery (LMCA) is insonated with a 2-MHz probe (DWL, Germany). Recordings are carried out at regular intervals throughout hypothermic (<34°C) and normothermic (<36°C) phase, together with LMCA velocity (FV) and blood pressure (BP) signals through a Doppler Box (DWL, Germany). Patients must be in steady state condition without stimulation during data collection. MATLAB (MathWorks, USA) is used for CAR analysis. Average BP and FV are calculated on a 10 seconds moving window with 50% overlap. Pearson's correlation coefficient between average BP and FV (MCA) was calculated. intact CAR was defined as MCA < 0.3. Results: We have included 6 patients so far. All were male (62 [55–70] yr). Recordings during the hypothermic phase (33.1 [32.7–33.4] °C) were carried out between 2 and 25 hr and during normothermia (37.0 [36.6–37.2] °C) between 36 and 48 hr after beginning of TTM. PaCO2 was 39 [37–42] mmHg and 35 [31–40] mmHg, respectively. Mean insonating time was 15 [6–16] min. Overall, CAR was impaired in 2/6 and 4/6 patients during hypothermia and normothermia, respectively. Conclusions: CAR is altered after CA. The larger number of impaired CAR following TTM is quite concerning.

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MANAGEMENT STRATEGIES FOR GLOBAL HYPOXIC/ISCHEMIC BRAIN INJURY IN PEDIATRICS
Karen Lidsky

Learning Objectives: Global hypoxic brain injury, often associated with hypoperfusion is considered the most common non-traumatic cause of CNS insult in the pediatric population, yet management for optimal outcomes remains controversial and quite variable between/within centers. Determining benefit of treatment will require ongoing multicenter trials but before designing any study one needs to know current management. The following survey was conducted to identify current management strategies implemented. Methods: A questionnaire was designed to capture demographic information and usual standard of care provided by physicians; ventilator management, targeted BP and glycemic control, seizure management, neuroimaging. The questionnaire was distributed via the Internet to physicians responsible for the acute care of infants/ children immediately following hypoxic-ischemic brain insult. The physician list was derived from publicly available directories of physicians working in ICUs responsive for the care of child. Results: 120 completed questionnaires: 98.3% specialty area Pediatric Critical Care with 1.7% identifying specialty in Neurointensive Care. Mean yr of experience 10 yr (1-30yr). Geographic location of institutions: 21% Northeast, 14.3% Southeast, 45.4% Midwest, 5.9% Southwest, 3.4% West, 10.1% Pacific. Patient management strategies: Atr line placement 93.2%, Central venous line 85.5%, CO2 management 92.4% Normocarbic, 5.9% Hypocarbic, <1% no set goal. O2 management (PaO2) -42.4% <60, 27.1% >100, 18.6% no set goal. BP management (MAP) - 26.3% 80–90, 31.4% 90–100, 11.9% 100–120, 22% no goal. 83.1% use both fluids and vasopressors to meet goal - first choice Epinephrine 49.6%, Norepinephrine 35.4%, Phenylephrine 10.6%, Vasopressin 4.4%. Immediate temperature control -80.9%. Osmolar therapy use- 35.3% with 39.2% adding for evidence cerebral edema. Intracra- nial monitor-5.2%. Glycemic control- 76.7%. EEG monitoring 44.3%

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PAROXYSMAL SYMPATHETIC HYPERACTIVITY AFTER ACQUIRED BRAIN INJURY IN CRITICALLY ILL CHILDREN
Matthew Kirschen, Genevieve Dupont-Thibeudeau, Sherri Kubis, Jennifer Hewlett, Robert Berg, Alexs Topjian

Learning Objectives: Survivors of severe acquired brain injury often experience paroxysmal sympathetic hyperactivity (PSH) during recovery. We hypothesized that the adult-derived PSH Diagnostic Likelihood Tool (PSh-DLT) would be able to accurately identify PSH in critically ill children. Methods: This retrospective descriptive study identified patients from the Virtual PICU Systems (VPS) clinical registry, which includes all PICU patients from July 2011 to March 2015. Eligible patients were included if they had a VPS diagnosis of autonomic dysfunction, instability or storming, or dysautonomia after an acquired brain injury. Diagnosis of PSH was attempted using the PSh-DLT. If the PSh-DLT could not be used to identify PSH, 2 intensivists classified the patients as having PSH based
on key components of the PSH-DLT. Patient demographics, clinical course, neurolologic outcome and PSH treatment were abstracted on chart review. Pediatric Cerebral Performance Category (PCPC) score described neurologic function pre admission and at discharge. Results: Thirty-one met inclusion criteria. The PSH-DLT was unable to identify PSH in this cohort due to retrospective data. Two intensivists determined that PSH likely existed in 75% (23/31; 65% male, median age 5.1 yr) of these patients. Of the children with likely PSH (n=25), brain injury causes were trauma (35%), cardiac arrest (35%) and other etiologies (30%) including infectious and autoimmune encephalitides. All survived to PICU discharge. 87% were neurologically normal prior to brain injury (PCPC=1) and 96% were severely disabled or in a vegetative state (PCPC=4 or 5) at PICU discharge. 43% had seizures and 30% received a tracheostomy. PSH-specific therapies included α2-agonists (96%), β-blockers (43%) and gabapentin (17%). Conclusions: In this retrospective study, adult PSH criteria were not adequate to diagnosis pediatric PSH. Prospectively defined pediatric-specific criteria must be identified, utilized and uniformly applied to effectively diagnosis PSH.

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DECOMPRESSIVE CRANIECTOMY FOR UNCONTROLLED CEREBRAL EDEMA FOLLOWING TRAUMATIC BRAIN INJURY (TBI)
Gene Grindlinger, Robert Ecker, Matthew Sanborn, Marshall Robaczewski
Learning Objectives: The application of decompressive craniectomy (DE CRA) in the management of refractory intracranial hypertension remains controversial. Some recent studies have shown benefit whereas others have had disappointing outcomes. This study reports our encouraging experience with DE CRA for unilateral hemispheric or global cerebral edema following TBI and intractable intracranial hypertension. Methods: During the 5 yr ending 7/31/2015, all patients undergoing DE CRA were entered into a DE CRA database. Timing of craniectomy was recorded as were the demographics, initial GCS, systolic blood pressure (SBP), ISS score, pre-DE CRA ICP (when performed), barbiturate use, ICP post-DE CRA, timing of cranioplasty and score at 6 mo on the Extended Glasgow Outcome Scale (1–8). DE CRA was performed in the frontoparietotemporal region. The anteroposterior diameter was 17 cm which extended into the temporal lobe base. Using allograft, an expansive duroplasty was done in each case. ICP management followed the Brain Trauma Foundation clinical practice guidelines. Results: 25 patients underwent unilateral DE CRA. The mean age was 42.2 yr ± 16.9. Twenty-two patients were male. The initial GCS was 6.8 ± 3.7. SBP was 133 ± 29 and the ISS was 30 ± 6.9. Sixteen patients underwent DE CRA within the first 24 hr, three within the next 24 hr and six between the 3rd and 7th day post injury. The pre-DE CRA ICP was 29.6 ± 10.4. Barbiturates were required for ICP management in 9 patients. Following DE CRA, the ICP was 11.1 ± 5.0. Sixteen patients underwent cranioplasty 1 to 3 mo post DE CRA. Of the 21 survivors following DE CRA, the GOS was 8 in seven patients, and 7 in four patients. The GOS was 5–6 in 3 others, two of whom are only 2 mo post DE CRA. Of the 7 survivors with poor outcomes (GOS=2–4), six were the initial patients in the series. Conclusions: In patients with intractable cerebral edema following TBI, unilateral DE CRA in concert with practice guideline directed brain resuscitation is associated with good functional outcome and acceptable mortality.

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IMPACT OF VENTRICULOSTOMY ON OUTCOMES IN CHILDREN HOSPITALIZED DUE TO INTRACRANIAL HEMORRHAGES
Roy Aparna, Munhu Bhaskaran, Sankeerth Rampa, Veerasarthapurush Allareddy, Veejalalndhar Allareddy
Learning Objectives: Intracerebral hemorrhages (ICH) in children frequently necessitate hospitalization and some of these patients require ventriculostomy (VT) to be performed. The incidence of VT in hospitalized children with ICH is unclear at a national level. We sought to examine the impact of having VT on outcomes (in-hospital mortality-IHM, hospital charges-HC, and length of study LOS) in children who were primarily hospitalized due to ICH Methods: We performed a retrospective analysis of the Nationwide Inpatient Sample for the yr 2004 to 2010. The study was granted IRB exempt status. All patients aged up to 18 yr who were hospitalized primarily due ICH were selected. Amongst this cohort, performance of VT was identified (independent variable). The outcomes of interest were IHM, HC (adjusted for 2010 $) and LOS. The associations between outcomes and primary independent variable were examined by multivariable linear and logistic regression models. The confounding effects of age, sex, race, insurance status, co-morbid burden, type of ICH, and hospital characteristics were adjusted in the regression models Results: During the study period a total of 42,560 children were hospitalized due to ICH. Of these, 2469 patients had a VT. The mean age of those who had VT was 10.3 yr (vs 8.6 yr for those without VT). Outcomes in those with VT vs without VT included: IHM rate (21.1% vs 6.5%), HC ($227,516 vs $60,132) and mean LOS in days (19.5 vs 5.8). After adjustment for multiple patient and hospital level confounders, those who had VT were associated with higher odds for IHM (OR=5.02, 95%CI=2.35–3.92, p<0.0001), higher HC (Estimate=+1,132, 1.039–1.224, p<0.0001, positive estimate implies higher) and longer LOS (e=0.858, 0.751–0.965, p<0.0001) when compared to those who did not have VT. Conclusions: In this large population based study, ventriculostomy was required in 5.8% of hospitalized children with intracerebral hemorrhage. The need for VT in children with ICH predicts higher risk of mortality and is associated with considerable hospital resource utilization.

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SEX INFLUENCES MICROGLIAL MORPHOLOGY AT BASELINE AND AFTER HYPOXIC ISCHEMIC INJURY IN IMMATURE BRAIN
Utpal Bhala, Ahmed Al Hazmi, Ewa Kulikowicz, Michael Reyes, Dawn Spicer, Jillian Armstrong, Raymond Koehler
Learning Objectives: Significant gender differences in neuronal death pathways exist in the developing brain after Hyoxia-Ischememia (HI). Neuroinflammation triggered by activated microglia determine the mode of neuronal death after HI. Sex differences in neuroinflammation may determine the sex differences in mode of neuronal death. Hypothesis: Sex influences microglial morphology at baseline and after HI Methods: Male and female piglets (3–4-day-old) were anesthetized with isoflurane, intubated, ventilated and catheterized for vascular accesses. The hypoxic-asphyxic insult consisted of 45 min of hypoxia (10% O2), followed by 7 min of airway occlusion. ROSC usually required ventilation with 50% O2 and up to 3 min of chest compressions with 1–2 epinephrine injections. Piglets were perfused to isolate brains at 3 days post-injury. Immunohistochemistry staining of brain was performed using 1:5000 IBA-1 primary antibodies. Microglial morphology (Sholl analysis of 10 microglia per 40X bright field in each piglet) was determined in Sensory Motor Cortex (SMC) using Neuro lucida. Naïve male and female piglets (7-day-old) were used as control. Student t-test was performed to compare the microglial morphology in male and female (p≤0.05, significant). Results: We studied 3 males and 3 female piglets in each of naïve and injured groups. The baseline physiology parameters were similar in 2 gender groups. Compared to naïve female (f) piglets, the naive male (m) piglets revealed smaller cell size (f56.1 ± 15.9 µm2, m43.7 ± 8.3 µm2), shorter branches (f444.6 ± 106.3 µm20 ± 5) (p<0.0001) in SMC. Compared to injured female piglets, the injured male piglets revealed shorter microglial branches (f264.6 ± 29.1 µm, m114.2 ± 54 m20 ± 5) (p<0.0001) in SMC. Compared to injured male piglets, the injured female piglets revealed smaller cell size (53.2 ± 12.6 µm2, f53.7 ± 18.8 µm2) did not differ significantly in the 2 gender groups. Conclusions: Sex influences microglial morphology at baseline and after HI in immature brain with a trend towards a less marked neuroinflammation in female cortex after HI.

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INTRanasal Dexmedetomidine: An EFFECTive SEDATIVE AGENT FOR NON-PAINFUL PROCEDURES
Nicole Baier, Suzanne Mendez, Alan Schroeder, Danielle Kimm
Learning Objectives: Dexmedetomidine (Dex) is an α2 adrenergic receptor agonist with sedative, anxiolytic, and analgesic properties. Many studies have reported it to be an effective agent for pediatric sedation when given intravenously (IV) or intramuscularly (IM). The intranasal (IN) route avoids the pain of IV or IM injection, but few studies have been published on the use of IN Dex for pediatric sedation outside of pre-surgical use. The purpose of this study is to examine the

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efficacy and outcome of the administration of Dex via the IN route for sedation of patients undergoing electroencephalograms (EEGs) and auditory brain response (ABR) testing. **Methods:** This was an IRB-approved chart review of outpatient pediatric sedations. Patients were given IN Dex if they were undergoing EEG or ABR. An initial dose of 2.5–3 mcg/kg IN Dex was given (maximum dose 100–150 mcg) via an atomizer device (LMA MAD Nasal, Teleflex Medical, Research Triangle Park, NC), with a repeat dose of 1–1.5 mcg/kg IN (maximum dose 50–75 mcg) if needed 30 min later. Prospectively entered patient information was extracted from a quality assurance database and additional information gathered via retrospective chart review. All patients sedated with IN Dex for EEG or ABR between October 1, 2012 and October 1, 2014 were included. **Results:** 169 patients received IN Dex (EEG=117, ABR=52). For ABR, the first dose success rate was 90.4% and for EEG it was 87.2%. Total success rates (with one or two doses of IN Dex) were 100% for EEG and 99.1% for EEG. The median time to onset of sedation was 25 min (IQR 20–32 min). The median time to full recovery was 107 min (IQR 90–131 min). Of the entire group, the following adverse events were noted: 6 patients had oxygen desaturation (<90%), 2 of whom received supplemental oxygen administration, and 1 patient with an underlying upper airway abnormality required CPAP support. **Conclusions:** IN Dex is a highly efficacious and non-invasive method of sedating children for EEG and ABR. The quick recovery time and favorable adverse event profile make it an ideal agent for outpatient pediatric sedation.

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**DOPPLER ULTRASONOGRAPHY OF THE RETINAL VESSELS AND OPTIC NERVE SHEATH IN CHILDREN WITH BRAIN DEATH**

Rebecca Rigggs, Bhavana Shivalukumar, Carmelina Trimbolesi-Heidler, Jay Patregani, Marjanieh Miller, Michael Spaeder, Joanna Cohen, Nathan Dean

**Learning Objectives:** Twenty one people die every day in the US waiting for organ transplants, and over 123,000 remain on the waiting list. The timely diagnosis and administration of BD is critical to facilitate organ donation, allocate medical resources, and to relieve the family of end of life decisions. BD is a clinical diagnosis based on two neurologic exams consistent with the absence of neurologic function and a known irreversible cause of coma. When the clinical exam is inconclusive, ancillary studies are used to confirm BD. We hypothesize that bedside Doppler ultrasonography of the central retinal vessels (CRVs) can become an ancillary study to support the diagnosis of BD. **Methods:** All children, 0–18 yr of age, evaluated for BD at Children’s National Medical Center from November 2012 to April 2014 were enrolled in this IRB approved, prospective observational cohort. The CRVs blood flow velocities, resistive index (RI), pulsatility index (PI), optic nerve sheath diameter (ONSD), and Doppler waveforms were evaluated in 13 children, ages 3 mo to 15 yr. All patients had at least one ophthalmic ultrasound within 30 min of each BD exam. A Sonosite M-TURBO® ultrasound with an 12.5x 13-MHz frequency linear probe in ophthalmic mode was used. Standard statistical methods through SAS® software were used for data analysis. **Results:** Thirty five ophthalmic ultrasounds were obtained on 13 patients, 8 males and 5 females, who each had 2 clinical exams consistent with BD. Nine patients suffered traumatic brain injury. Two were self-inflicted hangings, and 2 had unexplained cerebral edema. The mean ONSD was 5.12mm, and a crescent sign was present on all exams. Of the 27 exams with flow, the mean PI was 3.6, and the mean RI was 0.89. Eleven of 15 patients had both RIs ≥ 1 and waveforms consistent with BD showing no flow 23%, systolic spikes 26%, and reverberating flow 26%. A tardus-parvus waveform was present in 23% of exams. **Conclusions:** In this small sample, bedside Doppler ultrasonography of the CRVs was a useful indicator of BD showing that it can become an ancillary study to support the diagnosis of BD in children.

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**RISE IN MTBI (CONCUSSIONS) IN TRAUMA PATIENTS WITHOUT CHANGE IS OVERALL NUMBERS OF TBI**

Dave Milzman, aidan Neustadtl, Jeremy Altman, Danny milzman, Jack Sava, Sam Fenkel

**Learning Objectives:** Background: Minor traumatic brain injury (mTBI or concussion) has seen changes in resources devoted to education, and awareness as well as structured limitations on athletic concerns. Few studies to date have attempted to determine whether, increased occurrence is related to change in injury patterns or improvements in physician and public awareness and diagnosis. **Objectives:** To determine if mTBI rates are increasing faster than other traumatic injuries and whether detection is related to better diagnosis or increased occurrence. **Methods:** The Emergency Department and Trauma Center records were analyzed at ED and Trauma Centers in 2 metropolitan areas for the past decade 2005–2015. Trauma registries and the ED database were analyzed for trauma admits, ED visits and mTBI rates and treatment interventions including use of radiographic study and dispositions. mTBI defined as arrival GCS 15, possible LOC and no other injury. IRB approval and data analysis was obtained and performed. **Results:** From 2000–2015, the study only found a rapid rise in last 5 year with number of concussions increased by 140% compared to ED pt. census and Trauma pts volume increased only by 23.9%; p<0.02. The first 5 yr from 2000–2005 showed less than 5% of TBI patients with any mTBI diagnosis. There were also increases in use of CT for concussion by 25.8% with less than 1.2% of mTBI pts. having a positive finding on Head CT and none requiring neurosurgical intervention. Pt in hospital admission rate at same rate as new concussions. Despite rise in mTBI and neurosurg admits, there was no rise in Neurosurgical operative cases. **Conclusions:** There has been an effective impact on mTBI presentation and admission to our ED and trauma centers in the past five yr. CT increased in use with no improved treatment intervention. Future studies will need to determine utility of admit compared to outpatient observation and neuropsychiatric intervention. Standardized testing for concussion in mTBI in TBI and other trauma patients is still needed despite increased awareness. Current rising numbers may not yet have peaked.

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**SLEEP EEG CHARACTERISTICS OF CRITICALLY ILL CHILDREN WITH STATUS ASTHOMATICUS**

James Hungerford, Nancy Baron, Mark splaingard, Joseph Tobias

**Learning Objectives:** EEG-based sleep quantitation in the pediatric ICU (PICU) is poorly documented in the literature. We evaluated sleep using EEG in a cohort of children with status asthmaticus. Hypothesis: Critically ill children with status asthmaticus will have reduced total sleep time, fragmented sleep, and reduced total N3 (slow wave) and REM sleep compared to published age-based norms.
Methods: Children (<18 yr) admitted to the PICU for status asthmaticus were eligible for enrollment. Those with neurologic disease or systemic disease other than asthma were excluded from this analysis. Continuous sleep EEG data were collected for a target of 24 hr with a required minimum of 12 hr night time data collection. Standard sleep EEG was done using the international 10–20 system. All data were staged using R&K visual scoring rules. Findings were considered normal if they fell within 2 standard deviations of published norms for age. Data are presented as median (interquartile range). Results: Five children have been studied to date (age: 10.3 [5.5–13.6] yr, 4/5 male). None of the children received sedation. Median study duration was 20.5 (14.8–22.1) hr with a median total sleep time (TST) of 7 hr (6.3–7.6) hr. TST was below normal in 4/5 children. All five had fragmented sleep with a median of 16 (12–17) overnight awakenings. The median value for the average duration of awakening was 5.9 (3.2–6.4) min. The median value for the longest period of uninterrupted sleep was 95 (85–110) min, with a maximum of only 130 min. Remarkably, total min of N3 sleep were normal for 4/5 children whereas total min of REM sleep were reduced for 4/5 children. Conclusions: While PICU care for status asthmaticus was associated with reduced TST, fragmented sleep, and decreased REM sleep, restorative N3 (slow wave) sleep was preserved in the majority of the cohort. This establishes that measurement of sleep architecture is feasible in critically ill children and should be studied in larger and more diverse cohorts to evaluate relationships between sleep and outcomes (including delirium) in the PICU.

525 CONTINUOUS EEG FOR SEIZURES IN PEDIATRIC CRITICAL CARE: YIELD AND EFFICIENCY OF IDENTIFICATION

Arnold Sansevere, Elizabeth Duncan, Tobias Loddenkemper, Phillip Pearl, Robert Tasker

Learning Objectives: Continuous EEG monitoring (cEEG) is important to the detection of brief electrographic seizures (ES) and prolonged episodes of electroencephalographic status epilepticus (ESE). These seizures are often times subclinical and would go undetected without cEEG. The objective of this report is to better define at-risk PICU populations and the optimal duration of cEEG monitoring needed to adequately capture ES(E) events. Methods: This is a retrospective descriptive study of patients aged 1 month to 21 yr who underwent cEEG (>3hr) in the PICUs at Boston Children’s Hospital in the period of 2011–2013. In our institution we have a structured approach to cEEG monitoring after admission and the particular indication for monitoring is recorded. Results: 414 patients aged 4.2 (0.75–11.3) yr (median [IQR]) were included. The overall PICU length-of-stay was 7.8 (2.7–22.7) days and mortality was 14.3% (59/414). With a median duration of 21 (16–42.2) hr of cEEG monitoring, we identified ES(E) in 1-in-4 cases, i.e., we did not identify ES(E) activity in 75% of the population. Three features could make the use of cEEG resources more efficient and provide a framework for decision-making. First, aspects from the clinical history may help with the decision to not initiate cEEG monitoring. Second, the initial EEG finding has the potential to inform the decision not to continue with cEEG monitoring. Lastly, during cEEG monitoring, failure to record ES(E) within the first 4 to 6 hr of monitoring may be a sufficient test of whether there will be no further ES(E) activity, i.e., post-test probability of no ES(E) in subsequent cEEG monitoring 0.90. Conclusions: cEEG monitoring is considered standard of care to assess patient neurologic status and seizure activity. Individualized monitoring plans are necessary to increase the yield of seizure detection, while improving resource utilization. A strategy that uses information from the clinical history, initial EEG investigation and early background findings may be effective in accomplishing this goal.

526 SPONTANEOUS INTRACRANIAL HEMORRHAGE IN CRITICALLY ILL PATIENTS WITH MALIGNANCIES

Jeong Am Ryu, Dae Sang Lee, Jeong Hoon Yang, Chi Ryang Chung, Chi-Min Park, Gee Young Suh, Kyoeongman Jeon

Learning Objectives: Intracranial hemorrhage (ICH) is a highly morbid neurologic complication that accounts for nearly half of cerebrovascular events in patients with malignancies. Limited data are available on the intracranial hemorrhage (ICH) developed in critically ill cancer patients during their stay in the ICU. The purpose of this study is to evaluate the clinical characteristics of ICH and to identify predictors of ICH in critically ill cancer patients who underwent brain CT for suspicion of spontaneous ICH. Methods: All consecutive patients who underwent brain CT for suspicion of spontaneous ICH with acute neurologic symptoms or signs developed during their ICU stay were retrospectively evaluated to identify predictors of ICH. Results: Over the study period, a total of 273 patients underwent brain CT scanning for suspicion of ICH, with altered mental status in 202 (74%), seizure in 43 (16%), and hemiparesis in 34 (12%). However, only 49 (18%) patients had a final diagnosis of ICH. The most common type of hemorrhage was intracerebral in 34 patients (60%), followed by subarachnoidal hemorrhage in 17 (35%). In multiple logistic regression analysis, anisocoric pupils or abnormal pupil reflex (adjusted OR 7.939; 95% CI, 2.315 – 27.228) was an independent predictor of ICH. In addition, higher positive end-expiratory pressure (adjusted OR 1.204; 95% CI, 1.065 – 1.361) was significantly associated with ICH. However, platelet count was inversely associated with ICH (adjusted OR 0.993; 95% CI 0.988 – 0.999). Conclusions: In this study, our data demonstrate that approximately one fifth of critically ill cancer patients who underwent brain CT scanning for acute neurologic symptoms or signs developed during their ICU stay had ICH. Nevertheless, the results of this study suggest that brain CT scanning should be performed even in critically ill cancer patients, especially with risk factors and acute neurologic changes. However, these observations need to be further evaluated by larger cohort studies.

527 ASSOCIATION BETWEEN HYPEROXIA AND OUTCOMES IN CRITICALLY ILL STROKE AND ICH PATIENTS

Ozan Akca, Alexander Bautista, Kerri Remmel, Rainer Lenhardt

Learning Objectives: An association between hyperoxia and poor hospital outcomes was shown in some subsets of critically ill patients. However, it is not clear whether such association has any causal relationship, because pharmacokinetic and –dynamic properties of oxygen therapy are not well-defined. In the light of evidence from published meta-analyses work, we decided to analyze the association between the PaO2 levels of first 12 hr of ICU admission and mortality outcome of critically ill stroke and intracranial hemorrhage (ICH) patients. Methods: With the approval of the Human Studies Committee at the University of Louisville (IRB #: 13.0396), we performed a retrospective analysis. Elderly (>65 yr of age) stroke and ICH patients who were admitted to our Neurosciences ICU service between the yr 2008 and 2012 were included in the analysis study. Arterial oxygen tension values (PaO2) from first 12 hr of ICU admission were averaged for each patient. According to the PaO2 values, patients were categorized to two groups: Hyperoxia (PaO2>200mmHg) and Normoxia (PaO2≤200mmHg) groups. Severity indices, neurologic scores, and other potential confounding factors were assessed for their effects on mortality outcome by univariate and multivariate statistics. Results: Univariate statistics showed statistically significant differences between the study groups only in patients’ admission SOFA scores and hypotension. A small, statistically not significant, difference in mortality (42 vs. 38%, P=0.726) was found between the Hyperoxia and Normoxia groups. Table A Sample-size estimate of n=6,600 would be required if further association between hyperoxia and mortality to be addressed (α: 5%, β: 10%). In the multivariate analysis, age, GCS, and SOFA scores were found as the independent contributors of mortality. Conclusions: In this retrospective cohort of elderly critically ill stroke and ICH patients, there was no association found between hyperoxia and mortality.

528 CEREBRAL BLOOD FLOW DURING PAIN STIMULUS IN CRITICAL ILL

Cristini Klein, Wolnei Caumo, Fabiane Baches, Alexandra Lopes, Valéria Patines, Jeanne silveira, Tatiana Piler, Silvia Regina Vieira

Learning Objectives: The increase of cerebral blood flow during pain is reported in communicative research subjects. However, in non-communicative critically ill it was not studied. We aimed assess the cerebral blood flow in adults critical ill by functional transcranial Doppler sonography during pain stimulus. Methods: Convenience sample of non-communicative medical-surgical ICU adult patients. Exclusion criteria were treatment with neuromuscular blocking
agents or continuous analgesic IV infusion, neurodegenerative disease, quadriplegic patients. Data were collected between April and December in 2014. Patients were evaluated with transcranial Doppler sonography at 3 moments: at rest (M1), M2 during the pain pressure threshold (PPT), and 15 min after PPT (M3). We performed linear generalized model to evaluate differences between blood flow on middle cerebral artery in critical ill underwent pain stimulus Results: Sixty six paired assessment were performed, in 22 non-communicative critical. Mean age was 58.36 (SD ± 19.3) yr, mean APACHE score 24.05 (SD ± 9.23), mean body mass index 30.0kg/m2 (SD ± 8); 59.1% were man, 90.9% were medical patient, the most frequent reason for admission at ICU was sepsis (59.1%), 59% required mechanical ventilation and 95.5% had comorbidity, the most frequent was hypertension (68.2%) followed by diabetes mellitus (36.4%). The mean of blood flow on middle cerebral artery at rest was 46.88 cm/s (SD ± 15.73), 55.36 cm/s (SD ± 14.66) during PPT, and 47.59 cm/s (SD ± 15.16) 15 min after PPT. Generalized linear regression model showed that the flow in the moment M1 and M3 were different from M2 (p<0.001); M1 and M3 had no differ. Conclusions: This work shows that pain stimulus increased the cerebral blood flow. The increase in blood flow on middle cerebral artery reflects the hyperactivity of the neuromatrix of nociception in non-communicative critical ill.

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SEX DIFFERENCES AFTER CONTROLLED CORTICAL IMPACT IN MICE
Amy Clevenger, Hoon Kim, James Orfila, Paco Herson, Richard Traystman

Learning Objectives: The role of sex in short-term and long-term changes after traumatic brain injury (TBI) remains controversial, but differences seen before and after puberty suggest that sex steroids may play a role in outcome. We used the controlled cortical impact (CCI) model of TBI in mice to help evaluate sex differences. We hypothesized that after CCI, adult female mice would demonstrate less injury than adult male mice, and that this difference would disappear if the females had previously undergone ovariectomy.

Methods: A subset of adult female mice underwent ovariectomy and were recovered for a week. Following recovery, adult male and ovariectomized and non-ovariectomized female mice (8–12 weeks of age) were anesthetized and intubated. Hemicraniectomy was performed, and a controlled cortical impact was applied at depths of 0, 1, and 2mm, and a velocity of 3m/s. The skull flap was replaced and the animals recovered. Seven and thirty days follow-
ing injury, animals underwent behavioral testing and were then perfused for histological protection and fewer behavioral deficits 7 days after CCI compared to males. Of the patients with documented BP readings within 30 min of the start of the infusion, animals underwent pain pressure testing and were then perfused for histological protection and fewer behavioral deficits 7 days after CCI compared to males.

Results: Adult females exhibit relative protection of behavior and delayed loss of tissue in comparison to male mice. Of the patients with documented BP readings within 30 min of the start of the infusion, animals underwent pain pressure testing and were then perfused for histological protection and fewer behavioral deficits 7 days after CCI compared to males.

Conclusions: This work shows that pain stimulus increased the cerebral blood flow. The increase in blood flow on middle cerebral artery reflects the hyperactivity of the neuromatrix of nociception in non-communicative critical ill.

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APPLICATION OF TRANSCRANIAL DOPPLER IN THE EVALUATION OF PEDIATRIC CENTRAL NERVOUS SYSTEM INFECTION
Laurence Ducharme-Crever, Priya Mehta, Michele Grimason, Craig Smith, Mark Wainwright

Learning Objectives: Transcranial Doppler measurement of blood velocity in the major intracerebral arteries serves as surrogate for cerebral blood flow (CBF). Central nervous system (CNS) infections are life-threatening diseases associated with significant morbidity and mortality. We tested the hypothesis that TCD could detect changes in CBF in children with CNS infection and that these results would help direct care.

Methods: Single center retrospective study of children admitted to the PICU with CNS infection and undergoing TCD from March 2011 to April 2015. Primary objective is to characterize TCD patterns. Secondary objectives are to describe the epidemiology of children with CNS infection undergoing TCD and to discuss patients in which TCD resulted in tailoring of medical management. Results: 19 children with CNS infection underwent TCD. Data are expressed as median (1st, 3rd quartiles). The median age was 9.1 year (3.0–12.0), including 10 boys and 9 girls. The majority of cases were due to meningitis (n=12, 63%), the remainder comprising encephalitis (21%) and abscess/empyema (21%). Bacterial (n=9, 47%) and viral (n=9) were equally common with only 1 (5%) fungal infection. Median Glasgow Coma Scale (GSC) upon PICU admission was 12 (10–15). The patients underwent TCD 2 days after PICU admission (1–3). 4 patients had focal infection, in these patients TCD velocities were asymmetric (ipsilateral hyperemia, contralateral hypoperfusion and increased intracranial pressure (ICP)). 7 patients had clinical signs of increased ICP. Of these, TCD identified hyperemia in 5, hypoperfusion in 1 and 1 had no window for imaging. The clinical indications for TCD were for assessment of increased ICP, hypoperfusion or vasospasm. 2 patients had increased ICP and hypertension was safely achieved with CBF monitoring by TCD to avoid ischemia. In one patient with increased ICP and hyperemia, TCD help to guide pressors and blood pressure management. Conclusions: TCD can be used in children with CNS infection as a tool to assess CBF and help guide medical therapy including determining blood pressure goal and ICP management.

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CLEVIDIPINE VERSUS NICARDIPINE FOR ACUTE BLOOD PRESSURE LOWERING IN THE NEUROSCIENCE ICU
Jacqueline Finger, Lisa Kurczewski, Gretchen Brophy

Learning Objectives: Nicardipine is the standard of care for acute blood pressure management in stroke patients at Virginia Commonwealth University Health System (VCUHS). Currently, a lack of published literature exists regarding the use of clevidipine in the neuroscience population. Studies in cardiac surgery patients have shown that this medication may provide better blood pressure control versus other available continuous intravenous antihypertensive agents.

The purpose of this study was to compare the difference in time to achieve target sys-
tolic blood pressure (SBP) goals with clevidipine (CLV) versus nicardipine (NIC) infusions in patients admitted to the neuroscience intensive care unit (NSICU) at VCUHS. Methods: This retrospective study included NSICU stroke patients receiving clevidipine or nicardipine infusions between July 1, 2011 and June 30, 2014. Patients were matched based on indication for blood pressure (BP) lowering and target SBP. Primary endpoints included time to target SBP and percentage of time within target SBP range. Secondary endpoints included CLV or NIC doses required to achieve target SBP and documented adverse effects with therapy. Results: Of 57 patients included in the study, the most common diagnosis was ICH (42%). The median time to target was 30 min in the CLV group (n=19) and 46 min in the NIC group (n=38) (p=0.13). The percentage of time in target BP range was 79% vs 78% (CLV vs NIC, respectively, p=0.64). The median (IQR) dose of CLV was 3 (1,5.8) mg/hr and NIC was 5 (4,7) mg/hr. Of the patients with documented BP readings within 30 min of the start of the infusion, 69.2% of CLV patients and 38.1% of NIC patients achieved target SBP within this time (p=0.15). Conclusions: NSICU patients receiving CLV for BP management successfully achieved target SBP 15 min sooner than patients receiving NIC in our study; however, this difference was not statistically significant. Hypotension was rare in both groups.

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ATTITUDE OF PHYSICIANS TOWARDS MANAGEMENT OF NONCONVULSIVE SEIZURES IN THE INTENSIVE CARE UNIT
Sherif Abd Elwahed, Emman Abd elfatah

Learning Objectives: Non convulsive seizures and non convulsive status epi-
tileptics are increasingly recognized as common occurrences in the ICU. Electro-
encephalograph is essential in their diagnosis and management. The aim of the current survey is to detect the attitude of physician towards this problem as well as different ways of management in their daily ICU practice.

Methods: The sur-
vey was conducted through a questionnaire. The total number of responders was

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A total of 95 patients were included in the study. Outcomes as well as daily Na, Cl and creatinine. AKI was defined according to the study’s criteria.

Methods: We conducted a survey of 10 questions to Mayo Clinic (Minnesota, Arizona and Florida) critical care nurses, advanced practice providers (APP) and physicians over 3 weeks to evaluate current practices of neurologic monitoring of brain injured patients. A categorical scale was developed to measure the frequencies of neuro checks in a variety of neurocritical care populations.

Results: We received 103 responses from 518 invitations. RN’s constituted 58% of respondents, physicians 28% and advanced practice providers 14%. The most common frequency (60/103) reported for neuro checks in high risk intracranial hemorrhage populations was q1hr. The majority of respondents (58/103) estimated that high risk patients were monitored for at least every 2 hr more than 5 days. The respondents (57/103) reported an observed relationship between neurologic deterioration and sleep deprivation that required evaluation including imaging. Only 1 physician noted delayed intervention as a result of less frequent checks. Conclusions: Sleep deprivation from ICU as a result of less frequent checks may be an underappreciated phenomenon in neurocritical care, particularly in patients with prolonged ICU stays and may lead to unnecessary testing, including imaging. The data suggest respondents perceive an association between frequent neuro checks and neurologic deterioration caused by sleep deprivation. The survey underscores the need for studying the optimal frequency of neuromonitoring to detect secondary neurologic events and deterioration while counterbalancing potential for harm from sleep deprivation and unnecessary testing.

HYPERCHLOREMIA IS CORRELATED TO ACUTE KIDNEY INJURY IN SAH POPULATION TREATED WITH HYPERTONIC SALINE
Ofer Sadan, Prem Kandiah, Kai Singbartl, Kate Martin, Owen Samuels

Learning Objectives: Subarachnoid hemorrhage (SAH) is an acute, potentially life threatening medical condition, that results from a rupture of an intracranial vessel. Cerebral edema is a common sequela of SAH which is typically managed by instituting osmotherapy with hypertonic saline. Recently, hyperchloremia has been associated with the development of acute kidney injury (AKI) and increased mortality in critically ill patients. The current study examines the correlation between hyperchloremia, hypernatremia and AKI in SAH patients.

Methods: The study was approved the local IRB. All patient with a SAH discharge diagnosis from January to June 2014 and an ICU course of at least 5 days were included in the study. We retrospectively collected patients demographics, risk factors, outcome as well as daily Na, Cl and creatinine. AKI was defined according to the KDIGO criteria. Results: A total of 95 patients were included in the study.

16 patients (16.8%) developed AKI during their ICU stay (ICU day 6.5 ± 4.5 on average), excluding admission AKI. 12/16 (75%) patients with AKI received hypertonic saline therapy for cerebral edema. There was no statistically significant difference in the age, gender or risk factors between the AKI and non-AKI groups. Maximal level of chloride was 115.7 ± 0.8mg/dL in the non-AKI group vs 125.6 ± 2.9 in the AKI group (p<0.01); Sodium levels were 145.8 ± 0.8mg/dL vs 154.3 ± 5.1 respectively (p<0.05). In a logistic regression analysis, hyperchloremia and not hypernatremia was found to have a statistically significant interaction with the probability to develop AKI (OR 1.127 [1.055–1.205]). AKI in turn was linked to higher mortality (13.9% vs. 37.5%, OR 3.799 [1.122–12.643]).

Conclusions: In SAH patients managed in a tertiary neurocritical care where the use of hypertonic saline and normal saline is ubiquitous, the occurrence of hyperchloremia rather than hypernatremia is associated with a higher risk of developing AKI. This association with chloride raise the management strategy of comparing the effects of using high and low-chloride hypertonic solutions.
Average age was 10.6(±4.7), range 5-18yo, and weight 45 (±21.6) range 18-75kg. Diagnoses included traumatic brain injury (6), encaphalopathy (1), liver failure (1), stroke (1) and CNS lymphoma (1). Doses administered were 10ml (22), 20ml (2) and 30ml (7). ICP was documented in 8 doses, average pre 145 (±7) and post 147 (±7) mmHg, mean decrease 12.3 (95% CI 4.4-20.1), p<0.01. In patients without monitoring, transient clinical improvements were seen. Serum sodium levels were available in 26 doses, average pre 145 (±7) and post 146 (±7) mmol/L, mean increase 3 (95% CI 1.7-4.3), p<0.001. Routes included IV (2), CVL (2), IO (1). No infiltrates or phlebitis were reported, no survivors (4) had evidence of central pontine myelinolysis. Conclusions: Standardized dosing of 23% HS in pediatric patients facilitates rapid administration with potential benefits in ICP and serum sodium management. Further study is needed to determine benefits and harms.

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CLINICAL EVALUATION OF A PORTABLE NEAR-INFRARED DEVICE FOR THE DETECTION OF ACUTE STROKE
Saroshi Egewa, Toru Hifumi, Kenya Kawakita, Atsai Manabe, Hikari Murakata, Tomoya Okazaki, Hajime Shishido, Yasuhiro Kuroda

Learning Objectives: The Infrascanner® is a noninvasive, portable, near-infrared (NIR) device used to detect intracranial hematomas using near-infrared technology. Its efficacy in traumatic brain injury has been documented; however, its utility in evaluating acute stroke has not been reported. This study aimed to evaluate the efficacy of the NIR device in detecting acute stroke among patients with a consciousness disturbance in an emergency department (ED). Methods: From November 2014 to June 2015, we used the NIR device on 53 patients [Glasgow Coma Scale (GCS) ≤14] with an alert mental status at ED admission, excluding patients with traumatic brain injury, those with cardiac arrest, and those who were injected with a sedative drug upon arrival. The NIR device was used only once for each examination because of its convenience. The results were divided into two groups: “positive,” defined as results that marked above three reds only on one side; and “negative,” defined as any other result. Acute stroke was further evaluated by computed tomography or magnetic resonance imaging within 1h. The primary study outcome was the agreement in stroke detection between the NIR device and the imaging study. Results: Among the 53 patients, 9 were “positive” and 44 were “negative” based on NIR findings. Imaging studies confirmed four patients with acute stroke: three with an intracranial hemorrhage and one with an infarction. The NIR device demonstrated a sensitivity of 21% (4/19), specificity of 88% (29/33), positive predictive value of 55% (4/8), and a negative predictive value of 66% (29/44) in detecting any lateral lesions that involved bleeding and infarction. Conclusions: Based on this limited study population, NIR may be useful for detecting acute stroke among patients with disturbed consciousness in an ED. A future, larger study would be required to confirm NIR device efficacy.

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ROBOTIC TECHNOLOGY IDENTIFIES NEUROCOGNITIVE DEFICITS IN HIGH FUNCTIONING CARDIAC ARREST SURVIVORS
John Gordon Boyd, Stephen Scott

Learning Objectives: Neurologic outcome after cardiac arrest (CA) remains poorly defined. Most studies use 5-point rating scales (e.g. cerebral performance category; CPC), that do not provide the granular data necessary to examine the efficacy of modern neuroprotective strategies. Formal neuropsychological testing can be time consuming and costly. The KINARM robot provides quantitative and objective metrics of neurocognitive function. This tool has been used to demonstrate subtle neurologic deficits in stroke patients not identified by routine neuropsychological testing. Importantly, these subtle deficits correlated well with quality of life metrics. The objective of this study was to demonstrate the feasibility of using the KINARM to quantify the neurocognitive phenotype of CA survivors. Methods: We recruited 9 patients post CA. All CA subjects would be traditionally defined as having a good neurologic recovery (8 CPC=1, 1 CPC=2). The mean age of subjects was 49 (range 19-71). They were assessed 1-24 mo after CA. On the simple visuomotor task of visually guided reaching, most patients performed within the normal range. However, when the level of difficulty was increased by reversing visual feedback of hand motion, the majority of patients performed outside the normal range, particularly in reaction time, direction error, and limb speed. The number of speed peaks was also significantly higher, reflecting impaired feedback control of upper limb function. Conclusions: We have demonstrated the feasibility of using robotic technology to build a precise and quantitative definition of neurologic recovery after CA.

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EVALUATION OF INDICATION AND OUTCOME OF EXTERNAL VENTRICULAR DRAINAGE IN A TERTIARY ICU
Sharmilini Sinha, Souvik Chaudhuri

Learning Objectives: The role of external ventricular drain (EVD) in various acute intracranial pathologies and its effect on outcome has remained controversial. There are very few studies which have demonstrated any significant association between EVD placement and survival benefit. Literature survey reveals varying mortality rate between 31% at 7 days to 59% at 1 year. There is emerging concern of intracranial infections during EVD insertion or maintenance phase now-a-days given the increasing number of hospital acquired infections. The aim of this study was to analyze the indications of EVD, incidences of intracranial infections, mortality at 30 days and neurologic outcome. Methods: It was a prospective observational study conducted over 6 mo in 30 patients. Patients eligible for EVD as decided and performed by neurosurgery team were enrolled. Mortality at 30 days, change in Glasgow coma scale (GCS) at 72 hr and intracranial infections were studied. Mannitol, ventilation and other neuroprotective measures were instituted as per protocol. Results: The commonest indication for EVD placement was intracranial bleed (25/30, 83.33%), hydrocephalus (5/30,10%),infarction (2/30,6.66%). Ganglio-thalamo-limbic with intraventricular extension (IVE) was present in 21 out of 25 cases of intracranial haemorrhages (ICH).There were 18 males and 12 female patients. Average age of the patients was 64.68 yr.The average days of EVD was 6.16 days (2 days to 40 days). Mortality rate was 40% at 30 days (12/ 30) and 16 cases (53.33%) survived beyond 30 days. Two cases were lost to follow up. There was improvement in GCS (>2) in 8/30 cases (26.66%).Direct or indirect evidence of infection was found in 26.66% cases (8/30). Conclusions: Intracranial haemorrhage is the commonest indication for external ventricular drainage. Mortality rate at 30 days remains high at 40% and there is no significant improvement in GCS with insertion of external ventricular drain at 72 hr. Secondary intracranial infections remain a significant concern. Randomized controlled trial is necessary to delineate the role of EVD in such intracranial pathologies.

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INCIDENCE OF CARDIAC DYSFUNCTION IN PATIENTS WITH TRAUMATIC BRAIN INJURY
Chakradhar Venkata, Cheikhd OuldEhmane, Tariq Omer, Yashawi Belvadi, Jan Kasal

Learning Objectives: Cardiac complications after an acute neurologic injury are common and reported after aneurysmal subarachnoid hemorrhage and ischemic stroke. However, the incidence of cardiac dysfunction after traumatic brain injury (TBI) in non-selected patients has not been well studied. We describe the incidence of cardiac dysfunction and its association with clinical outcomes in patients admitted to ICU with TBI. Methods: This is a prospective cohort study of consecutive adult patients with TBI, admitted to the neuro-trauma ICU in level 1 trauma center. Focused echocardiograms were performed by study investigators experienced in image acquisition. The findings were confirmed by a staff physician who is a National Board of Echocardiography Testamur. Data were summarized as percentages for categorical variables, and means with standard deviations (SD), or median with 25% to 75% interquartile range (IQR) for continuous variables. We used chi-square, Fisher's exact and Student's tests to compare differences

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between groups. Results: 35 patients were enrolled through the first four mo of study (August–November, 2014), of whom 21 (60%) were men. Mean (SD) age was 48.2 (23) yr. Fourteen patients (40%) had severe TBI and twenty (57%) had mild TBI. Mean pre-hospital GCS was 10.4 and mean APACHE III score was 42.5. Five (14%) had history of coronary artery disease, and none had pre-existing heart failure. Five patients (14%) developed cardiac dysfunction after TBI. Three patients had mild reduction in the left ventricular ejection fraction (LVEF) (45–54%), and two had moderately reduced LVEF (30–44%). Regional wall motion abnormalities were identified in three patients. There were no statistically significant differences in duration of mechanical ventilation, hospital and ICU length of stay, and mortality between patients who developed cardiac dysfunction compared to patients who did not develop cardiac dysfunction, but comparison was limited by small sample size. Conclusions: Cardiac dysfunction occurs after a TBI but the incidence appears to be lower than the published literature.

**541 RISK OF RESISTANT MICROORGANISMS WITH PROLONGED ANTIBIOTIC PROPHYLAXIS FOR INTRACRANIAL DEVICES**

Stephanie Chauv, Gabriel Fontaine, Quang Hoang, Courtney McKinney, Margaret Baldwin, Whitney Buckel, Paul Wohlt

**Learning Objectives:** Intracranial pressure monitoring devices and drains (ICPD) may be used in patients with traumatic brain injury (TBI) and other neurological illnesses. Use of systemic antibiotic prophylaxis beyond 24 hr of device placement has yet to demonstrate a strong benefit and may be associated with increased risk of microbial resistance. The primary objective of the study was to determine the impact of prolonged systemic antibiotic prophylaxis in patients with ICPD on the growth of resistant microorganisms and *Clostridium difficile*. Methods: This retrospective, observational cohort study included patients admitted to ICUs at a large tertiary teaching hospital with TBI or other neurologic injuries from October 2012 through September 2014. Patients with neurologic injury who received ICPD and antibiotic prophylaxis for at least 72 hr were compared to patients with similar neurologic injuries who received neither ICPD nor associated antibiotic. Results: Evaluable patients in the study (n=116) and control (n=557) arms had mean APACHE II scores of 17.7 ± 9.2 and 15.1 ± 10.6 with 53.4% and 24.6% requiring craniotomy, respectively. Mean ICPD duration was 9.9 days in the study cohort with 73% of patients receiving cefuroxime for prophylaxis. Patients with ICPD on prolonged systemic antibiotic prophylaxis had a higher absolute incidence of multidrug resistant organisms (15.5% vs 4.1%; odds ratio 1.93, 95% CI 0.89–4.03, p=0.078). C. difficile incidence was similar between groups (2.6% vs 2.0%; odds ratio 1.45, 95% CI 0.35–6.12, p=0.61). Conclusions: We found a higher absolute incidence of multidrug resistant organisms in patients receiving prolonged antibiotic prophylaxis with ICPD compared to controls, but similar incidence of *C. difficile*. Lack of data supporting prolonged antibiotic prophylaxis for ICPD and the risk of nosocomial infections with resistant organisms in critically ill patients encourages limiting prophylaxis to a short course of perioperative antibiotics.

**542 SEVERE ALCOHOL WITHDRAWAL SYNDROME: DOES GENDER MATTER?**

Tahereh Emami, Tracy Cooper, Angelena Lopez, Francisco Canales, Jessica Coars, Richard Carlson

**Learning Objectives:** Severe or complicated Alcohol Withdrawal Syndrome (AWS) has been well characterized for males, but little data exists regarding demographics, course and complications of females. We reviewed patients with AWS to assess gender differences. Methods: All adult admissions were reviewed with primary or secondary diagnoses of AWS from 2010 through 2014 and compared results for females to a matched cohort of males from 2005–2010. Results: There were 1500 admissions; 1404 males and 96 females. From the historical cohort mean age of males was 45.8 yr (range 23–73) vs 45.6 yr for females (range 21–67, p=ns). Males had a 4.94 length of stay (LOS) vs 5.71 (2–24 range) for females (p<0.05). ICU admission was required for 31.2% of males vs 16.6% (p<0.05) for females. Respiratory failure with mechanical ventilation (MV) developed in 52.9% males vs 43% (p=ns) females. Pneumonia developed in 50.6% males vs 51% (p=0.05) females. For ward patients LOS was similar; 5.7 d for males and 5.4d for females (p=ns). Comorbid conditions were similar, including: alcoholic or viral hepatitis, seizures, sepis, and pancreatitis. There were no female deaths vs 1% males. Sedation therapy was similar; for ward patients lower doses of scheduled benzodiazepines (BZD) were utilized for females, although ICU patients received similar regimens of BZD plus adjunctive therapy with propofol or dexmedetomidine. Conclusions: Although socio-economic and cultural differences may account for gender differences in alcohol abuse, females have fewer hospital and ICU admissions and less severe or complicated AWS. The rate of ICU admission was less, with lower prevalence of pneumonia and MV. Similar comorbid conditions were seen. Female ward patients had similar LOS but lower benzodiazepine requirements. Females appear to have less severe AWS and fewer instances of severe or complicated AWS than males.

**543 INFRATENTORIAL STROKES CONVEY A HIGHER REINTUBATION RATE THAN SUPRATENTORIAL STROKES**

Pravin George, Charles Siegel, Paul Nyquist

**Learning Objectives:** Patients with acute neurologic injury are often intubated for airway protection in the critical care setting. The extubation of acute ischemic stroke (AIS) patients in particular with minor or absent primary pulmonary disease remains a challenge. Little clinical or imaging data currently exists to predict extubation success in this population. Methods: We conducted a retrospective review of all patients requiring intubation admitted to our neurosciences critical care unit over a 5-year period. From that cohort, we analyzed all AIS patients who were non-termintubated. A subset of those patients that needed to be re-intubated within 24, 48, 72 hr and 1 week was identified. We age and gender matched a 2:1 control group of stroke patients who underwent successful extubation to those who were reintubated and then analyzed the location of strokes, supratentorial versus infratentorial, in both populations. Results: A total of 1,265 patients required intubation due to a primary neurologic injury during the study period based on clinician report. Of those patients, 235 had an AIS and only 17 (7.2%) required reintubation within 1 week. Of the 51 total patients analyzed (17 reintubated, 34 control) 23 were female. The mean age was 63.1 (SD +/-14.2) for the reintubated patients and 62.4 (SD +/-14.8) for the control. Eighteen patients from this cohort suffered infratentorial strokes while 33 patients experienced supratentorial strokes. There were no significant differences in the location of stroke with relation to gender (p=0.049) or to age (p=0.105). Twelve of the 18 patients (66.67%) with infratentorial stroke required reintubation compared to 5 of the 33 (15.15%) with supratentorial lesions (p = 0.001). Conclusions: This is a preliminary, retrospective study to assess brain regions that may lead to unsuccessful extubation. Our study suggests that patients with infratentorial AIS who are extubated have a much higher rate of reintubation than those with supratentorial stroke. Further study on more specific brain regions leading to higher reintubation rates is warranted.

**544 ANTI CONVULSIVE EFFECT OF DEXMEDETOMIDINE**

Reza Hashemian, Mehrdad Fazii, Sephr Roodzard, Ehsan Firoozoi, Saeed Mohammad Taheri, Parsa Aziz Jalali, Sina Asadi

**Learning Objectives:** Dexmedetomidine is a highly selectiveα2-agonist with sedative and analgesic properties. Regarding to plenty of resistant epilepsy cases, exploring new drugs for management of this condition seems inevitable. The purpose of this study is to determine if Dexmedetomidine can possess a role in exploring new drugs for management of this condition seems inevitable. The purpose of this study is to determine if Dexmedetomidine can possess a role in exploring new drugs for management of this condition seems inevitable. Anti convulsive effects of Dexmedetomidine on seizure control. Male Suri mice were divided in groups with 10 subcutaneous (s.c.) injections of Dexmedetomidine (DEX, 100 and 400 µg/kg) or Valproate sodium (VAL, 100, 200 and 400 mg/kg) thirty min before seizure induction with maximal electroshock and ED50 of VAL was calculated. Then effect of administrating these two doses of DEX concomitant with VAL was assessed through calculating two new ED50 values for VAL. Ultimately with application of Yohimbine (YOH, 2 and 4 mg/kg), thirty min before administration of DEX-VAL combination, role of α2-adrenoceptors.

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in anti convulsive effect of DEX was evaluated. Results: DEX alone did not induce any seizure protection effect, but ED50 of VAL diminished significantly from 1.8 mg/kg to 0.8 in the presence of DEX 400 µg/kg, and to 0.39 in combination with DEX 100 µg/kg. YOH in doses of 2 and 4 mg/kg, decreased seizure protection of DEX 100 µg/kg + VAL 250 mg/kg from 100% to 70% and 30%. Similarly, these doses reduced anti convulsive effect of DEX 400 µg/kg + VAL 100 mg/kg from 30% to 20% and 10%, respectively. Conclusions: DEX can synergistically potentiate anti convulsive effect of VAL through a mechanism that may involve α2-adrenoceptors.

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EFFECTS OF VITAMIN D DEFICIENCY IN ANEURYSMAL SUBARACHNOID HEMORRHAGE
Yarelis Alvarado, Alexandra Perez, Gloria Rodriguez-Vega

Learning Objectives: Vitamin D deficiency has been associated with increased risk and adverse outcomes in many clinical settings including cardiovascular disease, stroke, and critically ill patients. Therefore we aimed to determine whether vitamin D deficiency (<20ng/mL) had any effect in aneurysmal subarachnoid hemorrhage (aSAH) outcomes including mortality, vasospasm, hydrocephalus, and hospital acquired infections. Methods: A retrospective record review was conducted in a tertiary community hospital in Puerto Rico. All records of adult patients admitted to the neurosurgical intensive care unit (NICU) with a diagnosis of aSAH from January 2013 to July 2014 were reviewed. Patients with a 25-hydroxyvitamin-D level drawn during admission were included in the analysis. Results: A total of 40 patients were admitted with a diagnosis of aSAH during the study period and 33 met the inclusion criteria. Overall, 81% (n=27) of patients were vitamin D deficient or insufficient (<30ng/mL). Subjects were grouped into those with vitamin D deficiency (n=13, 39%) and those without (n=20, 61%). Except for a larger prevalence of a history of coronary artery disease, all other demographic, and baseline clinical parameters were the same across groups. No significant difference in hospital mortality was observed between groups (2 (15.4%) vs 5 (25%) p = 0.676). The rate of vasospasm and vasopressor use was also similar (p = 0.95 for both). Although there was an increased use of intra-arterial nicardipine in patients with vitamin D deficiency it was not statistically different across groups (p=0.446). No difference was found in the rates of hydrocephalus requiring external ventricular drain or infections (p=0.46 and p=0.56, respectively). Conclusions: There is a high prevalence of vitamin D deficiency and insufficiency among patients admitted with a diagnosis of aSAH. Despite this no difference in clinical outcomes was observed in patients when compared by vitamin D group. Further studies with a larger sample size should be conducted to assess any potential effects of vitamin D levels in this patient population.

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RETROSPECTIVE COMPARISON OF ALPHA-2 AGONISTS FOR ALCOHOL WITHDRAWAL IN THE MICU
Christopher Leong, Erik Rachwalksi, Bryan Lizza, Craig Cooper

Learning Objectives: Benzodiazepines are commonly regarded as first line therapy for alcohol withdrawal syndrome. Patients requiring ICU admission often are not controlled on benzodiazepines alone, and need adjunctive therapy. The purpose of this study is to compare the benzodiazepine sparing effects two alpha-2 agonists, clonidine and dexmedetomidine. Methods: This study was a single center retrospective cohort study that examined 23 patients admitted to the ICU for AWS that received dexmedetomidine (n=11) or clonidine (n=12) as adjunctive therapy to benzodiazepines at an academic medical center. Results: Dexmedetomidine and clonidine began at a median (IQR) of 14 hr (3.5, 34) and 16 hr (9–39), respectively, after admission to the ICU for AWS. There was an observed median benzodiazepine reduction in the dexmedetomidine group of 2.5mg (-117,103) and 31 (-9.99) in the clonidine group (p=0.99). Conclusions: Both dexmedetomidine and clonidine showed a numeric decrease in benzodiazepine requirements in the 24 hr after their initiation. No difference in benzodiazepine reduction was seen between the two alpha-2 actions, suggesting that clonidine is a viable alternative to dexmedetomidine as adjunctive therapy to benzodiazepines for AWS.

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ISCHEMIC STROKE IN CRITICALLY ILL PATIENTS WITH MALIGNANCY
Jeong-Am Ryu, Oh Young Bang, Jeong Hoon Yang, Gee Young Suh, Joongbum Cho, Chi Ryang Chung, Chi-Min Park, Kyeongman Jeon

Learning Objectives: Cerebrovascular disease may occur commonly in cancer patients. Systemic cancer is related to ischemic stroke (IS) via various mechanisms. We investigated the clinical characteristics and predictors of IS in critically ill cancer patients when underwent brain magnetic resonance imaging (MRI) for acute neurologic symptoms or signs. Methods: All consecutive patients were retrospectively evaluated who underwent brain MRI for suspicion of IS with acute abnormal neurologic symptoms or signs developed in the oncology medical ICU of Samsung Medical Center from March 2010 to February 2014. A multiple logistic regression analysis was used to identify independent predictors of IS. Results: A total of the 88 patients who underwent brain MRI for suspicion of IS, 43 (49%) patients had a final diagnosis of IS. Multiple lesions were more common (41%) than single lesion (8%). Conventional stroke mechanism (CSM) were shown in 16 (37%) patients, including cardioembolism (n = 6), large-vessel atherosclerosis (n = 2), small-vessel occlusion (n = 2), and others (n = 6). However, IS without CSM (n = 27, 63%) was more common than IS with CSM. In addition, brain metastases were newly diagnosed in 7 (8%) patients. Thrombotic events were more common in IS group than in non-IS group (P = 0.028). However, patients finally diagnosed with IS had more hemiparesis symptom at the time of suspicion of IS (P = 0.001). Non-IS group had more seizure (P = 0.001). After adjusting for potential confounding factors, hemiparesis (adjusted OR 5.339; 95% CI, 1.521–19.163) was one of associative factors of IS in patients who underwent brain MRI for suspicion of IS in the oncology medical ICU.

Conclusions: Approximately half of critically ill cancer patients diagnosed with IS when underwent brain MRI scanning for suspicion of IS during their ICU stay. Although, it is generally difficult to differentiate between IS and non-IS based on symptom or sign alone, caution and careful examination are required when acute neurologic deficits are observed in critically ill cancer patients.

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EVALUATION OF OUTCOMES ASSOCIATED WITH VASOPRESSIN USE IN ANEURYSMAL SUBARACHNOID HEMORRHAGE
Kyle Schmidt, Alycia Navario, Lisa Forsyth

Learning Objectives: Cerebral vasospasm following aneurysmal subarachnoid hemorrhage (aSAH) remains a major cause of morbidity and mortality. Delayed cerebral ischemia associated with cerebral vasospasm may account for up to 50% of the deaths in patients who survive the initial hemorrhagic period. Various animal studies suggest vasopressin is involved in the development of cerebral vasospasm and brain edema. The purpose of this study was to investigate the effects and outcomes associated with the addition of vasopressin to triple-H therapy in patients with aSAH. Methods: Retrospective chart review of adult inpatients with confirmed aSAH. Hunt- Hess scores and age were utilized to match patients administered vasopressin in addition to standard therapy to patients that received standard therapy alone. Data were collected to characterize patient demographics, vasospasm, vasopressor use, hospital and ICU length of stay (LOS), in-hospital all-cause mortality, hemodynamic response, intracranial pressure (ICP) and serum sodium. The primary outcome was cerebral vasospasm incidence and duration. Secondary outcomes included LOS, mortality, hemodynamic response and impact on ICP and serum sodium. Results: Nine patients administered vasopressin that met inclusion and exclusion criteria were matched to patients that received standard therapy. Vasopressin was documented in 67% of the vasopressin group and 22% given standard therapy (p=0.058), but the duration was not significantly different (vasopressin 9.4 ± 5.4 days vs standard 8.3 ± 0.4 days, p=0.65). In the vasopressin group, median MAP did not change when vasopressin was added to other vasopressors. Measured ICP and sodium were similar between groups. The vasopressin group trended toward a longer hospital LOS (33.1 ± 18.5 days vs 19.5 ± 9.5 days, p=0.07) and ICU LOS (25.6 ± 12.4 vs 14.6 ± 7.0 days, p=0.08). There were no in-hospital mortalities. Conclusions: The incidence of vasospasm trended higher in the vasopressin group without a difference in duration. Vasopressin did not significantly alter the secondary outcomes but may be associated with longer hospital and ICU LOS.
DOES THE NUMBER OF COMORBIDITIES BEFORE ICU ADMISSION INFLUENCE QUALITY OF LIFE AFTER ICU? Charlotte Soulby, John Kinsella, Tara Quasim, Martin Shaw, Alex Warren, Joanne McPeake

Learning Objectives: Quality of life (QOL) deteriorates following intensive care and is known to be influenced by comorbidity. Sleep disturbance in survivors of critical illness is common but its association with QOL remains underexplored.

This study aims to determine the long term QOL in critical illness survivors in the UK, assess association with comorbidities and identify predictive elements of reduced QOL and sleep disturbance. Methods: The EuroQol 5D (EQ-5D) and Insomnia Severity Index (ISI), questionnaires to assess health-related quality of life and insomnia, were sent to 289 patients admitted to the ICU at the Glasgow Royal Infirmary between July 2012 and December 2013. Clinical and demographic variables were recorded during ICU stay. Results: 101 individuals responded (35%), with a median follow up time from ICU discharge of 862 (557–1092) days. Median health utility score (HUS) was 0.656 (IQR 0.082 to 0.7960), with 16 survivors found to have a negative HUS, indicating a QOL worse than death. 14 patients had 3 or more comorbidities on ICU admission. There was a significant association between HUS and number of comorbidities (p=0.03) and HUS and insomnia (p=<0.001, R^2=0.48). Lower QOL post ICU was associated with preexisting diagnoses of mental health problems (p=0.013), peripheral vascular disease (p=0.035) and cerebrovascular disease (p=0.03). Requirement for renal replacement therapy in ICU was associated with lower QOL post ICU (0.69 vs 0.05 p=0.01). There was no significant relationship found with vasopressor requirement or length of ventilatory support. There was no association between ICU or hospital length of stay and QOL. Conclusions: QOL following ICU stay is associated with many factors, including preexisting comorbidities and organ support during admission. Furthermore there is an association between insomnia following ICU and QOL.

Further research will necessitate exploration of QOL pre and post ICU and interventions to improve QOL post ICU are required.

PATIENTS RECALL OF BEING AWAKE DURING MECHANICAL VENTILATION IN THE ICU Eva Læker-Nielsen, Helle Hansen, Palle Toft, Ingrid Egerod

Learning Objectives: Currently there is a trend towards lighter sedation of critically ill patients in need of mechanical ventilation (MV). The feasibility of a strategy of no sedation has been demonstrated leading to shorter duration of MV and a decrease in time in the ICU and in hospital length of stay. One study showed that patients were assessed with a score closer to zero on the Richmond Agitation and Sedation Scale (RASS) following the no sedation protocol, compared with sedation with daily interruptions. More knowledge is needed about patients’ recall of their ICU stay, being awake during MV in the ICU. Methods: Patients were recruited from two ICU units at a University Hospital in Denmark where the no-sedation protocol is implemented in practice. The patients should be in need of MV for at least 3 days with a RASS score of zero the majority of the time on MV. Patients were interviewed during the first week after discharge from the ICU at the hospital ward using the ICU memory tool. The second interview was a semi-structured interview and took place in the patient’s own home 2 – 4 mo after discharge from the ICU. Data was analyzed using qualitative thematic description. Results: 11 surgical and nine medical patients participated. Age 50 – 78 yr (median 66 yr), 3 – 70 days on MV (median 10 days) and Apache II score 18 – 46 (median 28). Eight patients had delirium with at least one positive score using the Confusion Assessment Method for the ICU (CAM-ICU positive). All patients remembered being in the ICU and had factual and emotional memories from their ICU stay. 16 patients recalled delusional memories, mostly hallucinations and dreams. Five themes emerged from the analysis: a) Drifting in and out of reality b) An altered body c) Disrupted time d) Feeling vulnerable e) Ambiguous relations. Conclusions: Following the no sedation protocol and having a RASS score of zero during the majority of the time on MV, may imply factual recall of the ICU stay. However, despite assessed alert and calm, being severely ill in the ICU may at the same time result in altered and ambiguous recall from the ICU.
NUTRIC VS. NUTRITIONAL RISK SCREENING 2002 AS PREDICTORS OF OUTCOMES IN CRITICALLY ILL PATIENTS

Cecilia Canales, Caitlin McCarthy, Daniel Yeh, Nalin Chokengamwong, Donna Belcher, Anna Nakayama, Sadeq Quraishi

Learning Objectives: The Nutrition Risk Screening (NRS) 2002 is most commonly used to identify patients who may benefit from nutritional support. Recently, the NUTRIC was developed to stratify ICU patients at risk for malnutrition and undesirable outcomes. However, it is unclear whether the NUTRIC offers any advantages over the NRS2002. Therefore, our goal was to compare the NUTRIC to NRS2002 for important clinical outcomes in a mixed cohort of critically ill patients.

Methods: We performed a retrospective analysis of an on-going study of ICU nutrition. To investigate the association of NUTRIC/NRS2002 with: 1) 30-day ventilator free days (VFD), we performed a Poisson regression analysis, while controlling for age, sex, race, body mass index (BMI), and hospital length of stay (LOS); 2) ICU LOS, we performed a Poisson regression analysis, while controlling for age, sex, race, BMI, and VFD; 3) hospital LOS, we performed a Poisson regression analysis, while controlling for age, sex, race, BMI, and hospital LOS.

Results: 312 adults from surgical and medical ICUs comprised the analytic cohort. 1) NUTRIC (IRR 0.95; 95%CI 0.94–0.97) but not NRS2002 was associated with VFD; 2) Neither was associated with ICU LOS; 3) NUTRIC (IRR 1.03; 95% CI 1.02–1.05) but not NRS2002 was associated with hospital LOS; and 4) NUTRIC (OR 1.34: 95% CI 1.15–1.65) but not NRS2002 was associated with 90-day mortality. The AUC for NUTRIC was greater than NRS2002 for prediction of 90-day mortality (0.71: 95% CI 0.69–0.72 vs. 0.63: 95% CI 0.60–0.64, p=0.03).

Conclusions: Our data suggest that NUTRIC is superior to NRS2002 for assessing risk of malnutrition, morbidity, and mortality in ICU patients. Future studies are needed to assess whether nutrition support based on NUTRIC scores can improve clinical outcomes in critically ill patients.

FOOTPRINTS: SHARING THE FOOTPRINTS OF LIFE IN THE ICU

Neala Hoad, Tammy French, Melissa Shears, Lily Waugh, Mark Soth, Olana Lovell, Yung Timothy, Deborah Cook

Learning Objectives: Clinicians in the ICU may inadvertently forget the ‘lives lived’ of their patients before hospitalization, and may cease to view patients as people in the technical ICU setting. The objectives of the project are a) to facilitate more holistic patient centered care, b) to inform clinical encounters, and c) create deeper connections among patients, families and clinicians.

Methods: Phase 1: We conducted 20 semi-structured interviews with ICU staff to generate items about patients’ lives that would reflect their individual life journey and experiences which we used to create the Footprints form and to seek input on operationalizing the Footprints project. Phase 2: We enrolled 16 patients to pilot Footprints, using an interviewer or self-administered questionnaire. Phase 3: We enrolled 20 patients, seeking family feedback in semi-structured interviews.

Results: Interviews included nursing (8), medicine (2), respiratory therapy (5), physiotherapy (2), spiritual care (1), trainee (1) and research staff perspectives (1). The favored approach was completing a paper based form, alerting the ICU team to its completion, placing the form on the front of the medical chart, and selecting items to include on the whiteboard in the patient’s room along with a photo. Phase 2: 16 patients aged 48–89 (mean 67.1 yr) with medical (11) or surgical (5) diagnoses were approached and 15 families (participation rate of 93.8%) completed the form (7 interviewer administered, 8 self administered). Whiteboards included today’s date, preferred name, daily caregivers, aids at home, life milestones, important issues to share and a multidirectional message centre for families, friends and clinicians. Phase 3: Preliminary results from families suggest that Footprints exemplifies individualized care and promotes humanism in practice.

Conclusions: This mixed-methods project to develop and refine the Footprints initiative has helped to share information about patients before and beyond their critical illness. Future work will evaluate whether Footprints influenced experiences of family and staff satisfaction or communication.

DEVELOPMENT OF A DECISION AID FOR CPR WITH USER-CENTERED DESIGN AND A WIKI PLATFORM FOR PROTOTYPING

Ariane Plaisance, Patrick Archambault

Learning Objectives: To assess critical care specialists and ICU patients’ needs for better evidence and value based decision making prior to the development of a cardiopulmonary resuscitation (CPR) decision aid adjustable to patients’ characteristics.

Methods: This study took place in the ICU at the Hotel de Levis (Canada). We conducted three weeks of observation of patients, family members and intensivists discussions about advance care planning. We also employed user centered design and rapid prototyping to explore different ways to explain the risks and benefits of CPR to patients. We also explored different ways to elicit patients’ values and preferences.

Results: 9 patients about the acceptability and relevance of the information presented. Discussions between intensivists and patients were recorded and a standardized observation grid was used to collect patients’ comments and sociodemographic data. Field notes, verbatim and content extracted from the observation grids were content analyzed. Our observations and rapid prototyping will inform the adaptation of different existing decision aids in various formats (paper, video, web). We will house the different versions of our decision aid on a wiki that will enable future adjustments of our tool to various contexts and patients characteristics.

Results: Our qualitative content analysis revealed that patients and their family members are most concerned about the risks of losing functional autonomy following successful CPR. However, they lack knowledge about the purpose of CPR, the survival rate and functional outcomes after CPR. We also observed a lag between the level of care documented in the patient’s chart and their values, preferences and medical condition.

Conclusions: Basic understanding of what is a cardiac arrest, what is CPR and the risks and benefits of CPR is needed in order to reach a free and informed concern. Use of different formats of decision aid could improve advance care planning communication between intensivists and patients.

IMPACT OF PICU ADMISSION ON SCHOOL PERFORMANCE AND HEALTH RELATED QUALITY OF LIFE

Kathleen Kastner, Masha Korcherginsky, Karla Garcia-Huerta, Christopher Matson, Neethi Pinto, Michael Msall

Learning Objectives: For children and their families, PICU admission can be one of the most stressful experiences in their lives. It has been shown that children who have been admitted to the PICU have lower health related quality of life (HRQOL) scores than controls. One potential mediator is the impact of a PICU admission on school success. The purpose of our study was to examine how community supports from pediatricians and schools influence HRQOL and school success after critical illness.

Methods: 33 patients who were admitted to the PICU at Comer Children’s Hospital at the University of Chicago were enrolled. At baseline and 3 mo after enrollment, parents completed Pediatric Quality of Life (PedsQL) survey and brief questionnaires about school attendance/performance and the support they received after discharge. 21 patients completed 3-month follow up.

Results: On average, PedsQL scores decreased -1.7 from baseline at 3 month follow up with wide variability (-6.9 to +6.7). Notably, 67% of parents reported that their pediatrician did not ask about missed school and 29% felt their child’s grades had worsened since admission. 20% felt that their child’s school did not provide adequate services to help their child catch up. We found a trend towards significance (p=0.08) for the relationship between whether parents felt their child’s grades had worsened since admission and how they felt their child performed compared to peers.

Conclusions: There are missed opportunities for care coordination and educational support after critical illness. The transition back to school is challenging for some children, as evidenced in this small sample by parents who reported inadequate support from the school after admission and a decline in their child’s school performance. And considering that the majority of respondents reported that their pediatrician did not ask about school concerns following admission, providers may be incorrectly assuming that the transition is not a problem. Additional studies are needed.
EXPERIENCES OF ICU SURVIVORS WITH SELF-MANAGING TREATMENTS AND SYMPTOMS AT HOME
Sue Lasiter, Rebecca Bartlett Ellis

Learning Objectives: Five million Americans receive life-saving interventions and procedures annually in ICUs. Although necessary, these treatments cause physical and psychological stress predisposing patients to subsequent physical, cognitive and psychological symptoms that may last yr. After hospital discharge, patients who have survived ICU stays must self-manage symptoms and treatments at home where they receive little systematic, structured support from the current healthcare system. For ICU survivors, little is known about self-management of post-ICU symptoms and treatments. Methods: A descriptive phenomenological method was used to explore essential components, common features, and personal-social contextual elements needed for self-management in everyday life. Interviews were in-person, at home, approximately two weeks after hospital discharge and via telephone 2 weeks to 3 mo after the first interview. Interview data were analyzed using Porter’s seven-step analysis process. Results: Fifteen ICU survivors, age ≥ 40 yr, who were mechanically ventilated for ≥ 24 hr and discharged to home with at least one medication were interviewed. Participants described their actions, intentions, and perceptions of self-managing post-ICU symptoms and treatments. Essential components of self-managing symptoms were 1) creating a management system that works for me, 2) figuring out how to fix things on my own, 3) deciding when to self-manage and when to go to the hospital, and 4) making the choice to do my treatments. Common experiences were 1) always being ready for sudden onset of symptoms, 2) episodes of symptoms distress, and 3) wishing to get back to how things were before. Common personal-social elements were 1) depending on others to help configure treatments and 2) to come quickly if I need to go to the hospital now. Conclusion: Symptoms and treatments have a significant impact on patients’ everyday lives and must be managed. Providers can learn from ICU survivors who created unique processes for self-managing their symptoms and treatments and must provide support for those who struggle.

PATIENT AND FAMILY MEMBER RESEARCHERS IN THE ICU
Henry Stelfox, Marilyn Gill, Emily McKenzie, Peter Osland, Debbie Boulton, Donna Oswell, Svetaula Shkadov, Sean Bagshaw

Learning Objectives: Engaging patients and family members as partners in research increases the relevance of study results. Efforts to date are framed and initiated from a provider perspective and may result in lost opportunities. We used a novel methodology that trains former patients and family members as researchers to understand and describe the experiences of patients admitted to the ICU and their families. Methods: We engaged 4 former patients and family members trained in qualitative research methods to conduct and analyze semi-structured focus groups and interviews with patients (n=11) and family members of surviving (n=14) and deceased (n=7) patients recruited from 13 ICUs. Focus groups and interviews were recorded, transcribed and analyzed using conventional content analysis. Data collection continued until thematic saturation was reached. All aspects of the study were directed and performed by former patients and family members. A separate blinded qualitative research team conducted independent analyses. Results: Participants described 3 phases in the patient and family “ICU journey”: admission to ICU, daily care in the ICU, and post-ICU experience. Admission to ICU was characterized by family shock and disorientation and with families needing the presence and support of a provider. Participants identified interactions with care team and comfort and trust in the ICU as integral for a community of caring in daily care. The post-ICU experience was characterized by the challenges of the transition from ICU to a hospital ward and long-term effects of critical illness. Participants provided 5 suggestions for improvement: provide a dedicated family navigator, increase provider awareness of the fragility of family trust, improve provider communication skills, improve the transition from ICU to a hospital ward, and inform patients about the long-term effects of critical illness. Analyses by independent blinded qualitative researchers identified similar themes. Conclusions: Training patients and their family members to direct and conduct research is a feasible model for improving patient and family centered care.

STRESS IN FAMILY MEMBERS OF ICU PATIENTS
Sarah Beasley, Samuel Brown, Ramona Hopkins, Emily Wilson, Jorie Butler, Kathryn Kuntz, James Orme, Eliot Hirsiberg

Learning Objectives: Family members of ICU patients experience acute and prolonged stress that may result in persistent psychological distress. Family members with a history of anxiety may have higher levels of stress during a loved one’s ICU admission. Methods: Family members of ICU patients with APACHE II >15 were enrolled within 24 hr of ICU admission. Demographic data, stress level (measured on a visual analog scale from 0–100) and the perceived stress scale (PSS-4), and reasons for stress were recorded. Stress in family members with a history of anxiety was compared to individuals without anxiety using rank sum test. Linear regression assessed the relationship between stress level and severity of illness, patient age, and ICU diagnosis. Results: We studied 50 ICU family members. 76% of family members lived with the patient; 58% were the spouse and 26% were an adult child. Participants reported a median stress level of 55 (IQR 40–74) and a median PSS-4 of 3.5 (IQR 2.0–7.0). Degree of stress was not associated with severity of illness, patient age, or ICU diagnosis. 24% of family members reported a history of anxiety and they reported higher stress on the PSS-4 (7.0 vs 2.5, p<0.009). Most participants reported stress was due to: concern for the patient, the unexpectedness of the ICU admission, and the inability to communicate with the patient. Stress as a result of lack of sleep, needing to coordinate with other family members, and missing work was also common. Conclusions: Family members feel stress when they have a critically ill loved one in the ICU. While clinicians might expect that stress would be associated with diagnosis or severity of illness, families do not report an association with these factors. Family members with a history of anxiety have significantly higher stress levels. This observation may prove useful to attempts to tailor family support during an ICU admission.

CARER STRAIN IN CAREGIVERS OF ICU SURVIVORS
Joanne McPeake, Martin Shaw, Helen Devine, Pamela MacTavish, Malcolm Daniel, John Kinsella, Tara Quasim

Learning Objectives: There is an abundance of international literature demonstrating poor quality of life in ICU survivors following discharge home from hospital. The effect of this on the informal caregivers of ICU survivors is unclear. The purpose of this evaluation was to examine the prevalence of Carer Strain in this population. Methods: We ran an ICU rehabilitation course aimed at the working age population (16–64) who were ventilated for 72 hr or more. The aim of the course was to improve the health and wellbeing of patients and relatives. 36 family members attended the ICU rehabilitation course and were asked to complete a CSI questionnaire prior to attending the first session. This tool measures strain related to carer provision from the caregivers perspective. There are elements related to emotional adjustment, social issues, physical and financial strain. Each question is given one point. A score of seven or greater is the generally accepted cut off point for a high level of stress. Results: Carer Strain, as defined by a score of seven or greater on the CSI, was present in 19 (53%) caregivers, 16 (44%) caregivers required to make work adjustments and 14 (39%) stated that they had experienced financial burden during the critical illness stay and recovery period. 9 (25%) caregivers reported physical strain in their role as carer and 23 (64%) carers stated they had made emotional adjustments (due to for example, severe arguments) in their relationship. Poor quality of life in the patient was significantly associated with carer strain (median patient EQ SD, 0.60 vs. 0.082, p=0.006). Conclusions: In this evaluation of caregivers, caregivers of ICU survivors experienced financial strain, physical strain and had to make workplace adjustments during critical care recovery. Long term rehabilitation and care for ICU survivors should include the identification and assessment of vulnerable caregivers who may require support. Larger studies are required in this area to understand this problem more fully and to ensure that future rehabilitation programs for this cohort are both person and family centered.
ENGAGING AN ICU PATIENT AND FAMILY ADVISORY COUNCIL TO REDESIGN A PATIENT-ORIENTED WEBSITE
Thanh-Giang Vu, Priyanka Agarwal, Jayne McCullough, Angela Lipshtiz, Kathleen Turner, Wendy Anderson, Kevin Thornton, UCSF Critical Care Innovations Group

Learning Objectives: Patients and their families are inundated with information at the time of ICU admission. As part of a large quality improvement project (Emerge), we created a web-based educational resource for patients and families to help them better understand the ICU and empower them to be more engaged in their care. In order to optimize this resource, we sought feedback from a patient and family advisory council (PFAC). The process of using a PFAC to guide the development of such a resource has not been previously described.

Methods: After developing and publishing web-based, patient-oriented content based on previous research describing the information needs of patients and families in the ICU, we met with the 11-member adult ICU PFAC to review the website utilizing a user-experience focus group model. In a two-hour session, PFAC members provided feedback about the usability of the website while reflecting on their real-life experiences in the ICU. Member comments were analyzed to identify common themes and opportunities for improvement.

Results: Four key areas of improvement were identified: organization, content, layout, and voice. As a result, we made substantive changes to the site, including a reorganization that made patient experience the primary focus. We restructured content chronologically to match the ICU admission, ongoing treatment, and transition-out-of-ICU periods, and care partners became the site’s intended audience. New content also was developed to highlight practical information germane to a patient’s hospitalization, and the site’s tone was amended to address the true partner role parents and their family members have with providers in health care.

Conclusions: Inclusion of feedback from the PFAC via a user-experience focus group had a meaningful impact on our final website. We gained critical insights that would not have otherwise been implemented despite the website’s creation by a trans-disciplinary team of ICU clinicians. Our findings have significant implications for future development of health IT resources for patients and their care partners.

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RESILIENCE AND PSYCHOLOGICAL MORBIDITY IN PARENTS OF CRITICALLY ILL CHILDREN
Charles Rothchild, Laura Campbell, Karen Rychlik, Kelly Michelson

Learning Objectives: Research has shown elevated rates of depression, anxiety and post-traumatic stress (PTS) among parents following their child’s PICU stay. Resilience, one’s propensity to thrive through adversity, is correlated with depression, anxiety and PTS in several contexts. Parents with low resilience may be at increased risk of psychological morbidity. This study assesses the correlation between parental resilience at admission and psychological outcomes at discharge.

Methods: We surveyed parents of patients anticipated to be in the PICU at least 24 hr at admission and discharge. Admission surveys included the Connor-Davidson Resilience Scale (CD-RISC), scored from 0 (lowest) to 100 (highest). Discharge surveys included the PROMIS Short Forms (8a) for depression and anxiety and Impact of Event Scale-Revised (IES-R) for PTS symptoms. We performed Spearman correlations comparing resilience with depression, anxiety and PTS symptoms.

Results: Thirty one parents returned all surveys. The mean resilience score was 78.5 (SD=12.9), comparable to the general population. Mean t-scores for depression and anxiety were 49.4 (sd=7.7) and 53.4 (sd=9.6) respectively— which are also comparable to population means. Mean IES-R score was 15 (sd=13.7) corresponding to some symptoms of PTS. Resilience was negatively correlated with depression (r=−0.41, p=0.02). There was no significant correlation with anxiety (r=−0.28, p=0.11) or PTS (r=−0.12, p=0.53).

Conclusions: There was a significant correlation between parents’ resilience at admission and symptoms of depression at discharge. Symptoms of anxiety and PTS did not reach a statistically significant threshold. This work is limited by the small sample size and timing of surveys—PTS is better assessed after more time has passed from the acute stressor. Further study of the relationship between resilience and psychological morbidity in parents of critically ill children could elucidate how these factors relate over time, and whether interventions targeted at resilience-building could mitigate these adverse parental psychological outcomes.

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CULTURAL COMPETENCE IN ACUTE AND CRITICAL CARE MEDICINE: LITERATURE REVIEW AND RECOMMENDATIONS
Kevin Curwisk, Taru Dutt, Manasi Hulyalkar, Kumar Saurrottam, Patricia Erwin, Rahul Kashyap

Learning Objectives: Cultural competence among health care providers has consistently been linked to improved patient perceptions of care in long-term and primary care settings. The aim of this paper is to review the resources related to cultural competence in acute and critical care settings from multiple provider perspectives.

Methods: An online Databases search (Ovid Medline, EMBASE, EBSCO, CINAHL) from July 2005–June 2015 for English articles was executed. The search terms were used as: cross-cultural communication in medicine, clinical communication, cultural perceptions of healthcare, cultural competence, cultural sensitivity, transcultural care, cultural access to healthcare, cultural quality of care and diversity in medicine.

Results: A total of 1,268 articles were selected. Using inclusion criteria of acute/critical care and cultural competence, the following were excluded: 784 articles for not in acute/critical care, 125 articles unrelated to health, 105 articles not in the United States, and 244 for other reasons. A total of 10 articles were included in final analysis: 5 were literature reviews, 3 were case studies, 1 was prospective and 1 was interview-based study. A majority of the reviewed articles (80%) emphasized the nurse’s role in culturally competent care. Five key recommendations for improved cultural competence were emphasized in a majority of the articles: (1) involve the family throughout the process of care; (2) use an interpreter for accurate interpretation of illness and pain; (3) maintain a culturally diverse team of providers; (4) be clear in communication of procedures and diagnosis; (5) acknowledge the cultural diversity. Future research examining the significance of cultural competence from a variety of provider perspectives within acute and critical care is recommended.

Conclusions: Even in acute and critical care settings, patient perceptions of care improve with greater provider cultural competence. Cultural competence was shown to have significant impact in each discipline explored within acute and critical care.
EXPLORING THE ROLE OF RELIGION AND SPIRITUALITY WITH PARENTS AND STAFF ON A UK PICU: A QUALITATIVE STUDY
Tasmeen Modan, James Linthicum, Joe Brierley

Learning Objectives: For many families and some staff Religion and Spiritual- ity (R/S) is an important aspect of a child’s critical illness. Holistic care requires adaptation too, and support of, the role of R/S on PICU. Faith-based beliefs offer additional facets to critical care, particularly difficult treatment decisions – but the role of R/S support e.g. chaplaincy is little explored. This study was conducted to determine the role of R/S for parents and staff in a UK tertiary-PICU with integrated multi-faith chaplaincy, including differences in views.

Methods: Qualitative interview-based study: (i) families recently discharged from PICU; (ii) PICU staff. In-depth semi-structured interviews to encourage participant narrative with prompts: Religious affiliation, changes/affirmations in faith during PICU stay; experience of hospital chaplainry and other healthcare staff; memorable occasions where R/S played integral role (positive or negative); staff attitudes towards religion & ability to discuss topic. Inter- views recorded, transcribed and thematically analyzed using Braun & Clark’s framework: Data immersion, followed by coding and subsequent allocation to appropriate themes.

Results: 6 parents & 8 staff participated until saturation. Six distinct themes emerged: Themes exclusive to staff included major R/S role in parental decision making, rationalization of ICU with faith allowing parents to try to maintain control. Parents identified religion as: a source of comfort, hope and perspective though demonstrated relative polarization in previous faith i.e. becoming extremely religious or rejecting previous faith. The sup- portive role of chaplaincy was recognized by both parents and staff, but there was a discrepancy between attitudes towards miracles. Conclusions: PICU families would welcome staff training on religious & spiritual issues, whereas staffwhile welcoming R/S support for familiesare concerned about its role in critical care decision, not least in the context of miraculous interventions. The role of chaplaincy was welcomed by all, especially its integration on PICU, with no concerns about visibility.

IS THERE ARE RELATIONSHIP BETWEEN PERCEIVED SELF-EFFICACY AND QUALITY OF LIFE IN ICU SURVIVORS?
Joanne McPeake, Helen Devine, Pamela MacTavish, Malcolm Daniel, John Kinsella, Tare Quasim

Learning Objectives: There is an abundance of literature which has demon- strated poor social, physical and psychological functioning in survivors of ICU. A number of interventional studies have attempted to improve these issues with limited success. None of the interventions in this area have investigated ICU sur- vivors’ perceived ‘control’ or self efficacy after discharge home. In this evaluation we aimed to explore self efficacy and understand if it was related to quality of life in the ICU survivor population.

Methods: As part of a new rehabilitation service which we were offering in our ICU, we asked patients to complete an EQ 5D questionnaire. The EQ 5D is a measure of quality of life which produces a health utility score. A score of 1 describes perfect health and a score of 0 death. A nega- tive health utility represents a perceived quality of life as worse than death. The Self Efficacy tool which was utilized was a 10 point questionnaire from Schwarzer or negative); staff attitudes towards religion & ability to discuss topic. Inter- views recorded, transcribed and thematically analyzed using Braun & Clark’s framework: Data immersion, followed by coding and subsequent allocation to appropriate themes.

Results: 6 parents & 8 staff participated until saturation. Six distinct themes emerged: Themes exclusive to staff included major R/S role in parental decision making, rationalization of ICU with faith allowing parents to try to maintain control. Parents identified religion as: a source of comfort, hope and perspective though demonstrated relative polarization in previous faith i.e. becoming extremely religious or rejecting previous faith. The sup- portive role of chaplaincy was recognized by both parents and staff, but there was a discrepancy between attitudes towards miracles. Conclusions: PICU families would welcome staff training on religious & spiritual issues, whereas staffwhile welcoming R/S support for familiesare concerned about its role in critical care decision, not least in the context of miraculous interventions. The role of chaplaincy was welcomed by all, especially its integration on PICU, with no concerns about visibility.

EFFICACY OF THE PATIENT SELF-DETERMINATION ACT IN SURGICAL/TRAUMA ICU ADMISSIONS
Zuhdi Abdo, Natalie Provenzale, Brian Williams

Learning Objectives: The Patient Self-Determination Act (PSDA) of 1991 requires healthcare institutions to supply patients with information regarding Advance Directives (AD) upon admission. It also mandates that any patient without an AD must be given resources to create one if they desire. In our Surgical/Trauma Intensive Care Unit (STICU) we found a discrepancy in the total number admissions with a documented AD status. We hypothesized that the STICU saw at least 10% of patients without an AD status documented upon admission.

Methods: We retrospectively reviewed the electronic medical records of patients admitted to the STICU of an urban, Level 1 trauma, safety-net hospital from Jan 1 to Dec 31, 2014. We then compared the number of patients admitted to the STICU with an AD status documented to the total number of patients admitted to the STICU over that time period.

Results: There were 1,046 STICU admissions to our hospital in 2014. Of those, 799 (76.4%) had an AD status documented prior to the STICU, and 247 (23.6%) did not have an AD status documented prior to admission to the STICU.

Conclusions: This single institution review supports our hypothesis that at least 10% of admissions to our Surgical/ Trauma ICU do not have a documented Advance Directive status. The PSDA of 1991 requires that all patients have this documented. Our future efforts include a data validation study to determine the actual AD status of patients who have noted none documented in the EMR, assessing the role ADs have on patient and family outcomes, and implementing methods to increase the AD rate for patients admitted to the STICU.

COMMUNICATION WITH FAMILY MEMBERS OF ICU PATIENTS: LESSONS FROM MULTIDISCIPLINARY FAMILY MEETINGS
Guan Lee, Yeonjoo Lee, Jinsoo Min

Learning Objectives: Family meeting is the most studied communication inter- vention for ICU patients and their families in the Western countries. The interest

LATINO CHILDREN’S POSTTRAUMATIC STRESS AND PAIN AFTER ADMISSION TO A PICU
Lara Nelson, Natala Jaramillo Vasquez, John David Barton, Jeffrey Gold

Learning Objectives: Healthcare disparities have been seen in multiple medical are- nas. Research shows Latino youth tend to have higher levels of anxiety, including posttraumatic stress disorder (PTSD), and somatization. While children following admission to the PICU have been found to have increased rates of PTSD, no stud- ies have addressed differences in the Latino population or their experience of pain.

We hypothesize Latino children in the PICU will report more posttraumatic stress and pain than non-Latino children. Methods: This was a longitudinal, observational study of children 8–17 yr old admitted to the PICU with an anticipated stay >36 hr and without severe neurologic injury, psychiatric disorder or developmental delay. Ethnicity was as reported by parents. Children completed measures during admis- sion, and at 1- and 3-mo post-admission to assess acute and posttraumatic stress (Acute Stress Checklist for Children; UCLA Reaction Index), and pain (Brief Pain Inventory). Results: The sample consisted of 39 children with a mean age of 13 yr (range 8–17) and 61.5 % males. Nearly half were of Latino background (46%) and the others were White 26%, Mixed 10%, Asian 8%, Black 5%, Other 5%. Latino parents reported a monthly income M=3386 vs. $1,575 in non-Latino fami- lies (t=−4.4,p<0). All Latino children had state-sponsored insurance while 62% of non-Latino children had private insurance (x^2=19.2,p<0). There was no significant difference in acute stress between Latinos and non-Latinos at baseline or 1-month follow up or in posttraumatic stress at 3-month follow up. Pain ratings at the 3 times also did not show any differences. Conclusions: In this PICU, most Latino children were from a low socioeconomic status (SES). Despite the potential for health dis- parities based on ethnicity and/or SES, these children did not demonstrate different levels of posttraumatic stress or pain following PICU admission. This negative find- ing should be generalized with caution. Further research is needed to understand and meet the needs of the largest growing ethnic population in the US.

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学习目标：探索宗教和灵性在ICU幸存者中的作用，包括其父母和工作人员在UK PICU中的角色。方法：质性研究方法：(i) 家庭最近从PICU出院的；(ii) PICU工作人员。进行深度半结构化访谈，以鼓励参与者叙述，提供宗教信仰、信仰的改变/确认、信仰在ICU期间的重要性以及信仰对于维持控制的影响。结果：6名家长和8名工作人员参与数据收集直到饱和。研究中发现了六种不同的主题：父母角色的主题在工作人员中，包括父母在医疗决策中的作用，ICU决定中的宗教理性化，信仰允许家长尝试维持控制。父母将宗教视为：一种安慰、希望和视角，尽管在过去的信仰中表现出了相对的极化，宗教或宗教信仰的拒绝。支持性的角色，如牧师被父母和工作人员认可，但存在态度上的分歧，对奇迹的期待。结论：ICU家庭将欢迎工作人员进行宗教与精神问题的培训，工作人员在照顾家庭时，对ICU的角色感到担忧，尤其是ICU的整合，与信仰无关。

是否存在自我效能感与ICU幸存者生活质量的相关性？
Joanne McPeake, Helen Devine, Pamela MacTavish, Malcolm Daniel, John Kinsella, Tare Quasim

学习目标：文献中有关于儿童和ICU幸存者生活质量的研究，但大多数研究集中在有限的人群中，目前在ICU幸存者中缺乏关于自我效能感的研究。研究目的：探索自我效能感与ICU幸存者生活质量之间的关系。方法：在ICU幸存者中进行质性研究，使用EQ 5D问卷来测量健康相关生活质量，并通过10项自我效能感问卷来评估自我效能感。结果：6名家长和8名工作人员参与数据收集直到饱和。研究中发现了六种不同的主题：父母角色的主题在工作人员中，包括父母在医疗决策中的作用，ICU决定中的宗教理性化，信仰允许家长尝试维持控制。父母将宗教视为：一种安慰、希望和视角，尽管在过去的信仰中表现出了相对的极化，宗教或宗教信仰的拒绝。支持性的角色，如牧师被父母和工作人员认可，但存在态度上的分歧，对奇迹的期待。结论：ICU家庭将欢迎工作人员进行宗教与精神问题的培训，工作人员在照顾家庭时，对ICU的角色感到担忧，尤其是ICU的整合，与信仰无关。

学习目的：探索自我效能感与ICU幸存者生活质量之间的关系。方法：在ICU幸存者中进行质性研究，使用EQ 5D问卷来测量健康相关生活质量，并通过10项自我效能感问卷来评估自我效能感。结果：6名家长和8名工作人员参与数据收集直到饱和。研究中发现了六种不同的主题：父母角色的主题在工作人员中，包括父母在医疗决策中的作用，ICU决定中的宗教理性化，信仰允许家长尝试维持控制。父母将宗教视为：一种安慰、希望和视角，尽管在过去的信仰中表现出了相对的极化，宗教或宗教信仰的拒绝。支持性的角色，如牧师被父母和工作人员认可，但存在态度上的分歧，对奇迹的期待。结论：ICU家庭将欢迎工作人员进行宗教与精神问题的培训，工作人员在照顾家庭时，对ICU的角色感到担忧，尤其是ICU的整合，与信仰无关。

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of communication strategies is growing among the intensivists in South Korea. We report our experience of the multidisciplinary meetings with family members of ICU patient. Methods: After regular seminars on communication and end-of-life care, consensus on guideline of the ICU family meeting was made. A weekly multidisciplinary meeting was held to review any issues on the ICU patient’s future plan. Eight family meetings were held between September 2014 and January 2015. Results: The mean age and APACHE II score of the patients were 75.0 yr and 33.8. The median duration of the family meeting was 23.1 min. Four patients had acute respiratory distress syndrome, and 1 patient had ischemic encephalopathy. Except one family meeting, which failed to make decision, 7 family meetings were successfully conducted; 1 case of withdrawal of life-sustaining treatment (LST), 1 case of withdrawal of LST, 1 case of refusal to any LST, 2 cases of do-not-resuscitate, 1 case of full active treatment, and 1 case of supportive care. Four patients expired during hospital admission, 3 patients were discharged to long-term care facility, and 1 patient was discharged to home. Conclusions: It is the first case series of the ICU multidisciplinary family meetings in South Korea. In order to successfully integrate the family meeting into the ICU, more evidences are required to understand cultural differences of the local health systems.

570 PRECIPITATING CAUSES ASSOCIATED WITH DIABETIC KETOACIDOSIS IN ADULT PATIENTS
Katie Langley, Kenneth Butler, Stephanie Tessevere, Katherine Arman
Learning Objectives: With the establishment of the Hospital Readmissions Reduction Program, hospitals with excessive readmissions will receive reduced payments. While the overall early hospital readmission rate is 8.5 - 13.5%, in patients with diabetes, it is 14.4 - 21%. The number of admissions for diabetic ketoacidosis (DKA) is > 130,000 each year. DKA costs the healthcare system $2.4 billion annually. Several retrospective studies have shown poor compliance with medications is a major cause of DKA; however, few studies were prospective. The purpose of this study was to assess patient factors that could result in recurrent DKA. Methods: In a prospective, cross-sectional study, patient were asked survey questions to identify factors which lead to DKA. The Modified Morisky Scale, Duke-UNC FSSQ, and the PHQ-9 were also used. Demographics, A1c, urine drug screen results, serum alcohol level, the number of previous admissions for DKA and education sessions with a diabetes educator, and the admission unit was collected from medical record review. Results: During the study period, 37 patients were admitted with DKA. Of those, 20 patients were enrolled. The average number of previous DKA admissions and average number of sessions with a diabetes educator were both 2.8. The average A1c was 12.3%. Only 15% of patients knew their last A1c; however, 45% understood their A1c. Moreover, 65% of participants understood sick day management. There was a negative correlation between number of previous DKA admissions and A1c (r=-0.342, p=0.151). Patients who understood sick day management had lower A1c (p=0.04). The most common reason for stopping insulin was cost. Motivation scores had a negative correlation with number of DKA admissions (r=-0.208, p=0.379). Conclusions: Cost was the most common barrier for patients to obtain their insulin which may lead to readmissions for DKA. Education sessions with a diabetes educator may be an optimal intervention to prevent admissions. Future research is warranted to assess pharmacist-lead medication and sick day management education and providing a 30-day supply of insulin at discharge.

571 QUALITATIVE ANALYSIS OF SATISFACTION WITH CARE OF FAMILIES OF SURVIVORS AND NONSURVIVORS IN A NICU
Belinda Nhundu, Urs Weber, Jennifer Robinson, Nathaniel Anderson, Andrea Kniest, Kevin Huang, Kathleen Akgun, David Hwang
Learning Objectives: Survey studies using Likert scales suggest that families of patients dying in ICUs are more satisfied with their ICU experience than families of survivors. Differences in satisfaction with care between these two groups have been less well explored using qualitative methods. The free-response sections from a survey of families of ICU patients made comfort measures only (CMO) are more likely to contain a higher proportion of positive statements regarding care, compared to the same sections from surveys of families of ICU survivors.

572 CHARACTERIZATION OF PATIENT REFERRALS TO A POST-INTENSIVE CARE SYNDROME (PICS) RECOVERY CENTER
Sarah Bloom, Elizabeth Huggins, Joanna Stollings, Todd Rice, Carla Sevin, James Jackson
Learning Objectives: Survivors of critical illness are at increased risk for the development of physical, cognitive, and psychological dysfunctions, a set of problems that has been termed Post-Intensive Care Syndrome (PICS). The ICU Recovery Center at Vanderbilt was established to improve the long-term outcomes of patients after ICU discharge by providing an interdisciplinary team approach to ICU follow up. Patient characteristics and processes used for referral to an ICU recovery clinic have not been widely reported. A greater understanding of patient referral and scheduling processes is needed to optimize patient care. The purpose of this project was to identify characteristics of patients referred to the ICU Recovery Center at Vanderbilt and trends associated with clinic appointment attendance. Methods: Patient referrals received between 11/1/2015-6/30/2015 were included. Patient demographics, ICU and hospital length of stay (LOS), presence of inclusion/exclusion criteria for ICU follow up, discharge disposition, successful appointment scheduling and attendance were evaluated. Data are shown as mean (sd) and proportions. Results: A total of 112 patients were referred for ICU follow up during the study period. Mean age was 57.2 (+14.8) on admission to the hospital. ICU LOS was 10.3 (+13.3) days and hospital LOS was 18.3 (+18.2) days; 51 patients met pre-defined exclusion criteria for the clinic. Of the patients evaluated, 30% (34) died during hospitalization. 40 patients (35%;7%) were contacted for appointment scheduling and 20 (50%) patients were scheduled, 11 patients (55%) attended clinic, and 7 (35%) patients were absent. Appointments were scheduled 36.7 (+21.5) days after discharge. Age (OR 0.95, 95% CI: 0.92–0.99, p=0.014, but not discharge destination (OR 0.76, 95% CI 0.56 - 1.03) was independently associated with a clinic appointment being scheduled. Conclusions: The majority of patient referrals did not meet inclusion criteria or died during hospitalization. Of the 40 patients contacted for follow-up appointment, 50% were successfully scheduled. Age is associated with a clinic appointment being scheduled.

573 IMPLEMENTATION OF A NOVEL TABLET-BASED PROCESS TO EVALUATE FAMILY SATISFACTION IN THE ICU
Daniel Diedrich, Corbin Pozar, Natalie Caine, Mark Keegan
Learning Objectives: Evaluation of family and surrogate satisfaction with ICU patient care is an important element of unit performance assessment. Multiple ICU-specific family satisfaction surveys have been validated.(1) Difficulties with administration of such instruments at our tertiary referral institution, however, led to sub-optimal response rates. As a quality improvement project, we developed a
novel mechanism to survey family members and hypothesized that data acquisition would increase. Methods: Beginning in July 2014, after multidisciplinary task-force evaluation and obtaining IRB exempt status, we implemented a new process whereby a 10-question family satisfaction survey was administered via a user-friendly, dedicated iPad-based electronic interface to a representative family member of all ICU patients during a patient’s ICU stay. Health unit coordinators (HUCs) were given authority and responsibility to request survey completion. After a single-ICU 6-week pilot period for troubleshooting (Phase 1), the process was introduced in a step-wise fashion to the remaining 8 ICUs, each unit having its own 6-week run-in period (Phase 2). Continuous evaluation during pilot weeks led to minor unit-specific logistical alterations. Thereafter, during a maintenance phase (Phase 3), compliance data were communicated monthly to unit leadership who provided reinforcement of responsibilities. Survey accrual rates were compared with pre-process rates by paired t-test. Results: After 6 mos, 1337 family surveys were accrued. Average unit survey completion/admission rate was 22.7% (range 12%-48%). Pre-process rate was 1%, P<0.01. Implementation success was initially variable across ICUs and was dependent on unit-specific ‘change culture’ and HUC role, requiring different levels of intervention to optimize data collection. Adult ICUs with higher absolute mortality rates had lower accrual. Conclusions: Re-designation of responsibility for survey collection, coupled with near real-time tabular-based methodology, significantly improved assessment of family satisfaction in the ICU. 1. Rothen HU, Curr Opin Crit Care 2010:623–31

Research Snapshot Presentations: Pharmacology

574 INCIDENCE OF ARRHYTHMIAS IN CHILDREN RECEIVING DEXMEDETOMIDINE AFTER CONGENITAL HEART DISEASE REPAIR
Meera Keshary, Ornmann Laura, Kyle Lenley

Learning Objectives: Arrhythmias are common after the surgical repair of congenital heart disease. Tachyarrhythmias can result in significant hemodynamic instability and worse outcomes. Dexmedetomidine (DEX) is an alpha 2 receptor agonist used in increasing frequency for sedation. By regulation of norepinephrine and acetylcholine it may decrease tachyarrhythmia, but increase bradycardia. The aim of this study is to evaluate the incidence of cardiac arrhythmias in children receiving DEX for sedation after congenital heart disease surgery. Methods: A retrospective cohort study utilizing data extracted from the Children’s Mercy Hospital Heart Center Database. Included were patients age 6 mo or younger who required cardiopulmonary bypass for their correction or palliation of congenital heart disease from January 1, 2010 to June 30, 2014. The primary outcome was the incidence of tachyarrhythmias and bradycardia in the 48 hour post-operative period. Results: 430 patients met inclusion criteria. 69 were excluded for pre-operative DEX use, the presence of a permanent pacemaker or repeat surgery during the same admission. The overall incidence of arrhythmia was higher in the DEX group (42.7% vs 28.5%, p=0.01). There was a trend toward increased tachyarrhythmia (32.4% vs 23.2%, p=0.057) and bradycardia (15.4% vs 8.9%, p=0.059) as compared to the non-DEX group. The length of mechanical ventilation was decreased in those receiving DEX (median 66 vs. 91 hr, IQR 97–101, p=0.014). There was a trend toward decreased hospital length of stay in those receiving DEX (median 11 days vs. 14, IQR 9–22, p=0.050). Hospital mortality was not different in those receiving DEX (7.1% vs 6.6%, p=0.85). Conclusions: This study indicates an overall increased incidence of arrhythmias in children receiving DEX for sedation after congenital heart disease surgery. DEX decreased ventilation and length of stay. A large, randomized control trial is needed to further investigate the impact of DEX on post-operative arrhythmia, mechanical ventilation times and hospital length of stay.

575 DRUG HISTORY AS A MEASURE OF COMORBIDITY AND PREDICTOR OF LONG TERM OUTCOME FOLLOWING ICU ADMISSION
Roslyn Carnie, Malcolm Booth, Martin Shaw, Pamela MacTavish, Robert Docking, Andrew Mackay, John Kinsella

Learning Objectives: Comorbidity in patients in ICU has been shown to have an adverse effect on survival. While many scoring systems exist for assessing disease severity and estimating mortality in critically ill patients, they rarely take into consideration the full burden of comorbidity. Previous scoring systems have been developed for quantifying disease burden, but few have used drug history to directly measure this. This study aims to develop a prognostic tool based solely on patients’ repeat prescriptions, as a method of quantifying disease burden, and assess its ability to predict long term outcomes. Methods: The Medication-based Disease Burden Index (2006) was updated and modified. A retrospective search (using CareVue) for patients admitted to Glasgow Royal Infirmary ICU between 10/2007 and 11/2010 was carried out in order to obtain full drug histories from the time of admission. These patients were then individually scored using the modified MDBI. A second search was carried out using Clinical Portal to ascertain long-term survival. Survival analysis using Kaplan-Meier and Cox Proportional Hazards was carried out to illustrate any relationship between total score and survival probability, including correction for APACHE II score. Results: Over 65% of patients were included in the analysis. Survival probability dropped with increasing score: over 80% survival at 5 yr in those scoring zero, dropping to less than 40% in those with a high score. Log rank test was highly significant (p<0.0001). Hazard ratios for each of the 3 score groups showed an incremental increase in risk when compared to the zero score group, which was significant in each case (low score: HR 2.12(1.40–3.23) p<0.0001, medium score: HR 2.87(1.85–4.45) p<0.0001, high score: HR 5.16(3.08–8.64) p<0.0001). Results remained significant after adjusting for APACHE II score. Conclusions: This gives promising, significant evidence of a simple and useful predictive tool for quantifying comorbidity and the effect it has on long term survival following ICU admission. Further work is required to replicate its use in other populations, and in larger samples.

576 COMPARISON OF HEMODYNAMIC ADES ASSOCIATED WITH DEXMEDETOMIDINE AND PROPOFOL IN ICU PATIENTS
Amy West, Mallory Fiorenza

Learning Objectives: Dexmedetomidine and propofol are the preferred sedative agents to maintain light sedation in the ICU. Both sedatives can potentially cause hemodynamic adverse events (ADEs) in critically ill patients. The purpose of this study was to compare the prevalence of hypotension or bradycardia within the first 24 hr of sedation in ICU patients who received either dexmedetomidine or propofol. Methods: A multicenter retrospective cohort analysis of critically ill adults who received sedation with dexmedetomidine or propofol as a continuous infusion for at least 4 hr between September 2013 and March 2014 was conducted. Propensity score matching was used to match patients on a 1:1 basis to adjust for differences in baseline demographics. Bradycardia was defined as a heart rate below 60 beats/min. Hypotension was defined as a mean arterial pressure below 65 mmHg. The primary outcome was analyzed using the Pearson’s chi-squared test. Results: A total of 300 patients (150 dexmedetomidine and 150 propofol) met inclusion criteria. In the unmatched cohort, the dexmedetomidine group was more likely to have bradycardia (34.7% vs. 16.7%; p<0.01) and less likely to have hypotension (48.7% vs. 63.3%; p=0.01) compared to the propofol group. The composite outcome (bradycardia and hypotension) was not statistically significant when compared between the dexmedetomidine group and propofol group (16.0% vs. 13.3%; p=0.51). The propensity-matched cohort included 188 patients (94 dexmedetomidine and 94 propofol). More bradycardia was found in the dexmedetomidine group than in the propofol group (37.2% vs. 18.1%; p<0.01), however, there was no significant difference in the incidence of hypotension (51.1% vs. 59.6%; p=0.24) or composite outcome (18.1% vs. 13.8%; p=0.43). Conclusions: In critically ill patients, bradycardia was more common when sedated with dexmedetomidine, whereas hypotension was seen more with propofol. Further prospective studies should be conducted to confirm the incidence of bradycardia and hypotension caused by these sedatives and the impact on mortality.
These are the first VAN PK data in (1 mL/kg/min) with older oxygenators yet the Vd appears to be smaller with a con-
in this population of ECLS patients is significantly higher than previous estimates
bution (Vd), and intercompartment transfer constants were 2.02(2.79) mL/min/kg,
for clearance (CL), volume of the central compartment (Vc), total volume of distri-
were measured by fluorescent polarization and the population PK was determined
During the ECLS run, routine blood samples were collected from 26 children with a median age of 1.8 yr (3
Currently, no VAN PK data exists for children on ECLS with the current ECLS
equipment. The purpose of this study was to describe VAN PK in children with
Many factors can affect VAN PK in the pediatric ICU including sepsis and ECLS.
of 15–20 mg/L or an AUC:MIC ratio of 400:1 are needed to maximize outcomes.
Learning Objectives: VAN remains first line therapy for the treatment of life-threat-
earing infections caused by methicillin resistant Staphylococcus aureus (MRSA) and
ampicillin resistant Enterococci. Current evidence suggests that VAN trough levels of 15–20 mg/L or an AUC/MIC ratio of 400:1 are needed to maximize outcomes.
Many factors can affect VAN PK in the pediatric ICU including sepsis and ECLS. 
Cox proportional hazards model was fit for time to ICU discharge, and the associated hazards ratio (HR) was 0.97 (95% CI 0.87–1.07, p = 0.48). 
Opioid-related ADEs occurred in 55.3% of patients receiving IV APAP and 
40.7% of patients in the control group (p=0.001). 
Conclusions: Cardiothoracic surgery patients who received IV APAP had longer ICU length of stay and no dif-
ference in time to extubation compared to a matched-historical control. IV APAP 
was not associated with a reduction in opioid-related ADEs.

IMPACT OF INTRAVENOUS ACETAMINOPHEN IN 
CARDIOTHORACIC SURGERY PATIENTS
Matthew Wanek, Rosemary Persaud, Seth Bauer, Chiedozie Udeh, Amy Nowacki, Marc Gillinov
Learning Objectives: Compared to other analgesic agents, several potential advantages of intravenous (IV) acetaminophen (APAP) exist due to differences in side effect profiles. Although a reduction in opioid requirements with use of IV APAP has been suggested in prior studies, data supporting improvement in patient outcomes is lacking. Methods: Single-center, retrospective cohort study with a matched historical control. Data were extracted from the Society of Thoracic Surgeons (STS) Adult Cardiac Surgery database and electronic medical record. Study group included adult patients who received at least one dose of IV APAP postop-
eratively in the cardiovascular ICU (CVICU) from October 2011 to October 2014. 
The study group was matched to control patients admitted to CVICU postopera-
tively, between October 2008 and September 2011 (prior to the availability of IV APAP at the study institution), in a 1:2 ratio using propensity scores (based on age, 
sex, ASA Physical Status Score, and type of surgery) stratified by operative urgency. 
The primary endpoint was time to ICU discharge. Additional endpoints included 
time to extubation and the incidence of opioid-related ADEs based on administra-
tion of anti-emetics or naloxone. Results: After matching, 2,138 patients were included in the IV APAP arm and 4,276 in the control arm. Baseline characteristics between groups were similar. An unadjusted Cox proportional hazards model was fit for time to ICU discharge, and the associated hazards ratio (HR) was 0.90 (95% CI,0.86–0.94 p < 0.0001), indicating a decreased risk of discharge from the ICU with IV APAP. A Cox proportional hazards model was fit for the secondary end-
point of time to extubation, and the associated HR was 0.97 (95% CI 0.87–1.07, p = 0.48). 
Opioid-related ADEs occurred in 55.3% of patients receiving IV APAP and 
40.7% of patients in the control group (p=0.001). Conclusions: Cardiothoracic surgery patients who received IV APAP had longer ICU length of stay and no difference in time to extubation compared to a matched-historical control. IV APAP was not associated with a reduction in opioid-related ADEs.

INTERNATIONAL SURVEY OF PHARMACOLOGIC VTE PRO-
PHYLAXIS PRACTICE IN CRITICALLY ILL OBESE PATIENTS
Abigail Antigua, Jennifer Ashton, Jessica Coipe, Aimee Gowler, Martina Holder, Amir Kamel, Stephen Lemon, Stacy Voils
Learning Objectives: Critically ill are at increased risk for venous thromboembo-
Institute for Safe Medication Practices classifies hepa-
Learning Objectives: VAN remains first line therapy for the treatment of life-threat-
earing infections caused by methicillin resistant Staphylococcus aureus (MRSA) and 
ampicillin resistant Enterococci. Current evidence suggests that VAN trough levels of 15–20 mg/L or an AUC/MIC ratio of 400:1 are needed to maximize outcomes.
Many factors can affect VAN PK in the pediatric ICU including sepsis and ECLS. 
Cox proportional hazards model was fit for time to ICU discharge, and the associated hazards ratio (HR) was 0.97 (95% CI 0.87–1.07, p = 0.48). 
Opioid-related ADEs occurred in 55.3% of patients receiving IV APAP and 
40.7% of patients in the control group (p=0.001). Conclusions: Cardiothoracic surgery patients who received IV APAP had longer ICU length of stay and no difference in time to extubation compared to a matched-historical control. IV APAP was not associated with a reduction in opioid-related ADEs.

Intravenous Heparin Calculation Errors Pre- and Post-Implementation of the Heparin NOCLOT Wizard®
Amasrah Amin, Peter Perreiah, Sarah Providence, Lindsay McCartney, Sharon Camhi, R. Rao
Learning Objectives: The Institute for Safe Medication Practices classifies hepa-

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medications in critically ill obese patients, with enoxaparin 40 mg every 12 hr and heparin 7500 units every 8 hr the most common regimens. The majority of respondents did not report laboratory monitoring to guide dosing.

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CLINICAL IMPACT OF HYPERCHLOREMIA SECONDARY TO HYERTONIC SODIUM CHLORIDE ADMINISTRATION
Patrick Welch, Chris Droge, Jessica Winter, Neil Ernst, Shaun Keegan, Kiranpal Sangha, Eric Mueller

Learning Objectives: Intravenous (IV) hypertonic sodium chloride (HTS) has multiple clinical indications. Isotonic sodium chloride and subsequent hyperchloremia have been associated with acute kidney injury (AKI), prolonged hospital length of stay (LOS), and increased mortality. These associations have not been evaluated with HTS use. The primary objective of this study is to compare the incidence of AKI among peak serum chloride concentrations in patients receiving HTS.

Methods: This single-center, retrospective, observational study analyzed adult patients admitted >72 hr and receiving ≥15 grams of sodium chloride via IV HTS. Patients were divided into tertiles based on peak serum chloride: tertile 1 (T1) ≤108 mmol/L; tertile 2 (T2) 109–116 mmol/L; tertile 3 (T3) ≥117 mmol/L. AKI and in-hospital mortality rates were compared among tertiles. Multivariate logistic regression was performed to identify factors associated with AKI development or mortality. Results: 136 patients were included (T1, 43 [32%]; T2, 52 [38%]; T3, 41 [30%]). Baseline characteristics were similar among tertiles with the exception of T1 including fewer traumatic admissions (19 v 52 v 42%; p=0.003) and more hyponatremia diagnoses (4 v 4 v 0%; p=0.018). Increase in serum chloride from baseline was different among tertiles (6 v 9 v 16%; p<0.001). Rate of AKI increased with peak serum chloride (2 v 10 v 22%; p=0.015). Multivariate logistic regression identified that peak serum chloride independently predicted AKI development (OR 7.1, 95% CI 1.0–50; p=0.049). Hospital (15 v 16 v 13; p=0.053) and ICU (8 v 11 v 11; p=0.124) LOS (days) were similar among groups. Mortality rate increased with peak serum chloride (5 v 14 v 32%; p=0.008). No factors were identified as independent predictors of mortality. Conclusions: After adjusting for concurrent nephrotoxins and other confounding variables, increasing magnitude of serum chloride was associated with AKI among patients who received HTS. Prospective, multicenter studies are needed to confirm this relationship.

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CURRENT PRACTICES AND SAFETY OF MEDICATION USE DURING RAPID SEQUENCE INTUBATION (RSI)
Christine Groth, Nicole Acquino, Tina Khadem

Learning Objectives: We sought to characterize medication use practices during/ immediately post-RSI in wards, ICUs and emergency departments (EDs) across the US. Methods: This was a multicenter, observational, cross-sectional study utilizing the Critical Care Pharmacotherapy Trials Network. On March 12th 2015, all adult/pediatric patients in the ICU/ED were included if intubated during hospital admission. A 24-hour data collection around the time of first intubation (patient, RSI procedure, provider/location characteristics) was performed. Data are reported using descriptive statistics and chi-square/Fisher’s exact test as appropriate. Results: A total of 404 patients from 35 geographically diverse institutions were included (mean age 58 ± 22 yr, males 59%). During the first intubation attempt 21%, 87%, and 76% of patients received pre-induction, induction, and paralytic medications, respectively. Patients intubated in the ICU were more likely to receive pre-induction (28% vs. 13%; p=0.0006). Most common pre-induction agents were fentanyl and midazolam and induction agents were etomidate and propofol. Emergency medicine (EM) providers used etomidate more than critical care or anesthesia providers (82% vs. 52% and 38%, p<0.0001). EM providers used paralytics more (94% of the time, p<0.0001). Rocuronium and succinylcholine were the most common paralytics. Etomidate was used in 58% of septic patients. Despite little evidence ketamine increases intracranial pressure, it was only used in 1/66 patients with traumatic brain injury/stroke. In patients with a Glasgow Coma Scale Score of 3, 18% received paralyzation. Of those who received succinylcholine, 13% had a contraindication (hyperkalemia most often). In the 24hr post-RSI there was no difference in incidence of adrenal insufficiency/vasoconstricor use in those who received etomidate vs. no etomidate, hyperkalemia in those who received succinylcholine vs. no succinylcholine, or delirium in those who received ketamine or etomidate. Conclusions: Medication practices during RSI vary amongst intubation location and provider in the US.

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POPULATION PHARMACOKINETICS (PK) OF VANCOMYCIN (VAN) IN NEONATES ON EXTRA-CORPOREAL LIFE SUPPORT
Jeffrey Cies, Wayne Moore, Kristen Nichols, Chad Knoderer, Dominick Carella, Jason Parker, Paul Shea, Arun Chopra

Learning Objectives: VAN remains first line therapy for the treatment of life-threatening infections caused by methicillin resistant Staphylococcus aureus (MRSA) and ampicillin resistant Enterococci. Current evidence suggests that VAN trough levels of 15–20mg/L or an AUC:MIC ratio of 400:1 are needed to maximize outcomes. Many factors can affect VAN PK in the pediatric ICU including sepsis and ECLS. Currently, no VAN PK data exists for children on ECLS with the current ECLS equipment. The purpose of this study was to describe VAN PK in neonates with a contemporary ECLS operation, including the Quadro-di neonatal oxygenator.

Methods: During the ECLS run, routine blood samples were collected from 13 neonates who received VAN for either prophylaxis or empiric therapy. VAN concentrations were measured by fluorescent polarization and the population PK was determined using PMEMtics. Multiple compartmental and covariate models were explored to determine the best fit of the data. Results: 13 neonates with a median gestational age of 36 weeks accounted for 16 VAN treatment courses. Each course contributed a median of 8 VAN levels (3–27) to the model. A 2 compartment model with weight as a covariate fit the VAN concentration data best. Mean (SD) population estimates for clearance (CL), volume of the central compartment (Vc), total volume of distribution (Vd), and intercompartment transfer constants were 1.93(5.11) ml/min/kg, 0.27(0.25) L/kg, 0.49 (0.38) L/kg, 2.49(1.4) h-1, and 2.64(1.1) h-1, respectively. This resulted in a mean (SD) elimination half-life of 4.9(6.6) h. The CL estimate in this population of ECLS patients is significantly higher than previous estimates (0.5–1.0 ml/kg/min) with pre-Quadro oxygenators with a similar Vd with a contemporary ECLS arrangement. Conclusions: These are the first VAN PK data in neonates with a contemporary ECLS operation utilizing the Quadro-di neonatal oxygenator demonstrating significantly higher CL values with a similar Vd.

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THROMBOTIC COMPLICATIONS AFTER PROTHROMBIN COMPLEX CONCENTRATE (KCENTRA®) ADMINISTRATION
Emily Owen, Theresa Human, Gabrielle Gibbon, Rachel Stratman

Learning Objectives: Life-threatening bleeding in the presence of oral anticoagulant use is complicated, with few definitive treatments. Prothrombin complex concentrate (PCC) is an option for coagulopathy reversal in the setting of life-threatening bleeding. However, little is known about the risk of developing thrombotic complications in patients receiving PCC who were previously anticoagulated. The aim of this study is to characterize the rate of thrombotic complications after receipt of PCC.

Methods: One hundred consecutive patients receiving PCC for life-threatening bleed were retrospectively evaluated. Data collected for review included anticoagulant, indication, bleeding source, PCC dose and date and time of administration, INR, and thrombotic complications within 14 days of PCC dose. Results: One hundred patients received 110 doses of PCC. Of these, 15 patients developed 18 thrombotic complications, including lower extremity venous thromboembolism (VTE) (11), upper extremity VTE (3), ischemic stroke (2), and acute myocardial infarction (AMI) (2), with no patients developing pulmonary embolism. Three patients developed multiple thrombotic complications: 2 patients had lower and upper VTEs and 1 patient had a lower extremity VTE and an AMI. Additionally, 2 of the 3 patients received 2 doses of PCC. Patients with thrombotic complications received a median dose of 2500 units (IQR 1834–2778) (29.2 units/kg [IQR 25.9–35.3]) and thrombosis was discovered at a mean of 5.8 days after receiving PCC. Of 8 patients on warfarin, 3 were dosed based on manufacturers recommendations according to INR, with 1 patient being dosed lower (7.4 units/kg) and 4 dosed higher (median 39.6 units/kg [IQR 27.3–50.3]). In patients who received one dose of PCC, rate of thrombosis was significantly lower (11%) than in those who received a second dose of PCC (50%) (p = 0.006). Conclusions: PCC administration in the setting of life-threatening bleeding is not benign. Risk of thrombotic complications increases in patients who receive a repeat dose of PCC and should be further investigated.
EVALUATION OF DISCONTINUATION OF QUETIAPINE AND HALOPERIDOL PRESCRIBED FOR ACUTE ICU DELIRIUM

Mallory Fiorenza, Jonathan Garms, Kenneth Tolep, Doug Peterson, Suzanne Turner

Learning Objectives: Quetiapine and haloperidol are antipsychotics prescribed to treat the complications of acute ICU delirium. Antipsychotics prescribed for the treatment of acute ICU delirium are often continued after delirium resolution although therapy may no longer be indicated. The purpose of this study was to determine if quetiapine or haloperidol initially prescribed for acute ICU delirium was discontinued upon transfer out of the ICU or at hospital discharge. Methods: A multicenter retrospective cohort analysis of critically ill adult patients who received either quetiapine or haloperidol with international classification of diseases, ninth revision (ICD-9) codes for delirium between August 2012 and February 2014 was conducted. A delirium day was defined as having documentation (positive for the confusion assessment method for the ICU (CAM-ICU) or physician’s progress note) of the presence of delirium within a standard 24 hour day. Delirium resolution was defined when the patient was considered, based on clinical judgment by the attending or consulting physician, to no longer demonstrate signs of delirium documented in a progress note or the patient was discharged. The primary outcome was analyzed using the Pearson’s chi-squared test. Results: A total of 100 patients (54 quetiapine and 46 haloperidol) met inclusion criteria. Quetiapine patients were more likely to be continued on treatment upon transfer out of the ICU when compared to haloperidol (76% vs. 37%; p < 0.001). Upon hospital discharge, more patients were continued on quetiapine than haloperidol (57% vs. 5%, p < 0.001). Patients prescribed quetiapine for acute ICU delirium were 11.5 times more likely to be continued on this antipsychotic when compared to haloperidol at discharge. The time until delirium resolution was similar between the quetiapine and haloperidol groups (4 days [IQR 2.5–6] vs. 3 days [IQR 2–6.8]; p = 0.435). Conclusions: Future pharmacist-led education and medication reconciliation is needed during transitions of care to reassess the need for these high risk medications.

KETAMINE INFUSION AS ADJUNCT SEDATION IN MECHANICALLY VENTILATED CRITICALLY ILL PATIENTS

Lara Groetonger, Bryan Rivosecchi, Bryan McVerry

Learning Objectives: Several medications are available for sedation in mechanically ventilated patients. Clinical practice guidelines recommend against the use of continuous benzodiazepines. Ketamine, an N-Methyl-D-aspartate receptor antagonist, is a potential option in addition to first line agents. However it’s dosing, duration and adverse effects for this specific indication have not been well defined in the literature. We sought to describe the effectiveness and safety of continuous infusion ketamine for adjunct sedation in mechanically ventilated critically ill patients. Methods: Mechanically ventilated patients receiving continuous infusion ketamine for adjunct sedation between July 1, 2014 and June 30, 2015 were retrospectively reviewed. Demographics, ketamine dose, concomitant sedative dosing, and hemodynamic parameters were collected. Riker Sedation Agitation Score (SAS) was used to assess sedation in all patients, and every 2 hour screening is the standard of care throughout the institution. Patients were excluded if ketamine was administered for less than 6 hr, or if ordered solely for analgesia, alcohol withdrawal, or seizures. Results: A total of 90 patients were evaluated with 43 meeting inclusion criteria. The cohort consisted of a primarily male (67%) population, with an average age of 45 yr. On average, ketamine was initiated at 0.16 mg/kg/hr (range 0.05–1 mg/kg/hr) and continued for 3.6 days (range 0.5–21.6 days) with a mean dose of 0.44 mg/kg/hr (range 0.05–2 mg/kg/hr). A total of 1792 SAS scores were recorded, and goal SAS was achieved in 1259 (69%) of observations. Twenty six patients (60%) had at least one alternate sedative decreased or discontinued after the initiation of ketamine. Mean arterial blood pressure increased from 77 to 81 mmHg (p=0.15) compared to baseline in the initial 24 hr of ketamine infusion without significant change in heart rate (p=0.97). Conclusions: Ketamine infusion may be an effective and safe adjunct sedative in mechanically ventilated patients. Further study is warranted to explore the optimal dosing and timing of ketamine as a therapeutic alternative.

ANTI-FACTOR XA TESTING FOR QUANTIFYING ANTICOAGULANT EFFECT DUE TO ORAL DIRECT XA INHIBITORS

Jacob Beyer, Toby Trujillo, Tyyre Kizer

Learning Objectives: Clinical scenarios exist in critically ill patients who have been taking direct oral anticoagulants in which a quantitative assessment of anticoagulation intensity would aid clinical decision making (e.g. emergent procedures, anticoagulant transition, bleeding, etc.). We aimed to evaluate the anti-factor Xa assay calibrated with heparin standards at our institution for assessment of anticoagulation intensity due to rivaroxaban or apixaban. Additionally, we sought to develop an expected anti-Xa range, and compare the precision of the anti-Xa assay with the prothrombin time (PT). Methods: The anti-Xa (STA® liquid heparin kit) and PT (Neoplastin Plus®) tests were performed on hospitalized patients receiving rivaroxaban or apixaban. Dilution with pooled plasma was allowed to attain anti-Xa readings within the assay range. Test results were compared to plasma concentrations obtained either by spiking normal plasma with drug or by rivaroxaban or apixaban specific (research use only) calibration materials (Diagnostica Stago). Linear regression analysis was used to assess correlation between drug concentration and the anti-Xa or PT results. The proposed peak and trough anti-Xa activities were calculated using published pharmacokinetic data and the regression model obtained within this study. Results: Anti-factor Xa activity correlated with apixaban and rivaroxaban concentration in 8 spiked and 24 treated patient samples (r2 = 0.99, p < 0.001). This correlation was observed over a broad range of drug concentrations. The expected steady-state peak and trough anti-factor Xa activity ranges for apixaban are 1.80 – 2.2 IU/mL and 0.70 – 1.10 IU/mL, respectively. For rivaroxaban these ranges are 3.80 – 6.20 IU/mL and 0.60 – 1.00 IU/mL, respectively. Conclusions: The heparin calibrated anti-Xa activity demonstrated a more precise estimate of apixaban and rivaroxaban concentration versus the PT. Sample dilution allowed for extension of the evaluable range to almost all observed concentrations. Further study to determine the utility of the anti-Xa assay for clinical decision making in ICU patients is warranted.
Hemodynamic and respiratory profile while Propofol offered the advantage of quicker recovery. High dose Dexmedetomidine and Propofol are safe, effective sedative medications, Versed or Fentanyl. In Group P an initial bolus of 1-2mg/kg was followed by a continuous infusion during perioperative period. Its CL could be used as PK marker of renal function.

Learning Objectives: Dexmedetomidine (TXA) use is common antifibrinolytic therapy applied in order to reduce blood loss and transfusion requirements in acute care medicine. Initially, it was mainly used in cardiac surgical patients, however recently its use was introduced to critical care medicine, liver resection, liver transplantation and trauma. There are several dosing regimens applied but their pharmacokinetic (PK) characteristics is not described. The aim of this study is to describe PK profile of TXA used as an antifibrinolytic therapy in patients undergoing liver transplantation (LT).

Methods: After obtaining Research Ethics Board approval and written informed consent, 22 consecutive patients undergoing LT were recruited. Patients were divided into two groups: DD (n=13) group received cadaveric livers and LD (n=9) group received livers from living donors. TXA used as antifibrinolytic was administered as a 1 g bolus post induction of anesthesia followed by a continuous infusion at 10 mg/kg-1-hr-1 until 2 h post graft reperfusion. Plasma samples for PK analysis of TXA were collected at baseline (t = 0) and the in-predetermined time points till 24 h after surgery. The plasma concentrations for TXA were measured with use of liquid chromatography/mass spectrometry analysis. A two-compartment model was used to fit TXA data using ADAPT5® (USC.CA).

Results: TXA levels providing effective antifibrinolytic activity (>100 mg/l) lasted for almost 7 h after initiation of the infusion. PK of TXA administered as described showed no significant difference in TXA CL between the DD and LD groups. As TXA was assumed to be 100% eliminated via glomular filtration, total clearance (CLT) of TXA was equivalent to renal CL, which approximates glomular filtrate rate (GFR) in normal renal function. The estimated CL of TXA (~1 mL-min-1-kg-1) was 20% below the GFR suggesting reduced renal clearances in both transplant groups. Conclusions: Our results showed that proposed dosing of TXA provides effective antifibrinolytic plasma levels of medication during perioperative period. Its CL could be used as PK marker of renal function.

Learning Objectives: Children often require sedation for lengthy procedures. An additional bolus of respective medicine was given. Dosage, complications, procedure and recovery time were reviewed. Results: Of 996 cases completed, 452 were Group D. Group P patients were heavier (21.23kg v 19.19kg) and taller (1.5 ± 0.17 m v 1.49 ± 0.09 m, P<.05). Bradycardia (HR<60/min), hypertension (systolic blood pressure increase >20%) and hypotension (<100/60 mmHg) increased from baseline to 0.5, 1.0, and 2.0 mg/L. Descriptive and inferential statistics were performed. Results: Twenty-seven in each group were included. Mean trough concentrations were significantly higher in the CTS group vs controls, 18.4 ± 8.8 mg/L, p<0.01. Vancomycin-induced AKI was significantly higher in the CTS group vs controls, 25.9% vs 0%, respectively, p<0.01. There was a significant difference in vancomycin elimination rates in the CTS group vs controls, 0.11±0.06 vs 0.08±0.13 hr-1, p<0.01. No other statistical differences were noted with PK parameters. Based on dosing projections, CTS patients would require 21–28 mg/kg/day with a dosing interval determined by the child’s glomular filtration rate to achieve the target AUC:MIC >400. Conclusions: A regimen of 20 mg/kg/dose IV Q8H achieved higher trough concentrations in CTS patients than controls. PK parameters were highly variable in CTS patients indicating need for dose individualization. A future prospective study is needed to confirm whether dosing projections achieve the AUC:MIC target and are associated with less vancomycin-induced AKI.
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SEDATION AND NEUROMUSCULAR BLOCKADE IN ADULTS RECEIVING EXTRACORPOREAL MEMBRANE OXYGENATION

Jeremy DeGrazio, Kevin Anger, Benjamin Hohlfelder, David Reardon, Brianne Ritchie, Gerald Weinhouse

Learning Objectives: Critically ill patients receiving extracorporeal membrane oxygenation (ECMO) are thought to require increased doses of analgesics and sedatives. The purpose was to evaluate the management of pain, agitation, and delirium in ECMO patients. Methods: Adult patients supported on ECMO for at least 48 hr between January 2013 and December 2014 were prospectively evaluated. Data recorded included patient demographics, APACHE II and SOFA scores, indication and duration of ECMO, use of venovenous (VV) or venoarterial (VA) ECMO, pharmacotherapy utilization, sedation assessments, and patient outcomes, such as hospital mortality and length of stay. Results: Overall, 32 patients were included in the analysis; 15 received VA ECMO and 17 received VV ECMO. The primary indications for ECMO were cardiopulmonary failure (13, 41%), bridge to lung transplant (7, 22%), and sepsis-related ARDS (6, 19%). Mean APACHE II and SOFA scores upon ECMO initiation were 26.8 and 10.4, respectively. There were 475 total ECMO days, with 365 VV and 110 VA. Patients received continuous infusions of opioids, benzodiazepines, and propofol on 404 (85.1%), 199 (41.9%), and 95 (20%) of ECMO days, respectively. Median doses per day of opioid, benzodiazepines, and propofol were 3875 mcg (fentanyl equivalents), 24 mg (midazolam equivalents), and 650 mg, respectively. Other medications used included quetiapine (30%), clonidine (25.9%), haloperidol (23.4%), and lorazepam (16%). Median RASS was assessed on 94.5% of ECMO days, and the mean score was -1.5. RASS scores were lower in the VA group (-2.3 vs. -1.3, p<0.01). Hospital mortality was 40.6% and median length of stay was 31 days among survivors. Conclusions: Patients on ECMO received continuous infusions of benzodiazepines during less than half of their ECMO days. Sedative and analgesic utilization were lower than previously reported. Patients receiving VA ECMO were more deeply sedated than those receiving VV ECMO.

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KETAMINE USE FOR SEDATION MANAGEMENT IN PATIENTS RECEIVING EXTRACORPOREAL MEMBRANE OXYGENATION

Amy Dixieha, Jan Bakker, Justin Muir, Lauren Wasson, Michael Catabraro, Whitney Gannon, Kathleen Connolly, Daniel Brodie

Learning Objectives: Extracorporeal membrane oxygenation (ECMO) frequently requires deep sedation levels (RASS -5) to safely apply this technique in patients with acute respiratory distress syndrome (ARDS). Common sedatives may be difficult to titrate due to drug-circuit interactions. Ketamine, a minimally lipophilic drug, may not be affected by drug-circuit interactions, potentially decreasing the need for opioids to achieve RASS -5. We studied the impact on the use of opioids of a ketamine (KET) infusion beginning at the start of ECMO (START) until the decision to wake the patient up to achieve RASS -2 to 0 (WAKE). Methods: This IRB-approved, prospective non-blinded study randomized 20 consecutive ARDS patients requiring venovenous ECMO with requirements for RASS -5 to standard sedation practices (STD) or STD plus KET (40 mg bolus then 4 mcg/kg/min). Cumulative opioid and sedative requirements (mg of fentanyl [cumFEN] and mg of midazolam [cumMID]) and RASS scores were collected from start of ECMO through ICU discharge. Data is presented as means±SD or median [IQR] where appropriate. Results: The STD (n=10) vs KET (n=10) groups had similar APACHE II scores (19±7 vs 15±4, p=NS), time to WAKE (122±105 vs 188±101 hr, p=NS), and use of renal replacement therapy (RRT) 60 vs 20%, p=NS. Between START and WAKE there were no differences in cumFEN in the STD vs KET groups (8275 mcg [1800, 18672] vs 15200 mcg [5900, 25225], p=0.06) and cumMID (6 mg [3, 9] vs 8 mg [7, 11], p=NS). RASS on day of WAKE was not different between the groups (STD: -4 [-4, -4] vs KET: -4 [-4, -3], p=NS). On day 3 after WAKE, RASS had changed significantly in both groups without significance between the groups (STD: -3.8±0.8 to -2.6±1.3, p<0.001) KET (-3.3±1.5 to -1.6±2.2, p=0.02). Conclusions: Despite higher requirements of both opioids and sedatives in the KET group, although not significant these patients had lower RASS scores 3 days after WAKE. The higher use of RRT in the STD patients might have confounded the results. Larger studies are needed to determine the role of KET in patients receiving ECMO for ARDS.

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THE INCIDENCE OF HYPOTENSION WITH CONTINUOUS INFUSION ATRACURIUM COMPARED TO CISATRACURIUM

Luke Vanderweele, Mahmoud Abdel-Rasoul, Anthony Gerlach

Learning Objectives: A drug shortage of cisatracurium led to use of atracurium as an alternative neuromuscular blocker (NMB). Cisatracurium may be preferred due to less histamine release and potentially less hypotension. The study purpose is to compare the incidence of hypotension with continuous infusion atracurium to continuous infusion cisatracurium in ICU patients. Methods: This retrospective cohort analysis reviewed 127 ICU patients who received either continuous infusion atracurium or cisatracurium. The primary outcome was the incidence of hypotension (mean arterial pressure <60mmHg). Secondary outcomes included: incidence of blood pressure decrease >or=20% from baseline, time to first hypotensive episode, treatment for hypotension during NMB use, hospital mortality, ICU and hospital length of stay (LOS), duration of mechanical ventilation (MV), and NMB duration. Continuous data were analyzed using Wilcoxon test for nonparametric data and presented as median [25–75% interquartile range]. Categorical data were analyzed using either a Chi-Square test or Fisher's exact test. A two sided p-value of <0.05 was considered to be statistically significant. Results: Hypotension occurred in 66% of atracurium patients and 60% of cisatracurium patients (p=0.50), with 58% experiencing >or=20% drop in blood pressure in atracurium group and 52% in cisatracurium (p=0.54). Median time to first hypotensive episode was 7.1 [Interquartile range 1.1–19.1] hr atracurium and 3.8 [0.7–19.9] hr cisatracurium (p=0.35). There were no differences between atracurium and cisatracurium groups respectively for median ICU LOS (10.5 days and 12.2 days, p=0.31), hospital LOS (14.0 days and 17.8 days, p=0.29), MV duration (9.3 days and 10.3 days, p=0.37), infusion duration (33.7 hr and 24.5 hr p=0.35), or hospital mortality (64% and 56%, p=0.33). Hypotension treatment was similar between groups. Conclusions: The incidence of hypotension was similar between atracurium and cisatracurium. Critical drug shortages may provide an opportunity to study alternative drug therapy.

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VALPROIC ACID FOR AGITATION IN CRITICALLY ILL ADULTS

David Gagnon, Gabriel Fontaine, Kathryn Smith, Russell Miller, Richard Riker, Patricia Lerwick, Kristen Sihler, Gilles Fraser

Learning Objectives: Valproic acid (VPA) is an emerging option for behavioral control in critically ill patients. The purpose of this study was to describe its safety and efficacy for this indication. Methods: We present the interim results of a multicenter, retrospective study of critically ill adults receiving VPA for agitation from December 2012 through February 2015. Patients prescribed VPA as an outpatient or for other indications were excluded. Efficacy data included incidence of agitation, delirium, and concomitant sedative requirements on the day VPA was initiated (VPA-day 1) compared with VPA-day 3. Agitation and delirium were identified through documentation in the medical record. Safety data were examined for the duration of VPA therapy and included occurrences of liver function test (LFT) derangement, bone marrow suppression, or hyperammonemia. Continuous variables are reported as medians with interquartile range; p<0.05 was considered significant. Results: Thirty-five patients received 378 days of VPA therapy. Most patients were admitted to a medical intensive care service (44%) for respiratory failure (31%). The duration of VPA therapy was 7 (4, 12) days. Sixteen patients (46%) in the cohort received a loading dose of 2000 (1500, 2260) mg or 29 mg/kg. The daily maintenance dose was 1800 (1125, 2250) mg/ day or 24 mg/kg/day. Agitation incidence significantly decreased from 86% on VPA-day 1 to 44% on VPA-day 3 (p=0.001). Delirium incidence did not change (57% vs. 44%, p=0.22). Fentanyl-equivalents (1367 vs. 825 mcg/day, p=0.05) significantly decreased, while dexmedetomidine dose (1.2 vs. 0.9 mcg/kg/hr, p=0.31), propofol dose (45 vs 39 mcg/kg/min, p=0.50), lorazepam-equivalents (12 vs. 14 mg/day, p=0.58), and antipsychotic use (3 vs. 3 doses/day, p=0.84) were unchanged. Adverse events possibly associated with VPA included thrombocyto- cytopenia (14%), hyperammonemia (9%), neutropenia (6%), LFT derangement
(4%), and leukopenia (3%). **Conclusions:** VPA therapy was associated with a reduction in agitation incidence and opioid utilization. Further studies in this patient population are warranted.

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**THE PHARMACOKINETICS OF DEXMEDETOMIDINE IN INFANTS AND CHILDREN FOLLOWING ISOLATED ORTHOTOPIC LIVER**

Mihaela Damian, Gregory Hammer, Mohammed El-Komy, Adam Frymoyer, David Drower, Felice Su

**Learning Objectives:** Dexmedetomidine is a novel sedative medication used in the PICU because it causes minimal or no respiratory depression. However, the pharmacokinetics (PK) of dexmedetomidine has not been previously described in children following liver transplantation in whom post-operative liver dysfunctions is common and drug clearance may be reduced. The objective of this current study was to determine the PK profile of dexmedetomidine in children following liver transplantation.

**Methods:** This was a single center, open-label study of dexmedetomidine administered as an intravenous loading dose of 0.5 mcg/kg followed by a continuous infusion starting at 0.5 mcg/kg/hr. Twenty patients, age 1 month to 18 yr, following liver transplantation were enrolled. Whole blood was collected, processed using the dried blood spot method and analyzed for dexmedetomidine concentration. Non-linear mixed-effects modeling was used to characterize the population PK of dexmedetomidine.

**Results:** Dexmedetomidine PK was best described using a two-compartment model with first-order elimination. Pediatric patients following liver transplantation were found to have a whole blood dexmedetomidine clearance of 51.7 L/hr, inter-compartmental clearance of 246 L/hr, central volume of distribution of 1861 L/70-kg and peripheral volume of distribution of 203 L. Inter-individual variability ranged from 11 to 111%.

**Patient weight correlated with volume of distribution but weight did not have a significant influence on dexmedetomidine clearance.** Clearance was inversely proportional to INR. All other covariates including age, ischemic time, total bilirubin and ALT were not found to be significant predictors of dexmedetomidine disposition.

**Conclusions:** Children who received dexmedetomidine following liver transplantation have large variation in clearance, which was not associated with bodyweight but was influenced by liver function as reflected by INR. In this population, bodyweight-based dosing of dexmedetomidine may not be applicable and titration of dose to clinical effect is important.

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**THE PERSISTENCE OF ICU DELIRIUM AFTER CESSION OF SEDATIVES AND ANALGESICS**

Michael Kenes, Joanna Stollings, Li Wang, Timothy Girard, E. Wesley Ely, Pratik Pandharipande

**Learning Objectives:** To date, only one study has examined the epidemiology of delirium both during and after cessation of sedatives and opioids. The purpose of this study was to characterize the natural history of sedation-associated delirium.

**Methods:** This study included adults admitted to the medical ICU at Vanderbilt University Medical Center who required mechanical ventilation with receipt of continuous drips of analgesia and/or sedation and underwent a spontaneous awakening trial (SAT). We identified delirium using bedside-nurse CAM-ICU assessments and defined delirium as rapidly-reversible sedation-associated delirium (RRD) if it resolved within 4 hr (the frequency of our CAM-ICU assessments) of SAT or persistent delirium if it did not resolve.

**Results:** The study population included 70 patients that underwent 103 SATs. In the per-SAT assessment analysis, 28 (27.2%) were delirium free prior to cessation of sedation. Of the remaining 75 assessments in which delirium was present before the SAT, delirium persisted for at least four hr in 62/75 (82.7%) and persisted beyond 24 hr after the SAT in 1 in 38/75 (51%). In the 57/75 (49%) assessments in which delirium resolved within 24-hr of the SAT, the median (IQR) time to becoming delirium free was 9.8 (6.4-13.8) hr. At the patient-level analysis, 17 of 70 patients (24.3%) were delirium free prior to cessation of their medications, 42 (60%) had at least one episode of persistent delirium after an SAT and 11 (15.7%) had only RRD.

**Conclusions:** Even after cessation of continuous analgesia and/or sedation, sedation-associated delirium persists for the majority of patients. The relevance of the clinical distinction between RRD and persistent delirium needs to be studied further.

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**EVALUATION OF THROMBOELASTOGRAPHY FOR VENOUS THROMBOEMBOLISM PROPHYLAXIS IN LIVER FAILURE PATIENTS**

Jennifer Garber, Anne Rose, Chris Viesselmann, Jeffrey Fish

**Learning Objectives:** Liver disease affects over 30 million people annually in the United States. When these patients are hospitalized, questions arise regarding the need for venous thromboembolism (VTE) prophylaxis. It is commonly believed that patients with liver failure and an elevated international normalized ratio (INR) are “auto-anticoagulated.” Traditionally, conventional coagulation tests have been used to measure coagulation status in this population; however these tests do not provide information on the overall balance of coagulation. Thromboelastography (TEG) may be a novel method of assessing coagulation balance. The objective of this study was to evaluate the correlation between TEG (R-time and alpha-angle) and INR in admitted patients with documented liver failure and elevated INRs. Secondary objectives of VTE and bleeding rates were also compared.

**Methods:** Enrollment occurred from January 1 through May 30, 2015. Clinical pharmacists screened for VTE risk factors within 24 hr of admission using institution approved VTE risk assessment models. TEG was recommended for high VTE risk liver failure patients not placed on chemical prophylaxis. Based on TEG results, chemical prophylaxis was either initiated or withheld.

**Results:** A total of 37 patients were enrolled during the study period. Average age was 55.7 yr (range 28–77) and 56.7% were male. Average INR was 2.17 (range 1.5–4.7), and average platelet count was 119 K/mcl. (range 38–331). TEG was performed on 15 patients (35.1%). Of patients who had a TEG, 13 demonstrated a normal R time. VTE prophylaxis was initiated in 73.3% of high VTE risk patients with TEG and 68.2% of high VTE risk patients without a TEG. Overall, 3 bleeding events took place, and 1 VTE event occurred. **Conclusions:** An elevated INR did not correlate with increased bleeding risk, as demonstrated by normal coagulation status depicted by R time via TEG. No differences in bleeding or VTE rates were seen in patients who had VTE prophylaxis ordered based on TEG results.

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**ASSOCIATION BETWEEN COMPLIANCE TO THE YALE ALCOHOL WITHDRAWAL PROTOCOL AND OUTCOMES**

Maria Cardi, Claire Chan, Mojdeh Heavner, Jason Heavner

**Learning Objectives:** The Yale Alcohol Withdrawal Protocol (YAWP) is intended for patients admitted to the ICU with concern for alcohol withdrawal. The protocol uses a comprehensive treatment algorithm that provides symptom-triggered benzodiazepine doses based on the results of a scoring tool, the modified Minnesota Deterioration Scale (MINDS). The primary purpose of this study was to determine whether compliance to the algorithm is associated with improved outcomes.

**Methods:** This was a retrospective study of a previously analyzed cohort of patients following implementation of YAWP in the medical ICU at Yale-New Haven Hospital. Patients were included if they received YAWP post-implementation, and if outcomes data were available. The outcomes assessed were frequency of intubation, duration of intubation, ICU length of stay, and ICU-related pneumonia. Compliance was defined as meeting compliance criteria in ≥ 80% of all occasions. Dose compliance was defined as benzodiazepine dose administered within 30 min of the time the MINDS score was assessed. Score compliance was defined as benzodiazepine dose administered within 80% of the time interval specified by the algorithm. Results were analyzed using Fisher’s Exact Test and Welch t-test as appropriate.

**Results:** There were 89 patients included in the analysis. Of these, 65% (57/89) were score compliant and 71% (63/89) were dose compliant. The average compliance to score was 72% and the average compliance to dose was 64%. Compliance in any domain was not associated with a decreased intubation rate. Dose compliance was associated with a shorter ICU length of stay (55 hr vs. 96 hr, P=0.017) and duration of intubation (0.58 days vs. 2.24 days, P=0.019). Score compliance was associated with a trend towards decreased ICU length of stay (65 hr vs. 93 hr, P=0.165). Dose compliance was associated with a trend towards decreased ICU-related pneumonia (4% vs. 19%, P=0.098).

**Conclusions:** Dose compliance to the YAWP algorithm was associated with a decreased ICU length of stay and duration of intubation, but no difference in the intubation rate.
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PROPENSITY MATCHED ANALYSIS COMPARING HYPOTENSION BETWEEN ETOMIDATE AND KETAMINE IN SEPTIC PATIENTS
Megan Van Berkel, Meredith McCauley, Matthew Eslide, Kari Mount, Lindsay Ryder, Gary Phillips, Naem Ali, Bruce Doepker

Learning Objectives: Etomidate is commonly used for intubation with minimal hemodynamic effects, however its suppression of cortisol production may have a significant impact on a patient’s ability to maintain hemodynamic stability. Ketamine is also frequently used and has minimal effects on hemodynamics but no proven influence on the adrenal axis. Methods: A retrospective cohort study was performed to compare the incidence of clinical hypotension between ketamine and etomidate in critically ill septic patients. Clinical hypotension was defined as: mean arterial pressure (MAP) decrease > 40% and MAP <70 mmHg, MAP <60 mmHg, systolic blood pressure (SBP) 15 min, initiation of vasopressors, or increase to > 30% of the initial vasopressor dose. In addition, patients were evaluated for length of hospital and ICU stay, and mortality. Statistical analyses included unmatched and matched cohorts using a propensity score analysis. Multivariable logistic regression was used to evaluate the incidence of clinical hypotension 24 hr post intubation and vasopressor requirements. Results: A total of 260 patients were included for analysis (129 etomidate and 131 ketamine) with 138 patients matched 1:1 based on propensity score. Prior to propensity matching, clinical hypotension 24 hr post intubation was 75.2% in the etomidate group compared to 69.5% in the ketamine group (p=0.302) and there was no statistical difference in new onset hypotension following intubation. A random-effects logistic regression model was applied and there was a 38% reduction in clinical hypotension with ketamine (OR=0.62, 95% CI 0.3-1.29, p=0.2). There was also no statistical difference in ICU or hospital length of stay or mortality. Conclusions: Administration of etomidate for intubation did not increase the incidence of clinical hypotension 24 hr post intubation and vasopressor requirements. There was also no statistical difference in clinical hypotension within 24 hr (40.6%; 40.6%, p=0.2). There was also no statistical difference in ICU or hospital length of stay or mortality. Conclusions: Administration of etomidate for intubation did not increase the incidence of clinical hypotension 24 hr post intubation when compared to ketamine in septic patients. Large, prospective trials are warranted to confirm these results.

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DO ANTIPSYCHOTICS IMPROVE ICU OUTCOMES IN PATIENTS WITH DELIRIUM?
Juliane Jablonski, Alexander Schutz, Jose Pasqual L, Todd Miano, Tara Collins, Nick Martin

Learning Objectives: Introduction: Delirium in critically ill patients is associated with poorer ICU outcomes. Antipsychotics (both typical and atypical) such as quetiapine and haloperidol have been suggested to reduce days of delirium in the ICU. We hypothesize that antipsychotics are associated with improved ICU outcomes including less continuous opioid and sedative use, increased time at goal RASS of 0 to (-1), and ventilator free days. Methods: Methods: All mechanically ventilated patients admitted to the surgical ICU at an academic medical center during a 9 month period in 2014 with delirium were captured in a prospective, observational, performance improvement database. A clinical practice guideline for pain, agitation, and delirium (PAD) was in effect throughout the study period but did not obligate antipsychotic use. Sedation and agitation were measured by Richmond Agitation Sedation Scale (RASS) score, delirium by the Confusion Assessment Method for the ICU (CAM-ICU), and pain by Behavioral or Numeric Pain Score (NPS/BPS). Patient acuity was controlled for using age and APACHE score. Statistical analysis was facilitated via a multi-variant regression model. Results: Results: 173 patients met inclusion criteria, of which 52 received antipsychotics vs 121 without exposure. When controlling for age and APACHE, Ventilator free days were higher in patients exposed to antipsychotic medications (1.55 vs. 5.215, p=0.01). No significant differences were found in mean time of continuous opioid infusions (56% vs 47%) or sedative infusions (38% vs 21%) during mechanical ventilation. There were no differences in mean percentage of time at goal RASS of 0 to (-1), (50% vs 54%) or NPS/BPS goal showing adequate pain control between the groups. Conclusions: Conclusion: Use of antipsychotics in additional to a formal PAD clinical practice guideline may increase ventilator free days in surgical critical care patients, but may not impact RASS goal, or exposure to sedative and narcotic infusions.

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HIGH-VERSUS LOW-DOSE RECOMBINANT ACTIVATED FACTOR VII USE IN CARDIAC SURGERY PATIENTS
Joel Feih, Joseph Rinka, Huzefa Ghadiali, Markus Kaiser

Learning Objectives: Excessive bleeding occurs in 15% of cardiac surgery patients, with 2% of the total cases requiring interventions beyond blood products and reperfusion. Off-label use of recombinant activated factor VII (rFVIIa) has been utilized in these patients, although there are mixed data regarding successful prevention of reperfusion and incidence of thromboembolic events (TE). Therefore we decided to investigate the risk for failure with low-dose versus high-dose. Methods: This retrospective study evaluated 13 patients that received low-dose rFVIIa (less than 50 mcg/kg) and 18 patients that received high-dose rFVIIa (greater than 50 mcg/kg) for severe post-cardiac surgery related bleeding between September 2013 and February 2015. The primary outcome of the study was failure of rFVIIa, defined as a composite of reperfusion, need for repeat dosing within 6 hr post initial dose or chest tube output > 400 mL/hr within 6 hr post-dose. Pertinent secondary outcomes were the units of blood products given, chest tube output (6hr post-dose), TE (PE, DVT, pericardial clot, stroke, MI) and hospital mortality. Results: There were no statistically significant differences in the rate of failure between low- and high-dose rFVIIa for the composite outcome (69% vs 39%, p = 0.15). Rates of re dosing or reperfusion were not statistically different between groups, although the low-dose group required redosing more frequently (62% vs 23%, p = 0.06). The high-dose group had a numerically higher risk of TE (33% vs 8%, p = 0.19). There were no differences in blood products utilized, chest tube output, or mortality following rFVIIa. Conclusions: There are no statistically significant differences in efficacy or safety between low-dose and high-dose rFVIIa for excessive bleeding following cardiac surgery. However, there were numerically higher rates of redosing with the low-dose group and rates of TE with the high-dose group. Utilizing low-dose rFVIIa and titrating to effect may help prevent TE, more research is necessary to confirm these results.

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EFFECT OF DORNASSE ALPHA ADMINISTRATION IN MECHANICALLY VENTILATED PEDIATRIC PATIENTS
Larry Ngo, Juan Martinez, Salem Dekom, Sharon Thomas, Kozue Shimabukuro

Learning Objectives: Dornase alpha is a recombinant human DNase that cleaves extracellular DNA. It reduces airway spum viscosity and subsequently increases airway clearance. Dornase alpha has been traditionally used in patients with cystic fibrosis. Recently some studies have shown radiographic evidence of clearing of atelectasis when dornase alpha is used in non-cystic fibrosis patients. In light of these studies, ICU usage of dornase alpha has increased. Our study aims to evaluate the effect of dornase alpha on the duration of mechanical ventilation in pediatric patients. Methods: This IRB-approved retrospective cohort analysis reviewed single-center mechanical ventilation data from 2002 to 2013. Patients were included if they were <18 yr old, and were placed on mechanical ventilation due to respiratory failure. Patients were excluded from the study if they were intubated for other reasons (e.g. trauma, post-op, cardiac disease). Included patients were categorized into two groups: those who received dornase alpha, and those who did not. Baseline characteristics and severity of lung disease of the two groups were statistically equivalent. Using the Independent Samples T test and the Mann-Whitney test, the outcomes of reoperation, need for repeat dosing within 6 hr post initial dose or chest tube output were compared. The dornase alpha group had a significantly longer duration of ventilator days (20.5 vs 2.7 days, p <0.001) and longer ICU days (35.4 days vs 16.2 days, p <0.001). There was no difference in

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mortality (p < 0.45). Conclusions: Considering the poor outcomes associated with administration of dornase alpha, routine administration of dornase alpha for mechanically-ventilated pediatric patients suffering from respiratory failure should be withheld until randomized control studies are completed.

605 ASSOCIATION OF INSULIN DOSE, DIABETES, AND DIALYSIS WITH HYPOGLYCEMIA IN TREATMENT OF HYPERKALEMIA
Heather LaRae, Gary Peksa, Shital Shah

Learning Objectives: Hypoglycemia following intravenous (IV) insulin has been reported to occur with greater frequency in patients with acute kidney injury (AKI) or end-stage renal disease (ESRD). The purpose of this study was to investigate the safety and efficacy of 5 versus 10 units of insulin for hyperkalemia treatment in patients with renal insufficiency (AKI or ESRD) and identify risk factors for hypoglycemia. Methods: Single center, retrospective cohort study of patients in the emergency department between January 2008 and November 2014. Two groups compared were those treated with 5 versus 10 units of insulin for hyperkalemia with renal insufficiency. The primary outcome was incidence of hypoglycemia (blood glucose [BG] < 70 mg/dL). Secondary outcomes were incidence of severe hypoglycemia (BG < 40 mg/dL) and change in serum potassium following insulin therapy. Descriptive, bivariate and multivariate regression analyses were conducted to identify risk factors associated with hypoglycemia. Results: Hypoglycemia occurred in 18 of 96 patients in the 5 unit insulin group (18.8%), as compared with 108 of 406 patients in the 10 unit insulin group (26.6%) (95%CI -16.8 to 1.1). Incidence of severe hypoglycemia was 3.1% and 6.9% for insulin 5 and 10 units, respectively (95%CI -8.0 to 0.5). Decrease in potassium was similar between groups, 1.1 ± 0.7 mEq/L in the 5 unit insulin group versus 1.0 ± 0.7 mEq/L in the 10 unit insulin group (95%CI -0.1 to 0.2). A multivariate regression of the primary outcome revealed an increased risk of hypoglycemia with receipt of 10 units of insulin (OR 2.19, 95%CI 1.20 to 3.99) and hemodialysis (HD) dependence (OR 2.84, 95%CI 1.79 to 4.51). Older age (OR 0.98, 95%CI 0.97 to 0.99) and insulin-dependent diabetes mellitus (OR 0.49, 95%CI 0.25 to 0.99) were associated with a lower risk of hypoglycemia. Conclusions: In the treatment of hyperkalemia with insulin, a reduced dose may decrease risk of hypoglycemia without compromising efficacy. An insulin dose of 5 units may be considered for younger age or HD dependent patients to reduce the risk of hypoglycemia.

606 EVALUATION OF ANTITHROMBIN SUPPLEMENTATION ON HEPARIN ANTI-COAGULATION IN PEDIATRIC ECMO PATIENTS
Sharon Gordon, Travis Heath, Ali Bourguet-Vincent, Caroline Ozment

Learning Objectives: Heparin, the anticoagulant most commonly used in extracorporeal membrane oxygenation (ECMO), works by potentiating the effects of antithrombin III (ATIII). Although studies have found lower ATIII levels in ECMO patients on ECMO, current literature has shown variable effects of ATIII supplementation on surrogate markers of heparin anticoagulation in this population. Methods: Single-center, retrospective chart review of ATIII supplementation in pediatric patients supported with ECMO from April 1, 2013 to October 31, 2014 at Duke University Hospital. The primary endpoint of the study was the net change in heparin anti-Xa level following the administration of ATIII. Secondary endpoints examined the differences in achieving and maintaining therapeutic anti-Xa levels, bleeding rates and survival between the cohort of patients receiving ATIII and those not receiving ATIII. The Mann-Whitney U-test was used to test differences in secondary endpoints comprised of continuous data and associations between categorical variables were examined using chi-squared tests. Results: 54 pediatric patients were supported on ECMO during the study period, with 23 of these patients receiving at least one dose of ATIII. For patients receiving ATIII, the average change in anti-Xa level was 0.16 ± 0.13 IU/mL (p<0.0001). The average time to achieve the first therapeutic anti-Xa level did not differ between groups, however, the duration of therapeutic heparin levels was longer in those given ATIII (p=0.0233). Survival at 30 days from cannulation and survival to discharge (52.17% vs. 74.19%; p=0.0938) were not significantly different between groups. The rate of intracranial hemorrhage was higher in patients receiving ATIII (30.43% vs. 6.45%; p=0.0194). Rates of gastrointestinal hemorrhage or surgical site bleed did not vary between groups. Conclusions: The paucity of evidence for the efficacy of ATIII in improving anticoagulation measures, paired with the potential risks and costs of administration, support a re-evaluation of the current approach to ATIII supplementation in pediatric patients supported on ECMO.

607 RIVAROXABAN VS. STANDARD OF CARE POST ULTRASOUND ACCELERATED THROMBOLYSIS FOR PULMONARY EMBOLISM
Claudia Dubois, Patricia Louzon, Rohit Bhatheja

Learning Objectives: Pulmonary embolism (PE) is a potentially life-threatening condition afflicting over 600,000 patients annually in the United States. The standard of care (SOC) for the treatment of acute PE is initial anticoagulation with intravenous unfractionated heparin, low molecular weight heparin or fondaparinux followed by long-term oral anticoagulation with warfarin. For patients with massive and submassive PE, locally delivered alteplase and parental anticoagulation with ultrasound assisted thrombolysis (USAT) hastens the fibrinolytic process via the application of high frequency, low powered ultrasound to disband the fibrin components of the clot. Rivaroxaban may offer a more convenient method of oral anticoagulation. This study evaluates if the use of rivaroxaban post USAT decreases the length of stay(LOS), overall cost of hospitalization and incidence of major and minor bleeding events compared to SOC. Methods: A retrospective chart review was performed of patients ≥18 yr of age who underwent USAT for PE between January 1, 2012 and November 1, 2013 at Florida Hospital Orlando. Patients who received SOC post procedure were compared to those who received rivaroxaban in a matched and unmatched analysis. Information collected included patient demographics, clinical presentation, home anticoagulation regimens and pertinent laboratory values. Total alteplase and heparin doses, LOS, bleeding events, cost of hospitalization and anticoagulation were also collected. Results: A total of 59 patients received USAT with alteplase for PE during the study period (rivaroxaban n=10, SOC unmatched n=47, SOC matched n=10). There was no statistical difference between rivaroxaban and SOC groups for the primary outcome of LOS in the matched analysis, 6.5 vs 5.6 days (p=0.08) or unmatched analysis, 10 vs 5.6 days (p=0.097). However, there appears to be a trend toward clinical significance. The principal safety outcome of major bleeds did not occur. Secondary outcomes of cost, ICU LOS and minor bleeds were similar in both analyses. Conclusion: Rivaroxaban appears to be well tolerated and may decrease LOS post USAT for PE.

608 EVALUATION OF A LOW-DOSE HEPARIN NOMOGRAM FOR CARDIAC SURGERY PATIENTS WITH HIGH BLEEDING RISK
Sean Kelly, Ashleigh Lowery, Mehrnaz Pajoumand, Carla Williams, Daniel Herr

Learning Objectives: For patients with high bleeding risk in addition to an indication for anticoagulation in the cardiac surgery population, there is concern about starting heparin infusions. Therefore, lower PTT goals are sometimes chosen as a target. Our purpose was to determine if a heparin nomogram targeting a low PTT goal of 45–55 seconds was executable as well as safe and effective in cardiac surgery patients. Methods: A heparin nomogram targeting a low PTT goal of 45–55 seconds was piloted in the cardiac surgery ICU and telemetry units. Ninety-nine patients were included in this retrospective study. Conclusions: No statistical difference between rivaroxaban and SOC groups for the primary outcome of LOS in the matched analysis, 6.5 vs 5.6 days (p=0.08) or unmatched analysis, 10 vs 5.6 days (p=0.097). However, there appears to be a trend toward clinical significance. The principal safety outcome of major bleeds did not occur. Secondary outcomes of cost, ICU LOS and minor bleeds were similar in both analyses. Conclusion: Rivaroxaban appears to be well tolerated and may decrease LOS post USAT for PE.
dosing weight and correct starting rate were 86% and 75% respectively. The rate of correct dose adjustments was 90.3%. On average, it took 2.28 adjustments per nomogram protocol to achieve a PTT goal of 45–55 with 59% of patients achieving the goal PTT range on day 2 of therapy. Twenty-five patients met the bleeding definition and 16 patients had a thrombotic event. Eighteen of the 25 patients who met the bleeding definition were ECMO patients (72%). Most new clots were line-associated DVTs, also in the ECMO population.

Conclusions: Overall, the low-dose nomogram was effective at achieving the goal PTT. Given the population, the moderate rates of bleeding and thrombosis were expected but may require further investigation.

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ARE WE PROVIDING ADEQUATE ANALGESIA & SEDATION TO CRITICALLY ILL, MECHANICALLY VENTILATED PATIENTS?
Joshua Steelman, Charleen Gnisci, Lisa Hall Zimmerman, Lesly Jurado, Steven Nakajima

Learning Objectives: Analgesia first for sedation before adding agitation medications is advocated by the 2013 Society of Critical Care Medicine (SCCM) Pain, Agitation, and Delirium Guidelines. The objective of this study was to evaluate analgesia and sedation regimens in critically ill, mechanically ventilated patients to determine appropriateness prior to and throughout the duration of intubation.

Methods: This retrospective, IRB-approved study evaluated consecutive patients ≥18 yr admitted to the medical intensive care service ≥24 hr requiring mechanical ventilation from July 1–31, 2014. Time periods evaluated: 0–24 hr, 25–48 hr, 49–72 hr, and 0–72 hr. Time of intubation was defined as time 0. Inappropriate analgesia/sedation (IAAS) was defined as 1) no analgesia ordered, 2) analgesia ordered, none given in 24 hr, 3) intermittent fentanyl <400 mcg/hr and escalating propofol dose and/or inappropriate benzodiazepines (IBZD), or 4) continuous fentanyl <100 mcg/hr with propofol >30 mcg/kg/min and/or IBZD. All other cases were deemed appropriate analgesia/sedation (AAS).

Results: Of the 230 patients evaluated, 46 met inclusion during 0–72 hr, (13 AAS, 33 IAAS). Patients were 62 ± 16 yr of age with primary diagnoses of sepsis, 59%, and respiratory failure, 55%. Time 0–24 hr had 61% IAAS, 25–48 hr had 62% IAAS, and 49–72 hr had 52% IAAS. IAAS had less analgesia before sedation, 36% IAAS vs 69% AAS, p=0.04. In all three time periods, no analgesia ordered or analgesia ordered but not given occurred at least 40% of the time. In-hospital mortality was more likely with IAAS, 54% IAAS vs 15% AAS, p=0.02. In surviving patients, hospital and ICU LOS were not different. No difference with vasopressors used occurred between groups, 52% IAAS vs 61% AAS, p=0.53.

Conclusions: Analgesia and sedation are important aspects of care for critically ill patients. We identified opportunities to improve analgesia and sedation since the majority of our patients did not receive AAS. With 40% of patients receiving no analgesia in the first 72 hr after intubation, early evaluation of our patients is imperative.

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IMPACT OF IMPROVED SEDATION PRACTICES ON POSITIVE OUTCOMES IN CRITICALLY ILL PATIENTS
Kayla Kutch, Christopher Miller, Darowan Akajagbor, William Darko

Learning Objectives: In 2013, the society of critical care medicine (SCCM) updated the guidelines for management of pain, agitation, and delirium (PAD) as these are essential components of care for mechanically ventilated patients. Based on these guidelines, a protocol was created and included in the hospital’s computer physician order entry system (CPOE). The objective of this study was to assess the impact of changes in sedation practices on patient outcomes in mechanically ventilated medical ICU patients.

Methods: This was a retrospective cohort study of patients admitted to the medical ICU in 2012 (pre-protocol) and 2014 (post-protocol). Adult patients mechanically ventilated (MV) for at least 24 hr were included. Patients were excluded if they were admitted with anoxic brain injury, received a neuromuscular blocker infusion, or if a tracheostomy was performed. Baseline demographics, comorbidities, APACHE II scores, pain and sedation scores were extracted from the medical record in addition to outcomes such as time on MV, length of stay (LOS) and mortality pre and post-protocol.

Results: A total of 193 patients were included, 93 pre-protocol and 100 post-protocol. A decrease in the duration of MV was observed in the post-protocol group (135 vs. 89 hr, p<0.004). A reduction in the percentage of patients receiving continuous infusion benzodiazepines was also seen post-protocol (80% vs. 65% p=0.024). The post-protocol phase was associated with a reduction in the percentage of patients on sedation infusions alone without an analgesia regimen (27% vs. 13%, p=0.015) and an increase in the percentage of patients receiving analgesia only-based sedation (0% vs. 6%, p=0.016). No significant differences in ICU length of stay (p=0.062), hospital length of stay (0.320) or mortality (0.240) were seen. Conclusions: The release of 2013 PAD guidelines improved our ICU sedation practices which resulted in an observed reduction in the median duration on MV. Further research is needed to determine the full impact of a comprehensive PAD protocol implementation on patient outcomes.

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SEVERE CARBAMAZEPINE OVERDOSE TREATED WITH LIPID EMULSION THERAPY, HEMODIALYSIS, AND PLASMAPHERESIS
Asya Agulnik, Daniel Kelly, Rebecca Brucoleri, Christopher Yuskaits, Michele Burns, Daniel Kohane

Learning Objectives: Carbamazepine poisoning is a common cause of pediatric and adult intensive care admission. We describe the successful treatment of a severe overdose with extended-release carbamazepine tablets. In the face of critical illness with very high and rapidly climbing serum drug concentrations, a combination of therapies were employed.

Methods: A 15-year-old woman presented with altered mental status (GCS 5), respiratory failure, and shock after intentional ingestion of approximately 280 extended-release 200 mg carbamazepine tablets with a peak serum concentration of 138 mcg/mL (583.74 mcmol/L, the highest recorded in the literature) and severe lactic acidosis. The patient developed clinical seizures and was found to have a distinctive pattern of stimulus-induced rhythmic, periodic, or ictal discharges (SIRPIDs) on EEG suggestive of significant cortical dysfunction. Due to the patient’s extremely high drug serum concentration and unstable clinical status, the treatment team employed a combination of therapies in her management. She was treated with lipid emulsion therapy, plasmapheresis, hemodialysis, continuous veno-venous filtration, and endoscopic intestinal decontamination. The patient’s high serum lactate with a high mixed venous saturation suggested possible mitochondrial dysfunction, prompting treatment with a barbiturate coma to reduce cerebral metabolic demand.

Results: The serum carbamazepine concentration declined steadily, with resolution of lactic acidosis, no long-term end-organ damage, and return to normal neurologic function. The patient was eventually discharged in her baseline state of health.

Conclusions: Severe life-threatening carbamazepine toxicity can be successfully treated with a combination of modalities to achieve a full recovery. Neurologic dysfunction in carbamazepine poisoning is known to include seizures; we also observed other EEG abnormalities (SIRPIDs). Mitochondrial dysfunction, evidenced by a high serum lactate and mixed venous saturation, may also occur in severe carbamazepine toxicity.

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VITAMIN D DEFICIENCY IN A CARDIAC SURGERY ICU: STANDARD DOSES ARE NOT ENOUGH
Ashleigh Lowery, Amanda Tauber, Daniel Herr

Learning Objectives: Vitamin D deficiency is encountered frequently in critically ill patients and is associated with adverse health outcomes related to cardiovascular events, muscle and respiratory weakness, Clostridium difficile, and sepsis. There is a wide range of dosing recommendations for vitamin D supplementation, including some evidence that high doses are safe, but little evidence to evaluate their efficacy. Our purpose was to evaluate the treatment of vitamin D deficiency in a cardiac surgery ICU.

Methods: We conducted a retrospective review using the electronic medical record. All patients who received vitamin D (ergocalciferol) in the cardiac surgery ICU were included. We evaluated an 18 month period from January 2013 to June 2014. Patient demographics, baseline serum vitamin D-25(OH) levels, vitamin D dosing, follow-up vitamin D-25(OH) levels, and calcium levels were collected.

Results: A total of 62 patients were included. The majority of patients were heart/lung transplant, valve

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replacement or repair, or CABG surgery. Ages ranged from 23–88 yr (mean 62 yr). The mean baseline vitamin D level was 17.5 ng/mL. Dosing regimens varied widely and ranged from ergocalciferol 400 units daily to 50,000 units daily, with the most common being 50,000 units weekly. The mean duration of therapy was 16 days (range 2–116 days) and the mean follow-up level was 25.6 ng/mL. Of those patients with a follow-up vitamin D level, only 34.8% (n=8) achieved a level >30 ng/mL (lower limit of normal) and no patients exceeded the upper limit of normal (100 ng/mL). For patients who achieved a vitamin D level of >30 ng/mL, the majority (50%) were on a dose of 50,000 units daily, with a duration ranging 10–37 days. No hypercalcemia was observed. Conclusions: In a cardiac surgery population, the majority of patients did not reach a normal serum vitamin D level using standard dietary doses of vitamin D. The dosing regimens in patients who reached a normal serum level suggest that high dose vitamin D is effective. This warrants further study and ongoing evaluation of this regimen during patient care.

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AUTHORIZED AGENT CONTROLLED ANALGESIA IMPROVES PAIN CONTROL IN CRITICALLY ILL ADULT PATIENTS
Jonathan Messing, Joseph Aburahma, Richard Amundur, Madelyn Hernandez, Sarah Sirajuuddin, Daniille Davison, Babak Sarani

Learning Objectives: The efficacy and safety of authorized agent controlled analgesia (AACA), also known as patient controlled analgesia by proxy, is documented in the pediatric literature. Most adult ICUs do not offer this therapy. This study evaluates the efficacy and safety of AACA in the critically ill adult patient. Methods: A retrospective observational study was performed after an AACA protocol was introduced in a 42 bed mixed medical/surgical ICU. Patients requiring mechanical ventilation, frequent opioid dosing, or comfort care were independently placed on AACA by the ICU team. Nonverbal pain score and Richmond Agitation Sedation Severity Score (RASS) along with opioid and sedative use were abstracted 24 hr before and after intervention. Scores were compared using paired student t-tests. A mixed regression model adjusting for hour was used to control for change in pain over time. A random-effects mixed model was used to test whether the slope of pain scores differed from pre to post-AACA. A fixed effects mixed model was used to control for use of non-narcotic medications. Results: Among the 46 patients studied, the mean number of pain score evaluations was 9.3 ± 5.0 pre- and 10.4 ± 4.5 post-AACA. Mean change in pain score was -3.4 ± 2.0 (95% confidence interval -4.0 to -2.7). This represented a significant 70% drop in mean pain score (p<0.0001), from a pre-AACA mean of 4.8 ± 1.8 to a post-AACA mean of 1.5 ± 1.6. Examination of the slope of pain scores by hour found little change within the pre- and post-AACA period, with a large drop from pre- to post-AACA. Mean RASS score decreased significantly (-0.2 ± 1.9 vs -1.6 ± 1.3, p<0.0001), but in the model controlling for use of sedatives and analgesic medications, the effect of AACA on pain scores (pre- vs post-) remained significant (p=0.0001). No patient required naloxone. Conclusions: Use of AACA is associated with a significant reduction in pain scores in critically ill patients. Larger studies are warranted to confirm these findings.

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WARFARIN REVERSAL IN ICH: ACTIVATED VERSUS INACTIVATED FOUR FACTOR PROTHROMBIN COMPLEX CONCENTRATES
Mary Lunefsky, Deepika Pereira, Kimberly Levasseur-Franklin, Kasey Greathouse

Learning Objectives: Intracranial hemorrhage (ICH) is a significant cause of morbidity and mortality in patients taking vitamin-K antagonists. Rapid reversal of the international normalized ratio (INR) is crucial. Prothrombin complex concentrates (PCCs) are used to reverse INR. There are activated (APCC) and inactivated formulations (IPCC). Currently there is no literature comparing APCCs and IPCCs for this indication. This study was conducted to determine if there was any difference in overall INR reversal between the two PCCs. Methods: Single center, retrospective cohort study at Northwestern Memorial Hospital from January 2012 to December 2014. In March 2014, the formulary PCC changed from an APCC to an IPCC. Patients were included before and after the formulary change. Demographics, comorbidities, and clinical laboratory parameters were extracted from electronic medical records as well as outcomes such as length of stay (LOS), mortality, and thrombotic complications. The primary endpoint was percent and overall change in INR. Results: 24 patients were included in the study. 15 patients received the APCC and 9 received the IPCC. Baseline characteristics between groups were similar. The average age in the IPCC group was 65.3 yr. and 70 yr in the APCC group. Both the overall and percent change in INR were significantly different between groups. Baseline INR prior to PCC administration in the IPCC and APCC groups was 2.44 ± 0.72 and 2.98 ± 1.2, respectively (p=0.324). The INR post PCC administration in the IPCC and APCC groups was 1.29 ± 0.30 and 0.90 ± 0.15 (p=0.001). The overall percent change was 44.7% and 65.3% in the IPCC and APCC groups (p=0.001). There were three cases of deep vein thrombosis or pulmonary embolism in the APCC group, and zero cases in the IPCC group (NS). There were no differences between groups with respect to ICU LOS, hospital LOS, or mortality. Conclusions: APCC more effectively lowered the INR than IPCC. However, both IPCC and APCC reversed INR appropriately. There was a higher rate of thrombotic complications in the APCC group.

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INTRAPELVIC FIBRINOLYTIC AND DNASE THERAPY FOR PLEURAL INFECTION LEADS TO SURGICAL AVOIDANCE
Cara McDaniel, Michele Handzel, Scott Cowan, Nathaniel Evans, Boyd Hehn

Learning Objectives: Complicated parapneumonic effusion (PPE) and empyema involve bacterial infection of the pleural space and have a mortality rate of 10–20%. Standard therapy for PPE management is use of systemic antibiotics and tube drainage of infected pleural fluid. However, one-third of patients fail conventional therapy and require more aggressive surgical intervention when drainage is hindered by septations and loculations. The administration of an intrapleural (IPL) fibrinolytic (alteplase, rtPA) paired with enzymatic debridement (dornase alfa, DNase) is a therapeutic option, especially in poor surgical candidates. Methods: This is a single center, retrospective, descriptive analysis of clinical practice for adult patients admitted to our academic medical center who received IPL rtPA/DNase therapy for complicated PPE treatment from May 2012 to November 2014. All patients were deemed high peri-operative risk for surgical intervention. Outcomes were radiographic resolution, surgical avoidance, and all-cause mortality. Safety endpoints were bleeding events leading to cessation or interruption in therapy. Results: Thirty-four patients and 38 treatment courses were evaluated. Of these, 4 patients received IPL rtPA/DNase on two separate occasions. A course was defined as rtPA/DNase twice daily for 3 days. 10–20% of patients did not reach a normal serum level suggest that high dose vitamin D is effective. This warrants further study and ongoing evaluation of this regimen during patient care.

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CLINICAL AND PHARMACOKINETIC EVALUATION OF ORAL ACETAMINOPHEN ABSORPTION IN CRITICALLY ILL PATIENTS
Abby Rhoades, Molly Droge, Chris Droge, Megan Welch, Neil Ernst, Shaun Keegan, Eric Mueller

Learning Objectives: Serum acetaminophen concentrations following oral administration are anecdotally postulated to be a gastrointestinal function biomarker in critically ill patients. Except transit time and gastric residuals, limited
data describes clinical and pharmacokinetic utility of acetaminophen absorption tests (AAT). The study aim was to characterize AAT and determine risk factors for undetectable serum concentrations. Methods: Single-center, retrospective, observational cohort study performed in adult critically ill patients admitted to the surgical (SICU) or medical intensive care unit (MICU). Patients were excluded if oral, rectal or IV acetaminophen was administered within 12 hr of AAT; serum concentrations were obtained >180 min after AAT, or actual body weight >150 kg. Absorption (ABS) was defined as serum concentration ≥10 mg/L. Results: Nineteen patients were eligible for inclusion (17 ABS vs 2 no ABS [nABS]) accounting for 20 positive and 8 negative AAT. Gender, weight, vasopressor days, abdominal surgeries, cumulative fluid total, and mechanical ventilator (MV) use were similar between groups. Patients exhibiting nABS were younger (60 ± 15 vs 53 ± 14 yr, p=0.026). Weight, MV use, nasogastric suction and output, and SOFA scores were similar on AAT day. AAT dose, mg/kg dose, dosage form and route were similar. Nutritional parameters including caloric intake, serum albumin, prealbumin, transferrin, and C-reactive protein were similar. Two serum concentrations (IQR 2-3) were drawn per patient between 30–120 min (first assay mean time 48 ± 28 min, concentration 17 [IQR 11–19] mg/L, second assay mean time 94 ± 42 min, concentration 15 [IQR 13–20] mg/L) following a mean dose of 14 ± 3.7 mg/kg. No independent risk factors for nABS were identified via multivariate logistic regression analysis. Conclusions: AAT may provide a surrogate marker for absorption in critically ill patients when a dose of 10-15mg/kg is administered with two serum concentrations drawn 30–120 min after administration. Prospective studies with clinical outcomes are needed to validate this approach.

617 USE OF INTRAVENOUS SILDENAFIL IN PEDIATRIC PATIENTS AT AN ACADEMIC CHILDREN’S HOSPITAL
Eliana Van Zyl, Grace Shin, Kristine Parbuoni

Learning Objectives: Sildenafil, a selective phosphodiesterase-5 inhibitor, is utilized in pediatric pulmonary arterial hypertension (PAH) due to its ability to decrease pulmonary arterial pressure and pulmonary vascular resistance. Frequently, critically ill children with PAH are unable to absorb medications via the enteral route and therefore would benefit from intravenous (IV) sildenafil. Data on the safety of IV sildenafil in pediatric patients is lacking. Methods: This was a retrospective, observational study of IV sildenafil use in pediatric critically ill patients in an academic children’s hospital from January 2013 to February 2015. Data regarding the dose, frequency, and administration time of IV sildenafil was collected. Systolic blood pressure measurements 2 hr before and up to 3 hr after the initial dose and any increased dose were assessed. Paired-samples t-test was used to compare blood pressures before and after the start of sildenafil therapy. Results: Twenty-nine patients received IV sildenafil during the study. Mean patient age and weight (min, max) were 22 mo (2 weeks, 12 yr) and 8.98 kg (3.41, 30.56 kg). Average initial dose was 1.36 ± 0.49 mg/kg/day and final dose was 1.65 ± 0.78 mg/kg/day. Four patients (14%) received sildenafil via continuous infusion and 25 (86%) via intermittent infusion. Administration times ranged from 5 to 180 min. Average systolic blood pressure 2 hr before a sildenafil dose (91 ± 18 mmHg) did not significantly differ from average systolic blood pressure in the first hour (89 ± 16 mmHg, p=0.11), second hour (89 ± 14 mmHg, p=0.45), or the three hr following (90 ± 14.6 mmHg, p=0.22) the start of sildenafil infusion. Conclusions: Intravenous sildenafil administration was not associated with significant hypotension, however more data regarding the use of IV sildenafil in pediatric patients is needed to confirm this observation.

618 INCREASED NEONATAL VANCOMYCIN TROUGH LEVELS AND INCIDENCE OF OTOTOXICITY/NEPHROTOXICITY IN THE NICU
Jenna Fine, Rachel MacLeod MD, Anita Siu, Patricia Kooker, Yen-Hong Kuo, Eduardo Bautista

Learning Objectives: Vancomycin remains the drug of choice in treating late onset sepsis in neonates. In 2011, the Infectious Disease Society of America methicillin resistant Staphylococcus aureus guidelines recommended that vancomycin trough levels be increased from 5–10 mcg/mL to 10–20 mcg/mL. The association between higher doses and the incidence of toxicity remains to be elucidated in neonates and was the objective for this study. Methods: This retrospective chart review included neonates treated with vancomycin from 2006–2014. Data collection included baseline characteristics, vancomycin dose/levels, markers of renal toxicity, hearing screen, family history of hearing loss, and microbiology cultures for Groups 1 (5–10 mcg/mL) and 2 (10–20 mcg/mL). Statistical analysis included the use of descriptive statistics, Wilcoxon Rank Sum tests, and Chi-Square or Fisher’s Exact tests. Results: A total of 354 patients were treated with vancomycin from 2006–2014 with 100 patients included in the analytic data set. Baseline characteristics were not significantly different between the groups. Vancomycin initial mean doses were not significant among the groups, however, the highest reported doses in Group 1 and Group 2 were significantly different at 22 ± 9 and 28 ± 10 mg/kg/day, respectively (p<0.001). The mean blood urea nitrogen levels were also significantly different with Group 1 at 8 ± 6 mg/dL and Group 2 at 14 ± 12 mg/dL (p=0.004). Mean creatinine levels and urine output were not significantly different, Group 1 was 0.5 ± 0.2 mg/dL and Group 2 was 0.6 ± 0.3 mg/dL (p=0.09) and 3.9 ± 1.1 and 3.8 ± 1.0 mg/L/kg/hr, respectively (p=0.71). All patients from each group failed to demonstrate any renal toxicity. Ninety-six percent (n = 26) of Group 1 passed their hearing screen, whereas 86% (n = 63) of Group 2 passed (p=0.28). Conclusions: Our study suggests that vancomycin trough levels of 5–10 mcg/mL versus 10–20 mcg/mL showed no difference in nephrotoxicity and ototoxicity incidence. Further studies should be done using a larger sample size to fully validate our findings.
Alternatively, levallurterol contains one (L) enantiomer and is often preferred in cases where tachycardia may be detrimental. There is very limited human data on the change in heart rate (HR) and oxygen consumption (V'O2) with albuterol and levallurterol. Methods: Single center prospective randomized controlled single blinded study of healthy adult volunteers. Subjects separately received A (5mg) and L (2.5mg) aerosolized over 10 min. We measure HR and V'O2 before and after the medications and 5, 10, 20, 40 and 60 min thereafter. V'O2 was measured non-invasively with a laser diode absorption spectrometer. The maximum increase in measured values from baseline were compared between groups using Wilcoxon Signed Rank test. Results: We enrolled 14 patients median age 32 yr (range 27 – 48). Compared to baseline, there was a significant maximum increase in V'O2 following both A (mean 12% (1.3 IQR 7, 4%) p<0.001) and L (mean 19% (1.3 IQR 9, 34%) p<0.001). There was no difference in maximum increase in V'O2 between A and L (p=0.9). Compared to baseline there was a significant maximal increase in HR with both A (mean 28% (1.3 IQR 18, 39%) p<0.001) and L (mean 21% (1.3 IQR 17, 24%) p<0.001) and a significant difference between A and L (p=0.011). Conclusions: Oxygen consumption and heart rate significantly increased following albuterol as well as levallurterol compared to baseline. The increase was seen as little as 5 min and lasted up to 60 min. There was a statistically significant greater increase in heart rate change following albuterol as compared to levallurterol. The difference in heart rate effect may not be clinically relevant and therefore in standard doses there may be no clinical benefit to use of levallurterol over albuterol.

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AN EVALUATION OF NOREPINEPHRINE DOING STRATEGIES IN MORBIDLY OBSE Patients with Septic Shock
Paul Wong, Komal Pandya, Alexander Flannery

Learning Objectives: Norepinephrine (NE) is recommended as first-line for the hemodynamic management of patients in septic shock. A weight-based dosing strategy is being used more frequently; however, this strategy may increase drug exposure in obese patients, increasing the risk of adverse effects. No published literature exists on the appropriate dosing weight of NE in obesity. The purpose of this study was to evaluate the safety and efficacy of weight-based dosing using actual body weight (ABW) in the morbidly obese compared with normal weight (NW) patients. Methods: This was a single center, retrospective cohort study of adult patients admitted from January 1, 2011 to December 31, 2014 with septic shock requiring NE for at least 12 hr. Patients were grouped according to a body mass index (BMI) 18.5 – 24.9 kg/m2 or ≥40 kg/m2. Primary surgical and cardiac patients were excluded. The primary endpoint was the incidence of tachycardia within 48 hr of NE initiation. Secondary endpoints included time to and NE dose at which a second vasopressor and/or steroids were added, and time to goal mean arterial pressure (MAP). Results: A total 33 patients met inclusion criteria, 20 in the NW group and 13 in the morbidly obese group. There was no significant difference in the incidence of tachycardia within 48 hr of NE initiation between treatment groups. Average rates of NE (mcg/kg/min) were similar on day 1 (p = 0.15) and day 2 (p = 0.14). Total NE exposure was significantly greater in obese patients on day 1 (p = 0.02) only. Morbidly obese patients were more likely to be started on vasopressin (p < 0.001) and steroids at a lower weight-based NE dose (p = 0.016) compared with NW patients. Time to goal MAP (hr) was similar between the two groups (p = 0.56). Conclusions: A weight-based dosing strategy of NE using ABW did not result in a greater incidence of tachycardia in the morbidly obese compared to NW patients. Morbidly obese patients had significantly greater absolute exposure to NE with no impact on safety or efficacy. A weight-based dosing strategy using ABW in morbidly obese patients appears to be safe.

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EVALUATION OF PHARMACIST VS NURSE ASSESSED CONFUSION ASSESSMENT METHOD FOR THE INTENSIVE CARE UNIT
Livia Mackley, Jennifer Carlin, Karrie Derenski, Michelle Seratt, Amy Lewis, Kris Jones, Jennifer Gunn

Learning Objectives: The confusion assessment method for the ICU (CAM-ICU) is a validated tool assessing delirium in ICU patients with a pooled sensitivity of 76–80%, pooled specificity of 96% and inter-rater reliability between 0.75–0.96, however reliability has not been tested between pharmacists and nurses. The purpose of this study was to compare pharmacist assessed CAM-ICU to nurse assessed CAM-ICU in a tertiary health care center medical ICU. Methods: In this prospective, randomized, single center study comparing a pharmacist to nurse assessed CAM-ICU, patients 18 yr or older admitted to the medical and coronary ICU for greater than or equal to 48 hr were randomized and assessed daily for their level of consciousness using the Richmond Agitation and Sedation Scale (RASS), Riker Sedation and Agitation Scale (SAS) and delirium using the CAM-ICU. All cognitive assessments by pharmacists and nurses were conducted independently in a blinded fashion. The CAM-ICU scores between pharmacists and nurses were compared and inter-rater reliability determined. Results: One hundred matched CAM-ICU assessments determined a priori were needed to detect a difference between groups and 107 matched CAM-ICU assessments were included in the final analysis. Pharmacists reported the CAM-ICU as 61% negative, 24% positive and 15% unable to be assessed versus nursing reported 77%, 15%, and 8% respectively. Comparing the matched CAM-ICU assessments between pharmacist and nurses using a paired samples t-test (α = 0.05), 71% of assessments were the same and 29% were different (p = 0.01). Inter-rater reliability between pharmacists and nurses using the kappas agreement was 0.34 corresponding to fair agreement. Conclusions: There is a difference between pharmacist vs nurse assessed CAM-ICU at the study site with an inter-rater reliability being of fair agreement.

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IMPACT OF VARIABLE RE-DOSSING STRATEGIES ON INR AFTER PROTHROMBIN COMPLEX CONCENTRATE (KCENTRA®)
Gabrielle Gibson, Emily Owen, Theresa Human, Rachel Stratman

Learning Objectives: Prothrombin Complex Concentrate (PCC) is one of few options for the reversal of warfarin-induced life-threatening bleeding. Package labeling recommends a single weight-based dose for patients presenting with INR ≥2 in the presence of life-threatening bleeding. In patients who do not achieve hemostasis, a repeat dose is often considered despite lack of clinical data. This study aims to determine the effects of repeat dosing of PCC on INR and risk of thrombosis. Methods: Consecutive patients over a 20-month period that received more than one PCC dose for warfarin-induced life-threatening bleeding were retrospectively evaluated. In patients with repeat INR ≥2, two observed re-dosing strategies, variable weight-based dosing (VWBD) (variable units/kg) and fixed dosing (FD) (500 units), were compared to determine the absolute and percent change in INR between groups. The secondary outcome assessed the difference in thrombotic complications between the two groups. Results: One hundred sixty three patients received PCC for the reversal of warfarin-induced life-threatening bleeding. Of those, 17 patients were re-dosed despite a repeat INR ≤2. Of the 17, 67% received VWBD and 33% received FD. Patients in the VWBD group received 23.2 units/kg (IQR 19.4–27.1) and the FD group received 7.1 units/kg (IQR 6.0–7.6). On univariate analysis, there was no difference in INR between the VWBD group and the FD group (0.19 ± 0.16 vs 0.28 ± 0.19, 95% CI (-0.27-0.09), p=0.311) and percent change in INR (12.2% [IQR 9.8–18.3] vs 15.1% [IQR 11.2–26.1], p=0.424). There was no difference in the rates of thrombotic complications between the VWBD group and FD group (42% vs 33%, p=0.193). Conclusions: No difference was observed in absolute or percent change in INR between patients receiving variable weight-based re-dosing and fixed re-dosing of PCC in the setting of an INR ≥2 for warfarin-induced life-threatening bleeding. Although no difference was observed in rate of thrombosis between the two groups, the high rate of thrombotic complications warrants further investigation.

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THE IMPACT OF EARLY ANALGESIA ON OUTCOMES IN MECHANICALLY VENTILATED PATIENTS
Heath Oetken, Gregory Peitz, Rebecca Sedlak, Keith Olsen

Learning Objectives: Analgesia-first sedation may facilitate improvements in analgesia and consciousness using the Richmond Agitation and Sedation Scale (RASS), Riker Sedation and Agitation Scale (SAS) and delirium using the CAM-ICU. All cognitive assessments by pharmacists and nurses were conducted independently in a blinded fashion. The CAM-ICU scores between pharmacists and nurses were compared and inter-rater reliability determined. Results: One hundred matched CAM-ICU assessments determined a priori were needed to detect a difference between groups and 107 matched CAM-ICU assessments were included in the final analysis. Pharmacists reported the CAM-ICU as 61% negative, 24% positive and 15% unable to be assessed versus nursing reported 77%, 15%, and 8% respectively. Comparing the matched CAM-ICU assessments between pharmacist and nurses using a paired samples t-test (α = 0.05), 71% of assessments were the same and 29% were different (p = 0.01). Inter-rater reliability between pharmacists and nurses using the kappas agreement was 0.34 corresponding to fair agreement. Conclusions: There is a difference between pharmacist vs nurse assessed CAM-ICU at the study site with an inter-rater reliability being of fair agreement.
patients with a diagnosis of sepsis requiring analgesia, sedation or both in the first 24 hr of MV. The eligible cohort was stratified into three groups based on the relative dose of analgesia administered during the first 24 hr of MV. All daily intravenous analgesic and sedative doses were recorded during the period of MV. The primary outcome of interest was duration of MV. Comparisons between lengths of stay, mortality, sedation scores, pain scores and the use of sedatives and analgesics were also made. Multivariate analysis was performed to identify variables associated with duration of MV. Results: A total of 164 patients were included, of which 55 patients were stratified to the high dose (HD) group and 54 patients were stratified into each the medium (MD) and low dose (LD) groups. There were no observed differences in MV duration among the cohorts (6.4 days HD vs 4.6 days MD vs 4.4 days LD, p=0.08). HD patients spent more time in coma than MD patients (17.9% vs. 6.8%, P < 0.008). There were no differences in length of stay, mortality, sedation scores, pain scores, incidence of tracheostomy, ventilator-associated pneumonia or delirium. In multivariate analysis, analgesia administered in the first 48 hr of MV were not shown to decrease the duration of MV. However, a greater amount of analgesia administration in the first 48 hr was identified as an independent predictor of MV duration. Additional prospective studies are warranted to further assess early analgesia and sedation practices and their impact on ICU outcomes.

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WEIGHT-BASED HEPARIN NOMOGRAM FOR CRITICALLY ILL PATIENTS WITH HIGH BLEEDING RISK
Sai Ho Chui, Christopher Dooley, Ellen Huang, Sharon Wilson, Mehmanz Pajoumard, Deborah Stein

Learning Objectives: Weight-based heparin (hep) nomograms were developed to maximize therapeutic benefit while minimizing the risk of bleeding. However, no standardized goals for high bleeding risk patients have been developed. The purpose of this project is to evaluate a weight-based hep nomogram with lower activated partial thromboplastin time (aPTT) goals in these patients. Methods: A retrospective study was conducted using a hep nomogram with an aPTT goal 60–80 seconds for a 1 year period in the surgical units at a tertiary medical center. Dosing weight is determined by pre-printed nomogram. Initial hep dose is 15 units/kg/hr. The primary endpoint is the time to goal aPTT. Secondary endpoints were bleeding and new thrombosis. Baseline characteristics and endpoints were obtained from the medical record and nomogram documentation. Bleeding was defined as a drop in Hgb of 2 g/dl between any two monitoring periods, or any documented incidence of transfusions or surgical bleeding. Thrombosis was assessed with vascular study data and the medical record. Results: The analysis included 110 patients. 68 were newly started on anticoagulation and 42 were transitioned from another anticoagulation regimen. The most common indications for heparin was venous thromboembolism(VTE) (49.1%). The median time to two consecutive goal aPTT was 35.7 hr for new start patients and 35.0 hr for all patients. The correct dosing weight was used in 82.7% and adherence to a correct titration rate occurred in 67.3% of patients. Bleeding and thrombosis were assessed for 60 patients overall and 35.0 hr for all patients. The correct dosing weight was used in 82.7% and low dose (LD) groups. There were no observed differences in MV duration among the cohorts (6.4 days HD vs 4.6 days MD vs 4.4 days LD, p=0.08). HD patients spent more time in coma than MD patients (17.9% vs. 6.8%, P < 0.008). There were no differences in length of stay, mortality, sedation scores, pain scores, incidence of tracheostomy, ventilator-associated pneumonia or delirium. In multivariate analysis, analgesia administered in the first 48 hr of MV were not shown to decrease the duration of MV. However, a greater amount of analgesia administration in the first 48 hr was identified as an independent predictor of MV duration. Additional prospective studies are warranted to further assess early analgesia and sedation practices and their impact on ICU outcomes.

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DRUG DESENSITIZATION: OUTCOMES AND RISK FACTORS FOR SKIN REACTIONS IN ADULTS
Taryn Murray, Todd Rice, Arthur Wheeler, Elizabeth Phillips, Ryszard Dworski, Joanna Stollings

Learning Objectives: Drug desensitization induces a temporary drug tolerance allowing therapeutic use of a medication in an allergic patient without alternative options. The purpose of the study was to determine safety and identify risk factors associated with adverse skin reactions during desensitization in adults. Methods: A retrospective review of medical records of patients undergoing drug desensitization in Intensive Care Units at Vanderbilt University Hospital from January 1, 2011 to December 31, 2013. Risk factors associated with having a skin reaction during desensitization were determined by multivariable analysis. Reactions were classified according to the pre-test probability prior to desensitization. Reactions that occurred during desensitization were then graded according to the degree of skin reaction as: no reaction, mild reaction, moderate reaction, or failed therapy (unsuccessful procedure). Completed desensitizations were also assessed to determine if the patient required de-escalation secondary to any type of reaction. Results: A total of 88 desensitizations were performed in 69 patients. Desensitization was completed successfully in 85% of patients. No baseline characteristic, medication class (p=0.46), or indication for desensitization (p=0.59) was independently associated with having a skin reaction. A prior history of drug-induced urticaria and labored breathing was significantly associated with a skin reaction during desensitization (p=0.0001 and p=0.003, respectively). However, neither history of urticaria nor labored breathing was independently associated with having a reaction in multivariable analysis (OR 0.979, 95% CI: 0.325–2.952; p=0.970; OR 1.626, 95% CI 0.536–4.931; p=0.739, respectively). Conclusions: Drug desensitization is a safe procedure in adults with drug allergy. No baseline variables, history, medication or indication for desensitization were associated with having an adverse skin reaction during the desensitization process.

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APPROPRIATENESS OF RAPID SEQUENCE INTUBATION MEDICATION DOSES IN OBSESE VS. NON-OBSESE PATIENTS
Christie Sun, Rahul Bhat, Maryann Amirshahi, Maria Dynin, Janelle Vaughns, Eshetu Tefera, Daryn Towle, Munish Goyal

Learning Objectives: Obesity is associated with complications during airway management. Limited data exist regarding the appropriateness of sedative and paralytic dosing of obese patients undergoing rapid sequence intubation (RSI) in the emergency department (ED). Our primary aim was to compare the rates of appropriate sedative and paralytic dose in obese and non-obese patients. Methods: Retrospective analysis of an existing database of patients undergoing RSI in an urban, tertiary care, academic ED, from January to December 2011. Each patient was categorized based on the World Health Organization body mass index (BMI) classification. We reviewed the literature and defined appropriate dosing as succinylcholine 1–1.5 mg/kg total body weight (TBW) and etomidate 0.2–0.4 mg/kg TBW. Logistic regression was used to estimate the association of the relationship between appropriate dosing and BMI. An odds ratio was calculated to determine likelihood of appropriate dosing of obese patients with respect to non-obese patients. Subgroup analysis was also performed within each class of obesity. Results: 440 patients were included in the study, with 311(70.7%) classified as non-obese and 129 (29.3%) classified as obese. 233 (56%) received inappropriate dosing of paralytic and 107 (24%) received an inappropriate sedative dose. Obese patients were more likely to receive appropriate dosing of sedative and paralytic dosing (OR 2.1; 95%CI 1.3–3.2) as well as receive appropriate dosing of paralytic alone (OR 2.5; 95%CI 1.6–3.8) compared to non-obese patients. There was no significant difference in appropriate dosing of etomidate between groups. In subgroup analysis, all classes of obesity had a lower odds of receiving inappropriate dosing of paralytic, while class III obesity was associated with a higher odds of inappropriate etomidate dose (OR 2.9; 95% CI 1.3–6.4). Conclusions: Obese patients were more likely to receive appropriate dosing of RSI medications compared to non-obese patients. The majority of paralytics for obese and non-obese patients were appropriately dosed, suggesting that physicians do not dose these medications based on weight.

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THREE-VERSUS FOUR-FACTOR PROTHROMBIN COMPLEX CONCENTRATE FOR REVERSAL OF WARFARIN-INDUCED BLEEDING
Tara Holt, Scott Taylor, Prasad Abraham, Wesley McMillan, Tai Elder, Serena Harris, Jim Curtis

Learning Objectives: Prothrombin complex concentrate (PCC) is often utilized in cases of severe bleeding. Prior to May 2013, only 3-factor PCC was available in
the United States, while 4-factor PCC has been available in Europe and Canada for some time. At this time, there is no comparative data to determine what, if any, difference exists between three and four-factor PCC. This lack of data and the significant increase in cost with 4-factor PCC emphasizes the need for further research on this topic. Methods: This multi-center, retrospective cohort study analyzed data from patients admitted between May 2011 and October 2014 who received PCC for warfarin-induced bleeding. The primary outcome is to compare the rate of INR normalization (defined as INR ≤1.3) after administration of 3-factor compared to 4-factor PCC. Other variables of interest include incidence of additional reversal agents, new thromboembolic events, and mortality. Results: There have been 117 patients included in this study to date. Seventy-seven patients (66%) received 3-factor PCC. The average dose of PCC administered was 209 ± 628 units (24 units/kg) versus 3081 ± 907 (35 units/kg) in the 3-factor and 4-factor groups, respectively. Baseline INR was 3.6 ± 2.3 in the 3-factor PCC group versus 6.6 ± 4.6 with 4-factor. Four-factor PCC had more INR values 1.3 or less at first INR check post-PCC administration (1.4 ± 0.27 vs 1.23 ± 0.18; p=0.0004). Both groups had the 100% of the INR values at 1.3 or less at the second INR check. Three patients had an additional dose of PCC administered, all of which were in the 3-factor PCC arm. There were 4 thromboembolic events within 7 days post 3-factor PCC administration and 2 events with 4-factor PCC. There was no difference in mortality. Conclusions: In our study, 4-factor PCC had a higher incidence of INR normalization of ≤1.3 at first recheck and less thromboembolic events, though no mortality difference, when compared to 3-factor PCC.

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THE HALF-LIFE OF ACETAMINOPHEN AND ITS RELATIONSHIP TO MORTALITY AFTER ACETAMINOPHEN OVERDOSE
Laura Hencen, Mark Mlynarek, Michael Peters, John Stine

Learning Objectives: Acetaminophen toxicity continues to occur despite warnings and maximum dose recommendations. Prognostic markers and risk factors for mortality have been identified; however, acetaminophen serum concentrations are frequently monitored and half-life has not been investigated as a risk factor for mortality. The objective of this study was to compare acetaminophen half-lives in patients who died versus survived after acetaminophen overdose and treatment with N-acetylcysteine. Methods: This was a retrospective cohort study with a nested case control comparing the acetaminophen half-life and other risk factors and outcomes in overdose survivors versus non-survivors. Patients who were at least 18 yr of age with an acetaminophen overdose between January 2003 and October 2013 treated with intravenous N-acetylcysteine and had at least two detectable acetaminophen serum concentrations drawn at least 6 hr apart were included. The primary outcome was the mean acetaminophen half-life between groups. Secondary outcomes included mortality, risk factors for morbidity and mortality, and fulminant hepatic failure. Results: Of 265 patients screened, 84 (32%) met inclusion criteria. Of the 84 patients meeting inclusion criteria, 20 (24%) died and 64 (76%) survived. There was a statistically significant difference in mean acetaminophen half-life between groups. The mean acetaminophen half-life was 7.63 ± 5.25 hr in the group that survived and 23.46 ± 24.6 hr in the group that died (p<0.001). There was a statistically significant difference in all studied laboratory values between the two groups with the exception of alkaline phosphatase. After performing a multivariate analysis, acetaminophen half-life was found to be an independent predictor of mortality. Conclusions: This small, retrospective, single center study found acetaminophen half-life to be an independent predictor for mortality in patients who present with an acetaminophen overdose. Further research is warranted to confirm acetaminophen half-life as a predictor of mortality and to optimize timing of levels for half-life calculation.

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MAJOR BLEED RISK IN PATIENTS ON NOVEL ORAL ANTICOAGULANTS WITH PGP AND OR CYP3A4 INHIBITORS
Debbie Liang, Jared Peak, Kevin Lumbert, Caroline Girardeau, Nastaran Gharakhonloureh, Jeffrey Gross, S. Wayne Smith

Learning Objectives: The objective of this single-center, retrospective case series study was to characterize risk of major bleed in ED or direct admit patients on NOACs with or without concomitant PGP ± CYP3A4 inhibitors. Methods: Fifty-six patients who had major bleeds while taking NOACs were included in our analysis. The primary objective was to characterize major bleeds in patients on NOACs through specific major bleeding ICD-9 codes and major bleeding definitions based on the landmark NOAC clinical trials. Secondary objectives were to explore the association of major bleeds with the presence of PGP ± CYP3A4 drug interactions prior to admission, appropriate renal dose reductions of NOACs upon admission, and conventional anticoagulation studies (PTT, PT, INR). Descriptive statistics were used to address the primary objective. Pearson’s chi-squared test and Spearman’s rank correlation were used to address the secondary objectives. Results: For the primary endpoint, 60.6% of major bleeds were seen with drug interactions, and 30.4% of bleeds were seen without drug interactions; yielding approximately a 2:1 ratio. Gastrointestinal bleeds were observed as the majority of major bleeds at 43.6% and 58.8% of the PGP/CYP3A4 interaction and no PGP/CYP3A4 interaction groups, respectively. In both patient groups, rivaroxaban was the most commonly used NOAC (36.4% NOACs with PGP ± CYP3A4 inhibitors, 64.7% NOACs without PGP ± CYP3A4 inhibitors). Of patients taking NOACs and PGP ± CYP3A4 inhibitors, the most commonly used PGP inhibitors included atorvastatin (42.6%) and candelasib (58.4%), and the most commonly used CYP3A inhibitors included amiodarone (45.4%) and diltiazem (31.8%). Conclusions: Similar to reported case reports, we observed more major bleeds in patients on NOACs and PGP ± CYP3A4 inhibitors prior to admission. Given the lack of reliable laboratory markers and antidotes to reverse a NOAC-induced major bleed, these findings should prompt a reevaluation of the safety and widespread practice of NOACs and PGP ± CYP3A4 inhibitors. Our observations should be confirmed in larger prospective, randomized trials.

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TOLERABILITY OF SUBANESTHETIC KETAMINE IN THE SURGICAL INTENSIVE CARE UNIT
Veronica Raco, Jack Louro, Vivek Moitra, Mona Patel

Learning Objectives: Subanesthetic doses of ketamine (KET) has shown to effectively treat pain and reduce narcotic requirements in postoperative patients. The safety of subanesthetic KET in critically ill patients has not been well established. We sought to evaluate the tolerability of subanesthetic KET when used in the postoperative setting. Methods: An IRB-approved, retrospective chart review was conducted from January 2012 through June 2014 in adult patients who received KET 1–7 mcg/kg/min while in the surgical ICU. Hemodynamic variables and incidence of new onset hypertension and tachycardia were assessed hourly for 4 hr immediately before and upon initiation of KET. New onset hypertension was defined as any new occurrence of systolic blood pressure (SBP) greater than 180 mm Hg or diastolic blood pressure (DBP) greater than 100 mm Hg, or an increase in SBP, DBP, or mean arterial pressure (MAP) greater than 30% or more from baseline. New onset tachycardia was defined as heart rate (HR) greater than 120 beats/minute, or an increase in HR greater than 30% of baseline. The paired t-test was used to compare hemodynamic variables including SBP, DBP, HR, and MAP before and during KET. Results: Of the 27 patients, who met inclusion criteria, 55% were male and the median (IQR) age was 64 (46–75) yr. The median dose of KET was 3 (3–5) mcg/kg/min for a median duration of 27 (15–45) hr. No differences in mean SBP (122 ± 32 mm Hg vs 119 ± 25 mm Hg, p=0.43), DBP (65 ± 14 mm Hg vs 63 ± 11 mm Hg, p=0.26), MAP (81 ± 16 mm Hg vs 80 ± 14 mm Hg, p=0.62), or HR (93 ± 20 beats/min vs 93 ± 16 beats/min, p=0.98) were observed upon initiation of ketamine. No patients developed new onset hypertension or tachycardia with KET. Average morphine equivalents decreased from 101 ± 99 mg to 79 ± 118 mg (p=0.83) upon KET initiation. Conclusions: There were no occurrences of new onset hypertension or tachycardia and no changes in SBP, DBP, MAP or HR were observed with KET.

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COMPARISON OF NEUROMUSCULAR BLOCKERS IN EARLY ACUTE RESPIRATORY DISTRESS SYNDROME
Leanne Current, C. Joseph Kramer, Sophie Lopez, Ariel Modykamien

Learning Objectives: In patients with severe ARDS, early administration of neuromuscular blocking agents has demonstrated improvement in clinical outcomes. Specifically, the use of cisatracurium showed increase in 90-day survival compared with placebo. This study was conducted to determine if the use of
rates were: 0.04 ± 0.03, 0.25 ± 0.16 & 1.32 ± 0.80, p<0.001. Maximum infusion of norepinephrine (NE) do not exist. Both weight-based and non-weight-based strategies are used. We sought to determine whether a low (≤ 0.1 mcg/kg/min), moderate (0.1–0.5 mcg/kg/min) or high (>0.5 mcg/kg/min) NE starting rate effects time to target mean arterial pressure (MAP), and adverse events including arrhythmias, acute renal injury (AKI) and lactate (LA) levels. Methods: This retrospective study evaluated adult patients who received NE as the initial vasopressor in septic shock. Patients were divided into 3 groups based on NE starting rate: Low (n=63), Moderate (n=67), and High (n=20). We evaluated NE dosing, time to MAP>65 x 3 consecutive hr and adverse effects. Data is reported as mean ± standard deviation unless otherwise noted and in the order of Low, Moderate and High. A p-value<0.05 was considered significant. Results: 150 patients were included. There were no differences in baseline demographics or severity of illness (SOFA) scores (12 ± 4, 13 ± 4 & 12 ± 4, p=0.23). NE starting rates were: 0.04 ± 0.03, 0.25 ± 0.16 & 1.32 ± 0.80, p<0.001. Maximum infusion rates were: 0.57 ± 0.75, 0.780 ± 0.79 & 1.98 ± 1.11, p<0.001. Time to achieve target MAP>65 x 3 consecutive hr was similar between groups: 5.5 ± 5, 4.3 ± 5 & 3.8 ± 4 hr, p=0.56. There was no significant difference in total NE dose (mg) between groups: 127 ± 357, 89 ± 122 & 139 ± 116, p=0.59. NE duration was reduced by 50% in the High group but was not statistically significant: 2.5 ± 3, 3.0 ± 4 and 1.3 ± 1 days, p=0.17. Incidence of AKI was similar: 90%, 93% & 85%, p=0.83. More patients in the High group were started on another vasopressor, 22%, 32% & 80%, p=0.01 and had higher LA levels (4 ± 4, 6 ± 6 & 11 ± 7, p=0.001) and mortality 35%, 45% & 80%, p=0.01. No difference was found in rates of renal recovery, arrhythmias or tissue ischemia between groups. Conclusions: Starting NE at a high rate does not change time to target MAP but may lead to increased rates of lactate acidosis and mortality. It is difficult to know if the high starting rates were causative or the result of a rapidly declining patient.

DO NOREPINEPHRINE STARTING RATES EFFECT OUTCOMES IN SEPTIC SHOCK? Krista Wahby, Kara Zacholski, Mark Pangrazzi Learning Objectives: Formal dosing recommendations for initiation and titration of norepinephrine (NE) do not exist. Both weight-based and non-weight-based strategies are used. We sought to determine whether a low (≤ 0.1 mcg/kg/min), moderate (0.1–0.5 mcg/kg/min) or high (>0.5 mcg/kg/min) NE starting rate effects time to target mean arterial pressure (MAP), and adverse events including arrhythmias, acute renal injury (AKI) and lactate (LA) levels. Methods: This retrospective study evaluated adult patients who received NE as the initial vasopressor in septic shock. Patients were divided into 3 groups based on NE starting rate: Low (n=63), Moderate (n=67), and High (n=20). We evaluated NE dosing, time to MAP>65 x 3 consecutive hr and adverse effects. Data is reported as mean ± standard deviation unless otherwise noted and in the order of Low, Moderate and High. A p-value<0.05 was considered significant. Results: 150 patients were included. There were no differences in baseline demographics or severity of illness (SOFA) scores (12 ± 4, 13 ± 4 & 12 ± 4, p=0.23). NE starting rates were: 0.04 ± 0.03, 0.25 ± 0.16 & 1.32 ± 0.80, p<0.001. Maximum infusion rates were: 0.57 ± 0.75, 0.780 ± 0.79 & 1.98 ± 1.11, p<0.001. Time to achieve target MAP>65 x 3 consecutive hr was similar between groups: 5.5 ± 5, 4.3 ± 5 & 3.8 ± 4 hr, p=0.56. There was no significant difference in total NE dose (mg) between groups: 127 ± 357, 89 ± 122 & 139 ± 116, p=0.59. NE duration was reduced by 50% in the High group but was not statistically significant: 2.5 ± 3, 3.0 ± 4 and 1.3 ± 1 days, p=0.17. Incidence of AKI was similar: 90%, 93% & 85%, p=0.83. More patients in the High group were started on another vasopressor, 22%, 32% & 80%, p=0.01 and had higher LA levels (4 ± 4, 6 ± 6 & 11 ± 7, p=0.001) and mortality 35%, 45% & 80%, p=0.01. No difference was found in rates of renal recovery, arrhythmias or tissue ischemia between groups. Conclusions: Starting NE at a high rate does not change time to target MAP but may lead to increased rates of lactate acidosis and mortality. It is difficult to know if the high starting rates were causative or the result of a rapidly declining patient.
optimize duration of MV and avoid delirium. with prolonged MV. Further research is needed to determine appropriate analgesic control prior to continuous sedation. This practice led to suboptimal pain assess-

a steady state, patients could be delivered via a handheld device (MiniS
tm’ MS-1B) at 2Hz frequency with 50mAmp current. Surface electrodes and frequency was used with the EMG machine. However, the current intensity and duration of stimulation was determined individually, based on eliciting the supra maximal response. TOF was delivered and responses recorded using both PNS and EMG in each study session. Measurements were repeated, at least 48 hr apart, up to a total of three sessions. Results: The supramaximal stimulus deter-
mained by the EMG machine was higher than the maximum current (50mA) that could be delivered by the PNS, for every single patient who was tested. The mean supramaximal current in the patient population was 83.48 ± 16.2. There was no difference in TOF counts elicited by using the PNS and EMG. Conclu-
sions: Conventional PNS devices designed for use in the operating room may not monitor NMNB effect accurately in critically ill patients, due to a higher current required to achieve supramaximal stimulus.

637 IMPACT OF OVER-SEDATION AND INADEQUATE PAIN CONTROL ON DURATION OF INTUBATION IN ONCOLOGY PATIENTS
Trisha Patel, Stacie Gaige, Keval Patel, Mark Lewis, Joanne McGovern, Erica McGovern, Jeffrey Hoag

Learning Objectives: Published guidelines emphasize the importance of using a protocol to adequately control pain, agitation, and delirium in mechanically ventilated patients. Such recommendations are based on minimal oncology data. Chronic pain affects over 60% of cancer patients and about half suffer from anxiety. Chronic medications complicate control of pain and anxiety in this population in the setting of mechanical ventilation (MV). We sought to determine if long-term narcotic/anosilaryl use in cancer patients affected the management and weaning of MV. Methods: A retrospective review was performed in a subspecialty cancer hos-

ciptal of patients on MV between May and December 2014. Nursing assessments, doses of continuous sedatives and analgesics, APACHE IV scores, home analgesics, and duration of MV were recorded. Results: Thirty-three mechanically ventilated oncology patients were included (66% medical, 52% female; age 52 ± 11). Patients were severely-ill (APACHE IV 88 ± 22), and 75% (n=25) were on chronic opioids pre-admission. Although 36% (n=12) were on chronic analgesics/anti-depressants pre-admission, 88% (n=29) were initiated on a continuous sedative which remained active for 54% of the duration of intubation. Two-thirds (n=20) were initiated on continuous sedatives concurrently with continuous analgesics. The number of days of continuous sedation and days of MV were positively correlated (r=0.85). Patients observed to have a RASS <-2 at any time during intubation had statistically signifi-
cantly longer durations of MV (8 ± 7.3) than those who had a RASS ≥ -2 (3 ± 1.3; p=0.02). Conclusions: We found excessive use of continuous sedatives in ICU patients on MV; moreover, the analgesic dose was not titrated to optimize pain control prior to continuous sedation. This practice led to suboptimal pain assess-
ments, inadequate pain management, and over-sedation with a direct correlation with prolonged MV. Further research is needed to determine appropriate analgesic utilization in ventilated oncology patients on chronic narcotics and anxiolytics to optimize duration of MV and avoid delirium.

638 DAIKENCHUTO, A HERBAL MEDICINE, ON INTESTINAL MOTILITY AFTER ABDOMINAL SURGERY: A META-ANALYSIS
Akira Kuriyama, Seigo Urushidani

Learning Objectives: Daikenchuto (DKT) is a herbal medicine that has been long used in Japan. DKT is considered to promote intestinal motility. Currently, DKT is a candidate for the FDA approval, and there is at least one ongoing trial to examine the efficacy of DKT for the prevention of postoperative paralytic ileus in the US. Herein, we present a meta-analysis of randomized trials evaluat-
ing the efficacy of DKT on intestinal motility, which have been conducted in Japan. Methods: PubMed, the Cochrane Central Register of Controlled Trials, and Ichushi (Japanese Database of Medical Publications) were searched with-

out language restrictions. Randomized trials evaluating the efficacy of DKT after abdominal surgery were considered for inclusion. Our primary outcomes were the incidence of postoperative ileus and the time to first bowel movement after sur-

ery. Data were pooled using the random effects model. Results: Nine trials with 817 participants were included. All trials were performed in Japan. Compared with placebo or usual care, DKT was not associated with a reduced incidence of postoperative ileus (RR 0.51; 95% CI 0.20 to 1.28; I2=20.9%). However, DKT was associated with reduced time to first bowel movement after surgery (WMD -11.9 hr; 95% CI -17.8 to -6.0; I2=59.3%). Conclusions: DKT was not associated with a reduced risk of postoperative paralytic ileus, but was associated with reduced time to the first bowel movement. Given the clinical heterogeneity between the included trials and the small sample size of each trial, further studies are needed to confirm and enhance the generalizability of our findings.

639 LOW MOLECULAR WEIGHT HEPArine TREATMENT IN THE ICU SHOULD BE MONITORED WITH AN ANTI-FACTOR XA ASSAY
Ben Spellberg, Pauline Verschuure, Ingrid Blum

Learning Objectives: Low molecular weight heparins (LMWH) are used for example in the treatment of pulmonary emboli, venous thrombosis and atrial fibrillation. One of the advantages is that blood coagulation checks are not necessary anymore. Because patients on the Intensive Care Unit (ICU) have a different metabolism and distribution volume we examined if dose calculation according to body weight resulted in adequate anticoagulation. The anti-factor Xa assay is a functional assay that measures direct inhibition of factor Xa by LMWH. Methods: All patients on the ICU in 2014 who were examined for their anti-

Xa activity were investigated. Anti-Xa activity was measured after the 3h dose of dalteparine. The dose of dalteparine was calculated according to actual body weight. Estimated Glomerular Filtration Rate (eGFR) (MDRD clearance) 1 was determined daily. Pearson correlation was examined between anti-Xa activity, dalteparine dose, body weight and eGFR clearance. Linear regression analysis was performed between anti-Xa activity, dalteparine dose, body weight and eGFR clearance. SPSS version 22 was used for statistical analysis. A statistical signifi-
cant difference of p<0.05 was considered as significant. Results: 22 Patients were examined. Mean anti-Xa activity was 0.74 +/- 0.45 (therapeutic range: 1-2 U/ ml) There was a positive correlation present between anti-Xa activity and given dose of dalteparine (Pearson Correlation coefficient 0.78, p<0.01). Also a positive correlation was present between anti-Xa activity and eGFR (Pearson Correlation coefficient 0.49, p<0.05). Linear regression analysis showed that dalteparine dose predicted anti-Xa activity (p=0.001). 14 of the 22 values, however, were not in the therapeutic range. Conclusions: Dalteparine dose calculation according to body weight and eGFR resulted in inadequate anti-Xa activity in 14 out of 22 patients. There was a positive correlation between dalteparine dose related to eGFR and anti-Xa activity. In our opinion, all LMWH treatment in the ICU should be monitored with anti-Xa activity.

640 HYPOGlyCEMIA WITH THE USE OF LONG-ACTING INSU-LIN IN NON-DIABETIC ICU PATIENTS
Jordan Masso, Christopher Giuliani, Renee Alexander Paxton

Learning Objectives: Hypoglycemia occurs in up to 20% of critically ill patients and is associated with an increase in mortality. The purpose of this study is to assess glycemic control in non-diabetic surgical intensive care unit (SICU) patients receiving long-acting insulin. Methods: This single center, retrospective cohort study evaluated glycemic control in non-diabetic SICU patients receiving long acting insulin and sliding scale insulin (SSI) versus those receiving SSI only. Patients met inclusion if they were > 17 yr of age, admitted to the ICU for a minimum of 24hr, and had two consecutive blood glucose (BG) values

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> 180 mg/dL. Patients were excluded if they were diabetic, received subcutaneous NPH, R, or 70/50 insulin, received agents other than insulin to control blood glucose, or death within 2 days of SICU admission. Groups were matched based on type of sliding scale ordered and surgery. The primary outcome was to compare the proportion of patients who developed hypoglycemia (BG values < 70 mg/dL) between groups. Also, the number of hypoglycemic events between groups was evaluated as a secondary outcome. **Results:** Of the 1661 patients screened, 60 patients in each group were included. Hypoglycemia was significantly higher with long acting insulin and SSI compared to SSI only (28.3% vs 13.3%, p=0.047). After adjusting for BMI, renal failure, age, and APACHE II, the odds of hypoglycemia were 4.1 times higher for patients receiving long acting insulin and SSI compared to SSI alone (p=0.02). There were 42 hypoglycemic events in the long acting arm and 20 hypoglycemic events in the SSI alone arm (p=0.05). **Conclusions:** This study demonstrated that higher rates of hypoglycemia are associated with the utilization of long-acting insulin in non-diabetic SICU patients. The use of basal insulin should be discouraged in adult non-diabetic critically ill surgical patients.

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**ANTIBIOTIC WOUND PENETRANCE DURING NEGATIVE PRESSURE WOUND THERAPY**

Matthew Rowan, Krista Niece, Kevin Chung, Kevin Aker

**Learning Objectives:** Negative pressure wound therapy (NPWT) uses sub-atmospheric pressure as a non-invasive adjuvant therapy to treat wounds, and has demonstrated clinical efficacy in a variety of wounds. The mechanisms underlying the effects of NPWT on wound healing remain unclear, but are thought to involve early generation of granulation tissue, an increase in vascular perfusion, and a reduction in wound edema. NPWT may also play a role in preventing or treating wound infections, possibly by increasing wound penetration of antibiotics, but clinical data in patients undergoing NPWT are limited and more data are needed before conclusions regarding antibiotic wound penetrance can be made.

**Methods:** To evaluate the pharmacokinetic and pharmacodynamic profile of antibiotics in NPWT patients, we conducted an IRB-approved, prospective, observational study of burn and trauma patients treated with NPWT and systemic antibiotics from 2013 to 2014. We evaluated the plasma pharmacokinetic profile of systemic vancomycin (n=7), cefazolin (n=8), piperacillin/tazobactam (n=10), and ciprofloxacin (n=7) in 42 patients undergoing NPWT. We also measured the total and unbound antibiotic concentrations in wound effluent from these patients, obtained using 500ml V.A.C. ATS canisters without gel. Four patients receiving vancomycin (n=1), cefazolin (n=1), or ciprofloxacin (n=2) each had two wounds undergoing NPWT treatment, for a total of 46 wound effluents analyzed.

**Results:** Analysis showed wound effluent/plasma concentration ratios for vancomycin, cefazolin, piperacillin/tazobactam, and ciprofloxacin ranging from 0.81 to 1.86.

**Conclusions:** This initial report suggests that antibiotics effectively penetrate wounds during NPWT.

**642**

**HIGH VS. LOW DOSE SULFAMETHOXAZOLE/TRIMETHOPRIM FOR THE TREATMENT OF STENOTROPHOMONAS PNEUMONIA**

Michelle Horng, Celeste Vieira

**Learning Objectives:** Stenotrophomonas maltophilia (S. maltophilia) is a healthcare-associated multi-drug resistant pathogen associated with significant morbidity and mortality. First line treatment for S. maltophilia is sulfamethoxazole/trimethoprim (SMX-TMP) although the optimal dosing regimen is controversial, ranging from 8 mg/kg/day to 22 mg/kg/day of the TMP component.

**Methods:** This retrospective case-control study included patients who received at least 3 days of SMX/TMP treatment and were culture positive for S. maltophilia pneumonia in the sputum, tracheal aspirate, or bronchoalveolar lavage (BAL) between January 2011 and October 2013. High dose SMX-TMX (≥12 mg/kg/day TMP) and low dose SMX-TMX (<12 mg/kg/day TMP) were adjusted for renal dysfunction. Clinical success, defined by resolution of leukocytosis, temperature, purulent spumum, or chest x-ray, was determined by blinded adjudication.

**Results:** 43 patients met inclusion criteria for the study (low dose, n=25; high dose, n=18). Patient’s baseline characteristics were similar in age (63±15 yr) and culture method (BAL n=15; tracheal aspirate n=14; spumum, n=18). Patients in the low dose group received 8.3±5 mg/kg/day of TMP for 9±3 days of therapy, while patients in the high dose group received 14±4 mg/kg/day TMP for 9±4 days of therapy. There were no difference in clinical failure between the low dose versus high dose groups (42.9% vs 33.3%; p=0.626), largely due to persistence of clinical symptoms. Rates of adverse effects were similar in terms of hyperkalemia (21%), nephrotoxicity (11.6%), rash (2.3%), and QTc prolongation (4.6%).

**Conclusions:** Study investigators did not observe a difference in the clinical success or failure rates in patients who were treated with low versus high dose SMX-TMP groups. However, we were unable to recruit enough subjects to meet power, and larger studies are needed to determine the optimal dosing regimen for treatment of S. maltophilia.

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**EVALUATION OF PROPOFOL (DIPRIVAN*) MONITORING PRACTICES IN ADULT INTENSIVE CARE UNITS**

Lauren Kane, Lauren Held, Kimberly Varney Gill, Lisa Kurczewski

**Learning Objectives:** The use of propofol infusion for sedation in ICUs has increased, as use of shorter acting sedatives are now recommended to decrease time on mechanical ventilation. Propofol is associated with adverse effects including respiratory depression, hypotension, hypertriglyceridemia, and propofol-related infusion syndrome (PRIS). Although reported as a rare complication, PRIS is a life-threatening complication and routine monitoring for PRIS is recommended. Lab values that may indicate PRIS include elevated levels of triglycerides, creatine kinase, and lipase. The purpose of this study was to assess our institution’s current monitoring practices of propofol in adult ICUs.

**Methods:** This was a single-center retrospective review of adult ICU patients who received a continuous infusion of propofol for greater than or equal to 48hr (i.e. “propofol encounter”) from July 1, 2013 to January 8, 2015. Average dose, average duration, and percentage of propofol encounters with PRIS-related lab values were collected. Pertinent PRIS-related lab values included triglycerides (TGs), creatinine kinase (CK), and lipase. The percentage of propofol encounters that discontinued propofol within 24 hr of an abnormal PRIS-related lab value were also evaluated.

**Results:** There were 136 propofol encounters in the study. Average propofol dose and duration were 33.5 mg/kg/min and 8.5 days, respectively. PRIS-related labs drawn were 52% for TGs, 35% for CK, and 56% for lipase. Abnormal PRIS-related lab values were detected in 17.0% of encounters; 40.3% of these encounters had propofol discontinued. Within the encounters with abnormal labs, the average propofol dose was 32.4 mg/kg/min; the average duration was 6.8 days. Seventy-two patients (53%) received propofol for more than 7 days. Of these patients, 25% did not have PRIS-related labs drawn after day 4.

**Conclusions:** Our data showed that PRIS-related lab values are not routinely drawn in patients receiving propofol. Clinical education and propofol monitoring protocols should be developed to help detect or prevent serious complications of propofol.

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**DOES DEXMEDETOMIDINE REDUCE OPIOID REQUIREMENTS IN BRAIN INJURED PATIENTS**

Ali Paplaskas, Linda Park, Maria Punik, Dennis Parker Jr.

**Learning Objectives:** Studies in adult medical ICU patients have shown a reduction in ventilator days and the incidence of delirium when utilizing a dexmedetomidine (DEX) based regimen compared to a benzodiazepine regimen. Few studies have evaluated its use in patients with brain injuries. The objective of this study is to determine if DEX has an opioid-sparing effect and to evaluate the safety profile in a population consisting of brain injured patients.

**Methods:** This single-center retrospective analysis was performed on patients admitted to Neuro-ICU from 1/1/07 to 10/31/14 who received DEX. Opioid therapy in fentanyl equivalents (FE, mcg) and non-DEX sedative use were recorded 24 hr before and after initiation of DEX. The occurrence of hypotension (SBP < 90 mm Hg or > 30% decrease), bradycardia (HR < 60 BPM) and severe bradycardia (HR < 40 BPM) were recorded. P-value < 0.05 was considered significant. Data are expressed in means±SD or median (IQR). **Results:** A total of 41 patients were included in the analysis. The mean age was 43±15 and APACHE II was 14±5. Fourteen patients did not receive any alternative sedative agents prior to the initiation of DEX. There was a significant reduction in FE from 4.656
SAFETY OF ANALGESIA-BASED SEDATION IN THE TRAUMA ICU
Joseph Trang, Brandon Hobbs, Xi Liu-DeRyke, Michael Cheatham, Chadwick Smith

Learning Objectives: Recent practice guidelines advocate analgesia-based sedation (ABS), while discouraging use of benzodiazepines (BZD), the primary agents in hypnotic-based sedation (HBS). However, opioids commonly cause impaired gastrointestinal transit (IGT) which can result in significant morbidity. The purpose of this study was to evaluate the safety of ABS compared to HBS.

Methods: Retrospective cohort study evaluating patients ≥18 yr old admitted to the trauma ICU receiving continuous infusion of sedative/analgescics for ≥24 hr from January to March 2012 (HBS group) and January to March 2014 (ABS group). Patients were excluded if they were pregnant, had spinal cord or burn injury, or history of alcohol or drug abuse. The primary outcome was incidence of IGT defined as a composite outcome of constipation (no bowel movement for ≥72 hr), ileus, requirement of pro-kinetic agent, or tube feed (TF) intolerance (gastric residuals >300 ml/4 hr period). Secondary outcomes were duration of mechanical ventilation (MV) and ICU and hospital length of stay (LOS).

Results: Demographics differed between the ABS (n=36) and HBS (n=28) groups with more traumatic brain injury patients in the ABS group (p=0.05), while the ABS group had less patients with polytrauma (p=0.03). ABS patients received less BZD per day (5 mg vs 27 mg midazolam equivalents, p=0.02), while no significant difference in opioid or propofol requirements were found between the groups. Incidence of IGT between groups was similar [ABS=27 (75%), HBS=22 (79%); p=0.13]. When evaluating the components of the composite outcome individually, there was a trend towards more GI complications in the ABS group with more constipation, use of pro-kinetic agents, ileus, and TF intolerance [ABS=27 (75%), 20 (71%), p=0.13; ABS=13 (36%), HBS=6 (21%), p=0.07; ABS=8 (22%), HBS=3 (11%), p=0.08; ABS=7 (19%), HBS=4 (14%), p=0.12], respectively. No differences were observed in duration of MV, or ICU or hospital LOS. Conclusions: ABS appears to be safe. However, there was a trend towards more GI complications in the ABS group warranting further investigation.

EVAFULZ OF THE APPROPRIATENESS OF INITIAL ANTIBIOTIC DOZING IN SEVERE SEPSIS AND SEPTIC SHOCK
Phil Gurgurog, Jennifer Elfman, James Dargin, Yuxin Lei

Learning Objectives: Initial dosing of vancomycin and cefepime in patients with severe sepsis and septic shock presenting to the emergency department (ED) of a tertiary care center was assessed. We hypothesized that patients with severe sepsis and septic shock often receive inappropriately low initial doses of antibiotics.

Methods: In this retrospective, single center study, data were gathered for patients treated for severe sepsis or septic shock in the ED from 1/2014–6/2014. Data include: demographics, site of infection, antibiotics and dosage, ICU and hospital length of stay (LOS), and in-hospital and ICU mortality. Initial vancomycin doses >15 mg/kg and cefepime doses of 2 g were considered appropriate.

Results: In the initial phase, 5329 CAM measurements. RN-CAM and MD-CAM agreed 64% of the time, CAM was performed 1.9 ± 0.95 times/day/patient. Delirium was identified in more patients using MD-CAM than RN-CAM (16 vs 2% vs. p<0.0001). Patients with delirium by MD only compared with MD/RN agreement were more likely to be on mechanical ventilation (84 vs 33%, p<0.003) and receiving opioid infusion (63 vs 22%, p<0.03). While there were no differences in number of daily delirium measurements between the two groups (MD only: 1.0 [1.7, 0.7, 2.0] vs MD:1.2 [1.7, 0.7, 2.0], p=0.14), patients with delirium by MD only had more RN-CAM that were unable to score for delirium (MD only: 14 [12, 16] vs MD/RN: 1 [0, 2], p=0.14), patients with delirium by MD only had more RN-CAM that were unable to score for delirium (MD only: 25 [17, 37] vs MD/RN: 16 [11, 25], p<0.04). Conclusions: Nurses and intensivists agreed only 14% of the time in detecting delirium using CAM. Patients with delirium by MD and nor RN are characterized by a higher prevalence of mechanical ventilation and use of opioids. This demonstrates a need for further education and training to improve delirium monitoring.

EVALUATION OF DELIRIUM MONITORING IN A MEDICAL ICU
Jessica Yang, Amy Dzierba, Jan Bakker, Justin Muir, Daniel Brodie, Natalie Yip

Learning Objectives: Delirium may go undiagnosed in up to 70% of cases. Therefore, improved detection facilitating early intervention may lead to better outcomes. The Confusion Assessment Method for the ICU (CAM) is a validated screening tool. We studied the frequency and accuracy of CAM assessments in a medical ICU.

Methods: This IRB-approved, retrospective analysis included all adult patients admitted to the medical ICU from September 2013 to May 2015 with at least two CAM assessments in a 24 hr time window. All nursing CAM assessments (RN-CAM) were queried from the electronic health record. Delirium was defined by at least 2 consecutive positive CAM assessments in a 24 hr period. Each RN-CAM was reviewed and re-scored by an intensivist (MD-CAM). RN-CAM and MD-CAM assessments were compared. Data are presented as mean±SD or median [IQR] where appropriate. Results: During the study period there were 415 unique ICU admissions with at least two CAM assessments and a total of 5329 CAM measurements. RN-CAM and MD-CAM agreed 64% of the time. CAM was performed 1.9 ± 0.95 times/day/patient. Delirium was identified in more patients using MD-CAM than RN-CAM (16 vs 2% vs. p<0.0001). Patients with delirium by MD only compared with MD/RN agreement were more likely to be on mechanical ventilation (84 vs 33%, p<0.003) and receiving opioid infusion (63 vs 22%, p<0.03). While there were no differences in number of daily delirium measurements between the two groups (MD only: 1.7 [1.6, 2.1] vs MD/RN: 2.2 [1.7, 2.5], p=0.14), patients with delirium by MD only had more RN-CAM that were unable to score for delirium (MD only: 25 [17, 37] vs MD/RN: 16 [11, 25], p<0.04). Conclusions: Nurses and intensivists agreed only 14% of the time in detecting delirium using CAM. Patients with delirium by MD and nor RN are characterized by a higher prevalence of mechanical ventilation and use of opioids. This demonstrates a need for further education and training to improve delirium monitoring.
of patients, respectively. Appropriate vs. inappropriate dosing of vancomycin was not associated with inpatient mortality (10.5 vs 11.1%, p=0.95). ICU mortality (5.3 vs 7.4%, p=0.77), ICU LOS (4, IQR 3–28 vs 4 days, IQR 1–25; p=0.77), or inpatient LOS (7, IQR 2–50 vs 7 days, IQR 2–29; p=0.70). Appropriate vs. inappropriate dosing of cefepime was not associated with inpatient mortality (27.3 vs 7.7%, p=0.07), ICU mortality (18.2 vs 7.7%, p=0.27), or inpatient LOS (7, IQR 2–32 vs 7 days, IQR 2–50; p=0.34). We observed a trend toward reduced ICU LOS with appropriately vs. inappropriately dosed cefepime (3, IQR 1–28 vs 4.5 days, IQR 2–25; p=0.07). Conclusions: First doses of vancomycin and cefepime were inappropriately low in most cases of severe sepsis or septic shock initially treated in this tertiary center's ED.

649 DEXMEDETOMIDINE (DEX) PRESCRIBING PATTERNS FOR MECHANICALLY VENTILATED (MV) PATIENTS
Laura Bosse, Ryan Gries, Richard Carlson, Thomas Ashbile
Learning Objectives: DEX is an α2-adrenergic agonist, with indications for ICU and procedural sedation. A distinct advantage of DEX is its ability to sedate with minimal respiratory depression. Recent studies have explored extending duration and dose, however DEX is not absent of side effects. The objective of this study was to evaluate DEX in MV patients with a goal to update restriction criteria.
Methods: This was a retrospective review of MV patients given DEX from February 1, 2014 through January 31, 2015. Inclusion criteria were: MV patients, age ≥ 18 yr. Exclusion criteria were: Procedural usage, < 4 hr of DEX, primary diagnosis of alcohol withdrawal syndrome. Results: There were 51 cases of DEX in the MICU, SICU or Burn ICU. Median ICU LOS was 10.8 d (IQR 5.7–28.5), with MV 6.4 d (IQR 3.5–12.8), and DEX infusion 1.7 d (IQR 0.7–2.6). Indications for MV included trauma (45%), medical (23%), sepsis (18%), general surgery (8%), or burn (6%). A bolus was used for 13 patients (25%) with a mean of 0.61 mcg/kg. Within the first 24 hr of initiation, 14 patients (27.5%) reached the facility maximum dose of 1.5 mcg/kg/h within a median time of 42 min (IQR 27.5–251). A total of 30 patients (58.8%) received infusions ≥ 24 hr of therapy and 11 (21.5%) received ≥ 72 hr. At 4 specified intervals, 33.3% (22.3–39.9) received DEX at a rate > 0.7 mcg/kg/h. Approximately 11.2% (9.1 to 13.8) received the max dose throughout the infusion interval. BP and HR decreased by ~10% on initiation. A loading dose was associated with smaller decreases in hemodynamics. Thirteen patients (25%) required a new clonidine order or DEX re-initiation due to tachycardia and/or hypertension. Of the patients receiving DEX ≥ 72 hr, 6 (54%) required clonidine or DEX re-initiation. Conclusions: We conclude our facility may be utilizing DEX in dose titration and length of therapy > 72 hr. Extended infusions probably contributed to re-initiation of an α2 receptor agonist. Based on these findings, education and computer alerts will be developed to assist in evaluating appropriateness and ensuring targeted sedation goals are met.

650 INSUFFICIENT USE OF ANALGESIA AND ANXIOLYSIS IN POST-INTUBATED PATIENTS IN THE ED
Suprat Sady Wilson, Libby Giesler, Robert Sherwin
Learning Objectives: Critically ill patients such as those with sepsis often required mechanical intubation in the emergency department (ED). Most often, these patients remain in the ED for several hours or more waiting for a bed in the ICU. Intubated patients require close attention from nurses and physicians to ensure that adequate analgesia and anxiolysis are provided. Minimal data is available to describe the provision of post-intubation sedation and analgesia in the ED. The objective of this study is to describe the analgesia and sedation use in post-intubated patients in the ED. Methods: We performed a multi-center retrospective analysis of sepsis patients who were intubated in the ED from Jan 2008 to Dec 2012. Excluded patients were <18 yr old or made palliative care within 48 hr of admission. Demographics and use of post-intubation analgesic and anxiolytic agents in the ED were recorded. Primary outcome was the use of either analgetic or anxiolytic agents in these patients. Results: A total of 240 patients were identified, with a mean age of 65.9 ± 15 yr, 58% were males, 83% were African Americans, and 40% were from a nursing home. In the overall population, 49.6% received no analgesic, 25.4% received no anxiolysis, 21.5% received ≤ 24 hr, 25.4% received > 72 h. At 4 specified intervals, 33.3% (22.3–39.9) received infusions > 24 hr of therapy and 11 (8%) or burn (6%). A bolus was used for 13 patients (25%) with a mean of 0.61 mcg/kg. Within the first 24 hr of initiation, 14 patients (27.5%) reached the facility maximum dose of 1.5 mcg/kg/h within a median time of 42 min (IQR 27.5–251). A total of 30 patients (58.8%) received infusions ≥ 24 hr of therapy and 11 (21.5%) received ≥ 72 hr. At 4 specified intervals, 33.3% (22.3–39.9) received DEX at a rate > 0.7 mcg/kg/h. Approximately 11.2% (9.1 to 13.8) received the max dose throughout the infusion interval. BP and HR decreased by ~10% on initiation. A loading dose was associated with smaller decreases in hemodynamics. Thirteen patients (25%) required a new clonidine order or DEX re-initiation due to tachycardia and/or hypertension. Of the patients receiving DEX ≥ 72 hr, 6 (54%) required clonidine or DEX re-initiation. Conclusions: We conclude our facility may be utilizing DEX in dose titration and length of therapy > 72 hr. Extended infusions probably contributed to re-initiation of an α2 receptor agonist. Based on these findings, education and computer alerts will be developed to assist in evaluating appropriateness and ensuring targeted sedation goals are met.

651 POTENTIAL PROLONGED EFFECTS OF ARGATROBAN IN THE CRITICALLY ILL
Uyen Diep, Mareas Glass, Earnest Alexander, Melissa Giaratano, Erica Walker
Learning Objectives: Argatroban is a direct thrombin inhibitor used in the management of patients with heparin induced thrombocytopenia. Due to argatroban’s effects on INR and aPTT, bridging with warfarin recommendations are to discontinue argatroban during co-therapy and assess INR within 4–6 hr. Limited data exists evaluating whether the effects of argatroban completely dissipate in 4–6 hr in the critically ill. The intent of this study was to identify if there is a prolonged effect of argatroban in critically ill patients bridging to warfarin. Methods: A single center, retrospective chart review was performed on patients admitted to the ICU between 01/01/12 to 05/31/15 that received co-therapy with warfarin and argatroban. Patients with liver dysfunction were excluded. Demographics, aPTT, INR, doses of argatroban and warfarin were abstracted from the medical record. The percentage of patients who did not return to a baseline aPTT within the 4–6 hr following the discontinuation of argatroban was calculated. Results: A total of 10 patients received co-therapy. Of these patients, 9 (90%) had aPTT values that did not return to baseline within 4–6 hr after argatroban discontinuation with a mean aPTT of 38 ± 9 sec. Warfarin-alone INRs were subtherapeutic (INR <2) in 3 patients (30%), 2 (20%) were supratherapeutic (INR >3), and 5 (50%) therapeutic (INR 2–3) after argatroban discontinuation. Conclusions: Prolonged effects of argatroban on aPTT were evident in 90% of patients. This indicates argatroban was likely not cleared and may still have an effect on the INR value. This calls into question the adequacy of the 4–6 hour time cutoff for assessing INR in the critically ill. In 50% of patients, warfarin-only INR was either sub or supratherapeutic, thus adding to the complexity of the bridging process. In these situations, the appropriate timing of discontinuation or argatroban is questionable. Duration of argatroban’s effects is often unpredictable and further guidance is needed on bridging critically ill patients from argatroban to warfarin.

652 PROTHROMBIN COMPLEX CONCENTRATE (KCENTRA) FOR REVERSAL OF ORAL FACTOR XA INHIBITORS
Rachel Stratanman, Emily Owen, Gabrielle Gibson, Theresa Human
Learning Objectives: Several guidelines recommend 4-Factor Prothrombin Complex Concentrate (PCC) for reversing the anticoagulant effects of oral factor Xa inhibitors. These recommendations are based on limited evidence in healthy volunteers. Despite the absence of conclusive evidence and reliable monitoring parameters to assess coagulopathy, clinicians often opt to give PCC when presented with a patient suffering from life-threatening bleeding. This study, therefore, aims to describe the effects of PCC on reversing oral factor Xa inhibitors. Methods: Consecutive patients that received PCC (Kcentra®) for oral factor Xa inhibitor reversal from January 1, 2014-August 1, 2015 at an academic medical center were retrospectively evaluated. Data collected for review included patient demographics, anticoagulant and corresponding indication, source of bleed, PCC dose, administration time, coagulation parameters, intracranial hematoma expansion, and hospital length of stay (LOS) and mortality. The ED were recorded. Conclusions: Forty-seven patients received 53 doses of PCC. Thirty-six patients received rivaroxaban, while 11 received apixaban. Indication for anticoagulation included atrial fibrillation (34); DVT/PE (8); other (5). Bleeding source included intracranial hemorrhage (spontaneous [19], traumatic [17]; emergent surgery reversal [4]); hematoma (4); GIB (2); non-urgent procedure reversal (1). PT/INR was collected prior to 48 doses. The median pretreatment
PT was 16.2 seconds, while the median pretreatment INR was 1.5. The median PCC dose was 42.7 units/kg (IQR 27.4–50.1). The observed percent change in PT and INR after PCC administration was 17.5% (IQR 11.6–26.0) and 17% (IQR 11.8–25.7), respectively. Intracranial hematoma expansion was observed in 16.7% (6/36) of patients and 5 patients received ≥ 2 doses. Thrombotic complications occurred in 12.8% (6/47) of patients. The hospital LOS was 4 days (IQR 2–6) and mortality was 19.1% (9/47).

**Conclusions:** Administration of PCC resulted in improvement, but not normalization, of coagulation parameters. The correlation between PCC administration, hemostasis, and thrombosis warrants further evaluation.

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**RISK FACTORS ASSOCIATED WITH ELEVATED VANCOMYCIN TROUGH CONCENTRATIONS IN A MEDICAL ICU**

Lauren Adams, Steven Pass

**Learning Objectives:** Vancomycin is frequently used for empiric antibiotic coverage and treatment of methicillin-resistant staphylococcus aureus in the ICU. Due to concern for several elevated levels, we conducted a review to determine potential risk factors for elevated vancomycin trough concentrations (> 20 mcg/mL) in a medical ICU population. **Methods:** This was a single center retrospective observational study using data from the computerized patient record system (CPRS) at the Dallas VA Medical Center. Patients admitted to the medical ICU that received ≥ 48 hr of vancomycin and had a vancomycin trough level drawn between January 1, 2014 and December 31, 2014 were included in this analysis. The following potential risk factors were recorded: age greater than 65 yr, body weight (actual, ideal, and adjusted), dose (mg/kg), history of CKD or hemodialysis, serum creatinine (SCR), estimated GFR, estimated creatinine clearance (CrCL), and history of congestive heart failure (CHF). Univariate and multivariate analyses were performed using logistic regression and multivariate analysis of variance, respectively, to identify predictors of elevated trough concentrations. **Results:** A total of 430 patients were initially screened, of which 93 patients met inclusion criteria. Univariate analysis identified CHF, increased acutal body weight, SCR > 2 mg/dL, decreased eGFR (< 20 and < 40 mL/min), and decreased CrCl as significant risk factors for elevated serum trough concentrations. On multivariate analysis, only CHF, eGFR < 20 mL/min, and SCR > 2 mg/dL were identified as independent predictors for elevated serum trough concentrations. **Conclusions:** We analyzed the possible risk factors for elevated vancomycin trough concentrations in a medical ICU population. Factors that influence volume of distribution, mainly CHF and renal dysfunction, were found to be significant risk factors. While adjustments are typically made for renal patients, the results of this study indicate that patients with CHF should also be closely monitored for necessary adjustments in both vancomycin dose and dosing interval.

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**RISK FACTORS FOR THE DEVELOPMENT OF HEMODYNAMIC ADVERSE EFFECTS WITH DEXMEDETOMIDINE**

Ahmed Mahmoud, Jeremy Flynn, Alexander Flannery

**Learning Objectives:** DEX (Dexmedetomidine) is a selective alpha 2-adrenergic agonist utilized as a mild sedative in the ICU. DEX’s major adverse effect is hypotension. **Methods:** We identified all medical ICU patients who received DEX (0.5 mcg/kg/hour) during January 1, 2014 and December 31, 2014 was performed. Baseline demographics, vitals, SAPS II score, cardiac disease history and concurrent medications were recorded as well as the incidence of any hemodynamic compromise. **Results:** One hundred and twenty six patients were included for analysis. Nineteen percent experienced bradycardia and 34.9% experienced hypotension with the use of DEX. There was a statistically significant association between the incidence of bradycardia and baseline heart rate and duration of use. In addition, there was a statistically significant association between the development of hypotension and baseline SBP, STICU admission and duration of DEX use. **Conclusions:** This study highlights the importance of consideration of individualized patient risk factors for adverse hemodynamic events when prescribing DEX.
CONTINUOUS SEDATION WITH MIDAZOLAM IN OBSESE VS NON-OBSESE CRITICALLY ILL PATIENTS
Yuliya Genkina, Erin Mancl, Megan Rech

Learning Objectives: The purpose of this study was to evaluate how adequately obese critically ill patients were maintained within goal Richmond Agnesta Sedation Score (RASS) compared to non-obese patients on midazolam infusions dose based on mg per hour. Methods: This retrospective cohort study of patients admitted to Loyola University Medical Center from January 2013 through December 2014 included patients at least 18 yr old, mechanically ventilated and sedated with fentanyl and midazolam continuous infusions for at least 24 hr to a light level of sedation (goal RASS 0 to -2). Patients were categorized according to body mass index (BMI) < 30 kg/m² or ≥ 30 kg/m². Results: Of the forty patients included in this analysis, the percentage of time spent at goal RASS was not statistically different between non-obese (67.1%) and obese patients (61.1%; p=0.496). Higher doses of fentanyl were used in obese patients with cumulative doses of fentanyl in non-obese group being 13987.2 ± 12811.7 mcg compared to 28539.6 ± 22725.6 mcg in obese group (p=0.014). The mean rate of fentanyl infusion was 123.6 ± 100.7 mcg/hr in non-obese compared to 284.5 ± 185 mcg/hr (p=0.001). Additional benzodiazepine doses were more likely to be given to obese (13%) compared to non-obese (9%) patients (p=0.01). Conclusions: Obese patients may have higher dose requirements of analgesic medications compared to non-obese patients in the ICU. Maintenance within goal RASS did not show a statistically significant difference between groups, but higher doses given in the obese population may play a role in maintaining in goal RASS. With the rising obesity epidemic it is crucial to develop evidence-based practices for sedation of obese critically ill patients to optimize patient outcomes and healthcare costs as obese patients are generally excluded from large-scale ICU studies.

Research Snapshot Presentations: Professional Development

“My BIGGEST CONCERN…”: TRANSITIONING FROM FELLOW TO FACULTY
Roshini Sreedharan, Utpal Bhalala, Ashish Khanna, Denise Goodman, Samuel Fisherman, Sarah Lee, Elizabeth Hunt, Vinay Nadkarni

Learning Objectives: The importance of training in professional and career development during Graduate Medical Education is increasingly acknowledged, but to date is not specialty specific. There is a lack of published data on assessment of career development needs for trainees who are transitioning to their first job in Critical Care Medicine (CCM). We sought to evaluate the career-oriented concerns of CCM professionals during transition from training to their first job. Methods: We conducted a survey during the In-training session of the SCCM Annual Congress in 2015. Participants were asked to write down their two principal concerns when considering the transition from training to first CCM job. Responses were examined for themes. Results: 59 participants of the session responded with a total of 81 concerns. Six themes emerged: Concerns related to competency, logistics, new responsibilities, administration, End of Life (EOL) care and work-life balance. The most common was competency related (41%)/perception of new colleagues, fear of inadequate clinical competence, earning support and trust of senior staff. The second most common area was related to logistics (20%) - learning the hospital infrastructure, policies, efficient documentation and billing. Demands of new responsibilities – leading evidence-based rounds for trainees or making decisions leading to a bad outcome was third on the list (18%). Administrative concerns (10%) centered on juggling multiple responsibilities and taking on a leadership role in the ICU was fourth. EOL care concerns (6%) related to provision of futile care and making EOL decisions was next. Interestingly, work-life balance concerns such as work hr, burnout and inadequate time with the family was least likely to be mentioned (5%). Conclusions: Career-related concerns on transition from training to first job are common among critical care professionals and are varied, the commonest being related to overall competency. These observations may form the foundation for a broad assessment of attitudes related to transitioning from trainee to faculty and to better prepare junior intensivists.

IMPLEMENTATION AND PERCEPTIONS OF A CRITICAL CARE PHARMACISTS’ MENTOR-MENTEE PROGRAM
Drayton Hammond, Serena Harris, Brian Kopp, Suan Hamblin, Clinical Pharmacy and Pharmacology Section

Learning Objectives: The Society of Critical Care Medicine’s (SCCM) Clinical Pharmacy and Pharmacology (CPP) Section created a mentorship program in 2006 to facilitate mutually beneficial professional growth between critical care pharmacists. We describe the implementation and perceptions of a Mentor-Mentor Program (MMP) associated with an international, multidisciplinary organization. Methods: A validated, online survey was developed and distributed to mentors and mentees who participated in the MMP in 2013–14. Collected data included participant demographics, topics discussed, perceptions of professional growth and benefits of the MMP (using a 5-point Likert scale). Descriptive statistics were utilized. An internal CPP Section database was used for historical demographics from 2010–15. Results: Since 2010, 72 mentor-mentee pairs with practice sites in 20 and 26 different states, respectively, have participated in the MMP. Twelve participants from 13 mentor-mentee pairs completed an online survey. The majority of mentors (67%) and mentees (83%) indicated the frequency of contact was appropriate. All mentors and most mentees (67%) agreed or strongly agreed they had a shared understanding of the goals of their relationship. While most mentors (83%) knew the strengths and weaknesses of their mentee, only 50% of mentees knew these about their mentor. Mentees were confident in the following areas after participation in the MMP: conducting research (67%), involvement in the SCCM CPP Section (75%), career development (100%), academia (100%) and establishment as a new practitioner (60%). All mentors and most mentees (83%) agreed or strongly agreed that the person they were paired with was good and would recommend the MMP to another pharmacist seeking mentorship. Conclusions: The MMP meets a need for critical care pharmacists by facilitating growth and development in essential areas. The CPP Section should continue to support this program while addressing potential areas for improvement such as standardizing contact frequency, facilitating development of clear, mutual goals and discussion of strengths/weaknesses.

USING SOCIAL MEDIA TO INCREASE THE REACH OF SCCM’S CRITICAL CARE CONGRESS
Elizabeth Mack, Mike von Iischudi, Ken Tegtmeier, Christopher Carroll, Tamas Szakmany, Alice Ackerman

Learning Objectives: Social media is transforming the landscape of information sharing. While medical knowledge is increasing at an unprecedented rate, conferences have traditionally had a reach limited to those who able to attend or purchase the recordings. We aimed to examine the trends in social media growth at the Society of Critical Care Medicine (SCCM) Critical Care Congress (CCC) and assess which groups were responsible for growth over time. Methods: We used Symplur analytics to assess the impact of Twitter as a platform to expand conversation across the globe during CCC in 2014 & 2015. The number of tweets and impressions were analyzed using the official SCCM hashtags #CCC43 and #CCC44 during the calendar month of the conference. Impressions are calculated by Symplur using analytics to assess the impact of Twitter as a platform to expand conversation across the globe during CCC in 2014 & 2015. The number of tweets and impressions were analyzed using the official SCCM hashtags #CCC43 and #CCC44 during the calendar month of the conference. Impressions are calculated by Symplur as the number of tweets per participant multiplied by the number of participants’ followings in the specified timeframe and are analogous to views or the reach of the tweet. Tweepers were categorized as either healthcare providers or industry, healthcare organizations and advocacy groups. Results: Comparing the 2014 & 2015 SCCM conferences (#CCC43 & #CCC44), the trend is towards a higher number of tweets (1795 vs. 4448) by more participants (296 vs. 657) resulting in a significantly larger number of impressions (163,187 vs. 6,594,005); in 2015 fewer impressions (84%) than in 2014 (179%). The majority of impressions (61%) were due to tweets from industry, healthcare organization or advocacy groups (15% vs. 39%) were due to tweets from individual healthcare providers and more were due to tweets from industry, healthcare organization or advocacy groups (15% vs. 61%). SCCM membership in the same time periods was 15,692 in 2014 and 15,850 in 2015; The number of people in attendance at these conferences was 4419.
in 2014 to 4570 in 2015. **Conclusions:** There has been substantial growth in the reach of SCCM Critical Care Congress through the use of Twitter in two years, with a 40-fold increase in impressions. This reach far surpasses the attendance and is in large part due to an increased industry presence in social media at CCC. Medical conferences should continue strategies to encourage growth of social media to improve reach, such as SCCM’s formation of a social media task force.

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**DIVERSITY IN THE EMERGING INTENSIVIST WORKFORCE: TRENDS IN CRITICAL CARE FELLOWS FROM 2004-2014**

Meghan Lane-Fall, Todd Miyano, Jaya Ayoola, John Augoustides

**Learning Objectives:** Diversity in the physician workforce is desirable because it may increase patient satisfaction, improve patient outcomes, and improve cultural competency of healthcare teams. Gender, racial, and ethnic diversity in medicine has increased over the previous 10 yr, but demographic trends in the critical care workforce have not been described. The objective of this project was to characterize demographic trends in critical care fellows, who constitute the emerging intensivist workforce. **Methods:** Using annual reports published in the Journal of the American Medical Association, we used logistic regression to compare trends in the percentage of women and racial/ethnic minorities across critical care (CC) fellowships, including anesthesiology CC, internal medicine CC, pulmonary CC, pediatric CC, surgical CC, and combined emergency medicine-interneal medicine CC medicine. From 2004-14, the number of critical care (CC) fellows increased annually, up 54.8% from 1,607 in 2004-05 to 2,489 in 2013-14. The proportion of female CC fellows increased from 29.5% (2004-05) to 38.3% (2013-14), with a 1.2% increase per year (p=0.001). The number of black fellows increased each year but the percentage was statistically unchanged (5.1% in 2004-05 vs. 3.9% in 2013-14 (p=0.92)). Hispanic fellows increased from 124 (7.7%) in 2004-05 to 216 (8.4%) in 2013-14 (p=0.015). The number of American Indian/Alaskan Native/Native Hawaiian/Pacific Islander fellows decreased from 15 (1.0%) to 7 (0.3%) (p=0.001). When compared to population estimates, female CC fellows and those from racial/ethnic minorities were underrepresented in all yr. **Conclusions:** Women and racial/ethnic minorities underrepresented in medicine are also underrepresented in the emerging critical care workforce. The representation of women and Hispanics is increasing over time, while black, American Indian, Alaskan Native, Native Hawaiian and Pacific Islander representation is flat or decreasing. Further research is needed to explore the reasons for the persistent underrepresentation of certain groups in critical care fellowship programs.

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**IMPACT OF A CLINICAL PHARMACIST PARTICIPATING IN MULTIDISCIPLINARY ROUNDS IN AN ICU SETTING**

Thomas Bushell, Nam Cho

**Learning Objectives:** Patients who are admitted to the ICU are at a greater risk for medication errors and adverse drug events than other hospitalized patients; they have many comorbid conditions, unstable disease course, and are prescribed twice as many medications as their non-ICU counterparts. Therefore, continuous drug monitoring is needed to ensure that medication therapy is clinically appropriate. Pharmacists in the ICU have been shown to optimize clinical outcomes, reduce adverse drug events, and reduce costs. When incorporated into multidisciplinary rounds, pharmacists can intervene to correct medication errors where they are most prone, during prescribing and administration of medications. Rounding pharmacists are able to assist in making real-time decisions with the most current and up to date information, follow patient response to prescribed therapy, and educate and assist nurses in medication administration. Continued research is needed to highlight the impact pharmacists may have on ICU patient care. Incorporating a pharmacist on ICU multidisciplinary rounds will lead to medication therapy interventions that would otherwise be missed. **Methods:** A retrospective observational study evaluating clinical pharmacist interventions made during Medical ICU rounds at a teaching hospital from January 1 to March 31, 2015. **Results:** During a three month period, 1240 interventions from 676 patients were documented by the clinical pharmacist. The mean number of medications per patient profile was 24. From the total patients, 577 (56%) patients suffered from acute kidney injury and 163 (24%) patients received dialysis during their ICU admission. The most common interventions were related to medication monitoring (35%), dose adjustments (23.6%) and medication therapy recommendations (14.5%). Of the interventions related to medication monitoring, the majority (46.9%) were related to pharmacokinetic/pharmacodynamics adjustment. **Conclusions:** Pharmacists included in ICU multidisciplinary rounds have a more complete and current clinical picture and can therefore make numerous interventions that may have otherwise been missed.

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**IMPROVEMENT IN ICU NURSING SATISFACTION AFTER IMPLEMENTATION OF AN INTENSIVIST PROGRAM**

Hesham Hassaballa, Melanie Atkinson, Kenneth Cruz, Jay Cowen, Sergio Zanotti-Cavazzoni

**Learning Objectives:** We set out to show that implementation of an Intensivist Program in a community hospital ICU would improve nursing satisfaction. **Methods:** We administered a seventeen-question online survey to staff nurses in the ICU in six community hospitals prior to and 12 mo after implementation of a comprehensive Intensivist Program. Nurses were asked to respond to each question with an answer ranging from “Strongly Disagree” to “Strongly Agree.” Each answer was weighted so that an answer of “Strongly Agree” was given a numerical score of 5, and “Strongly Disagree” was given a score of 1. “Neutral” was given a score of 3. **Results:** Nursing satisfaction scores for each question improved after implementation of an Intensivist Program. Overall, the average satisfaction score increased by 21% from 3.27 to 3.94 after implementation of the Intensivist Program. The greatest increases in nursing satisfaction scores were answers to the questions: “Patients have central venous access placed appropriately and quickly” (2.62 to 3.84, 47% increase), and “I receive excellent physician response when needed for my patients” (3.02 to 4.03, 35% increase). **Conclusions:** Nursing satisfaction improves with implementation of an Intensivist Program in community hospital ICUs. This is important to minimize nursing turnover in the ICU and promote consistent ICU nurse staffing, which may help improve outcomes.

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**PROTOCOLIZED EARLY MOBILIZATION LEADED BY INTENSIVISTS IS FEASIBLE AND SAFE IN JAPANESE CLOSED ICU**

Ryu Keibun, Tomofumi Harasawa, Dai Miyazaki, Mitsunobu Nakamura, Takayuki Ogura

**Learning Objectives:** Early mobilization improves the outcome of critical ill patients. Many reports about the utility of early mobilization were published from European countries or the United States, where early mobilization team is deployed in their ICU. However, there is no mobilization team in Japanese ICU. Japan is the most aging developed country and Japanese patients in the ICU are now also aging. Early mobilization for the geriatric critical ill patients in Japanese ICU without professional mobilization team is so challenging. In our Closed ICU, Early Mobilization Protocol is introduced, performed by Intensivists and nurses. The aim of this study is to investigate the feasibility and safety of this protocol performed in our Closed ICU without professional mobilization team. **Methods:** This is a single center prospective observational study. The observational length was from June 2015 to July 2015. This report is the interim report. The critical ill patient who was urgently admitted to our ICU was enrolled and Early Mobilization Protocol was adapted for them. The patients with disease of severe cardiovasocular, cerebrovascular, neuromuscular, or cardiopulmonary arrest, and disease limiting the mobilization were excluded. One intensivist and two nurses were needed for the activation of the protocol. **Results:** The mean period from admission to first protocolized rehabilitation was 0.9 days. 100 times of protocol activation were conducted. 26 patients were included, and 21 patients could ambulate before the admission. 19 patients of them could sit on edge of the bed, and after the sitting, 11 patients could stand. Finally, 4 patients could ambulate among their ICU stay. 57 times of protocolized rehabilitation were activated under mechanical ventilation, and 24 times were performed with ventilators. Two adverse events were shown because of extreme exhaustion and abdominal pain. No adverse event which needs to treat was recorded. **Conclusions:** Protocolized early mobilization in a Japanese Closed ICU performed by intensivist and nurse can be feasible and safe. Further observation and verification is necessary.
Learning Objectives: The role of intravenous Magnesium Sulfate (MgSO4) as treatment for severe asthma has not been well established. We investigated the use of MgSO4 in pediatric acute asthma over an 8-year period. Methods: A multi-institutional, retrospective cohort study of 41 pediatric hospitals using data from the Pediatric Health Information System for yr 2007 through 2014 was performed. Patients with a primary diagnosis of asthma (ICD-9 code 493.x, APR-DRG 141) and ICU admission were extracted. Demographic data and outcomes were analyzed. Pharmacological interventions, mechanical ventilation (MV), length of stay (LOS), mortalities, and total charges were compared based on whether patients received MgSO4. Results: Of the 28,851 patients studied, 16,463 received MgSO4 and 12,388 did not. MgSO4 use in children with severe asthma increased significantly from 2007 to 2014 (49.0% vs 61.5%) (p < 0.0001). Interestingly, the variability across hospitals was very large (usage ranged 22.1% to 84.4%). Patients receiving MgSO4 were older (88.5 mo vs. 77.8 mo in non-MgSO4 patients) (p < 0.0001) and were more likely to be black (52.9% vs. 41.4%) (p < 0.0001). Patients receiving MgSO4 had greater average charges per admission ($32,493 vs. $25,899) (p < 0.0001) as a result of greater MV use (13.3% vs. 9.4%) (p < 0.0001), greater ICU LOS (1.97 days vs. 1.79 days) (p < 0.0001), and hospital LOS (3.42 days vs. 3.20 days) (p < 0.0001). Patients receiving MgSO4 were also more likely to have received terbutaline, iatrogenic bronide, aminophylline, and ketamine (p < 0.0001 for all) among other interventions. However, mortality rate was not significantly different between the two groups (p = 0.367). Conclusions: The use of magnesium sulfate in severe asthma in children has increased over the past 8 yr. However, there is wide variability in its use in the absence of evidence-based guidelines. In use is associated with increased hospital charges, interventions and length of stay without significant difference in mortality. Further studies are needed to establish clinical and cost effectiveness of this drug to standardize best practice.

HIGH-FLOW NASAL CANNULA FLOW TITRATION AND EFFORT OF BREATHING IN THE PICU

Thomas Weiler, Asavari Kamerkar, Justin Horz, Patrick Ross, Christopher Newth, Robinder Khemani

Learning Objectives: High-flow nasal cannula (HFNC) is frequently used during the acute phase of respiratory illness for infants and young children. There are limited data examining the optimal dose of HFNC to reduce effort of breathing (EOB). This study aims to identify the dose-response of HFNC flow rates on objective measurements of EOB in children <3 yr old. Methods: We performed a prospective trial of children (<3 yr old) on HFNC in the PICU at Children's Hospital Los Angeles during their acute phase of illness (not post-extubation). We used a naso-esophageal pressure catheter, calculating pressure-rate product (PRP), phase angle (PA) (a measure of thoracoabdominal asynchrony). Measurements were taken at flow rates normalized to body weight (0.5, 1, 1.5, and 2 L/kg/min) using one or both of two HFNC delivery systems, Fisher & Paykel" (FP) and/or Vapotherm® (VT), and were repeated daily while patients remained on HFNC. Results: Patients enrolled (n = 12 with 25 total measurements) showed a statistically significant decrease in PRP as HFNC was titrated to 1.5 L/kg/min with no further decrease at 2 L/kg/min. Median PRP was 764 at 0.5 L/kg/min (IQR 619, 912), 652 at 1 L/kg/min (422, 852), 556 at 1.5 L/kg/min (406, 816), and 586 at 2 L/kg/min (391, 835) (p = 0.000002, ANOVA). Multiple comparisons with Bonferroni correction showed a significant difference when comparing PRP at 0.5 L/kg/min to all other flow rates (p < 0.05) but no difference when comparing PRP at flow rates of 1.1.5, and 2 L/kg/min to each other. A similar pattern of lowest PRP at 1.5 L/kg/min was consistent when stratifying by device with statistically significant differences between flow rates (p = 0.0015 for FP, p = 0.00872 for VT, ANOVA). Smaller sample size precluded meaningful multiple comparison analysis. There was no difference in the PA at different flow rates (p = 0.87, ANOVA). Conclusions: There is a dose-response relationship between increased HFNC flow rate and lower effort of breathing with lowest effort at a flow rate of 1.5 L/kg/min.
1.8–5.6; p<0.0001) were associated with significantly higher odds for IHM. Those who developed SA (Estimate±SE=0.895, 95% CI=0.67–1.13, p<0.0001, estimate implies higher), MS (Est=0.310, 0.22–0.40, p<0.0001) or PN (Est=0.34, 0.24–0.45, p<0.0001) were associated with significantly higher HC compared to their counterparts. Likewise, those who developed SA (Est=0.478, 0.28–0.667, p<0.0001), BI (Est=0.145±0.098, 0.192, p<0.0001), MS (Est=0.320, 0.254–0.387, p<0.0001) or PN (Est=0.27, 0.203–0.338, p<0.0001) were associated with significantly longer LOS compared to their counterparts. Conclusions: The significant impact of infections in hospitalized adults with CF is highlighted. Aggressive preventive measures are needed to optimize outcomes.

669 THE EFFECT OF LOW DOSE METHYLPRENDISOLONOLE IN BIOMARKER LEVELS IN EARLY PEDIATRIC ARDS
Dai Kimura, Jordy Shea Sarav, Cynthia Rownaghi, Andreas Schwinghackl, Gianfranco Meduri, Stephanie A. Cormier, Kanwaljeet Anand

Learning Objectives: Activation of multiple pro-inflammatory pathways, including neutrophils, epithelial and endothelial injury, and the coagulation cascade occurs in ARDS, leading to acute respiratory failure. In a pilot randomized controlled trial (RCT) of low-dose methylprednisolone therapy (MPT) for early pediatric ARDS at a tertiary-care children’s hospital, MPT improved oxygenation and ventilation without altering duration of mechanical ventilation or mortality. Plasma samples from these patients, were evaluated for the effects of MPT on ARDS biomarkers of endothelial (Ang-2, sICAM-1), epithelial (sRAGE), coagulation (PAI-1) and neutrophil activation (MMP-8). Methods: In 48 plasma samples from 35 patients (18 in placebo group, 17 in MPT group) collected on Days 0 and 7, multiple regression models were used to predict associations between changes in biomarkers and clinical outcomes. Results: No differences occurred in biomarker concentrations between the groups on Day 0. Reduction in MMP-8 levels (p=0.0016) in the MPT group and increases in sICAM-1 levels (p=0.0005) in the placebo group occurred on Day 7 (no increases in sCAM-1 in the MPT group). sRAGE levels decreased in both MPT and placebo groups (p<0.002) from Day 0 to Day 7. Linear regression demonstrated that PAI-1/Fibrin ratios in the MPT group on Day 8 positively correlated with Day 7 sRAGE levels (r=0.93, p=0.024). O2 requirements at ICU transfer positively correlated with Day 7 MMP-8 (r=0.85, p<0.016) and Ang-2 levels (r=0.79, p=0.036) in the placebo group, and inversely correlated with Day 7 sICAM-1 levels (r=0.91, p=0.0095) in the MPT group. Conclusions: We demonstrated changes in selected biomarkers of ARDS between the placebo and MPT groups correlated with clinical endpoints. Reduced neutrophil activation by anti-inflammatory effect of MPT may allow faster epithelial recovery, thus avoiding an increased endothelial injury as noted in the placebo group. Larger controlled studies are needed to validate the ability of these biomarkers to predict outcomes in pediatric ARDS.

670 IMPACT OF SUBGLOTTIC SUCTION ENDOTRACHEAL TUBES ON ASPIRATION AND VENTILATOR-ASSOCIATED CONDITIONS
Melody Bennett, Mary Sole, Lara Deaton, Aurea Middleton, Danielen Penoyer, Xin Yan, Janet Conrad, Devendra Mehta

Learning Objectives: Guidelines recommend that subglottic suction endotracheal tubes (SS-ETT) be inserted to reduce the risk of aspiration and ventilator-associated pneumonia. The suction port of the SS-ETT removes secretions that accumulate above the cuff. Outcome data on ventilator-associated conditions (VAC) and aspiration as measured by tracheal amylase are limited. We hypothesized that subjects with a SS-ETT would have fewer cases of VAC and lower levels of tracheal amylase. Methods: This is a secondary analysis of data from an ongoing trial to reduce aspiration in ventilated patients. Within 24 hr of intubation, we obtained consent and enrolled adult subjects (age ≥ 18). We provided oral care to all subjects every 4 hr. We collected tracheal specimens at baseline and every 12 hr while enrolled, and ran alpha-amylase levels (biomarker of aspiration of oral secretions) using standard laboratory methods. We classified VAC by the CDC National Healthcare Safety Network (NHSN) surveillance definition. We conducted chi-square analysis and t-tests for independent samples. Results: Data were available for 123 subjects; 94 (76.4%) had a SS-ETT. Sample characteristics were mean age 55.9 yr, 60.2% male, 25% racial minority, and 18.7% Hispanic ethnicity. Diagnoses included 46.3% medical-surgical, 27.6% trauma, and 26% neuro. Mean tracheal amylase for traditional ETT was 22,890 Units/L, and 17,579 Units/L with SS-ETT (p = .54). Positive tracheal specimens (≥ 36 Units/L) were noted in 90% of specimens of conventional ETT and 85% of SS-ETT (p = .22). VAC was identified in 20 subjects (16.3%): 20.7% conventional ETT and 14.9% SS-ETT (p = .46). Conclusions: We found no significant differences between type of ETT and VAC and aspiration outcomes. The lack of significant findings may be due to various etiologies for VAC, and the provision of oral care to all subjects. The level of tracheal amylase varied widely. Findings show that aspiration of oral secretions occurs around the ETT cuff, regardless of tube type. (IR01NR014508)

671 PNEUMONIA IN THE ICU: VARIABLE RATES BASED ON DIFFERENT DEFINITIONS
Erick Duan, Bram Rockoverg, John Centofanti, Joanna Dionne, Lois Saunders, Maureen Meade, Jennie Johnstone, Deborah Cook

Learning Objectives: Patients, families, clinicians, investigators and administrators remain concerned about pneumonia in the ICU and its associated morbidity and mortality. However, there is no single diagnostic criterion for pneumonia in critical care practice or research. Our objective was to compare the burden of pneumonia in the ICU based on 4 published definitions in current use. Methods: We conducted this study nested in a multicenter pilot randomized control trial examining the feasibility of allocating mechanically ventilated adults to probiotics (L. rhamnosus GG) vs placebo to evaluate the outcomes of ventilator-associated pneumonia and other infections. We prospectively collected data on all possible respiratory infections as suspected by the ICU team from ICU admission to death or ICU discharge. Possible respiratory infections were each adjudicated independently by 2 intensivists, 1 internist and 2 residents; disagreements were settled by consensus. We used 4 published pneumonia diagnostic criteria: (1) Clinical Pulmonary Infection Score (CPIS), (2) Centre for Disease Control PNU1+2, (3) Calandra (International Sepsis Forum) and (4) REDOXs. We recorded any identified microorganisms and antimicrobial treatment. Results: Among 99 patients, the mean age was 59 yr (SD=16), median ICU length of stay was 13 days (IQR=7–19), and hospital mortality was 25%. We adjudicated 142 potential respiratory infections (55 ventilator associated, 54 community acquired, 33 hospital associated). The frequency of pneumonia varied: REDOXs (n=55, 59%), CDC PNU1+2 (91, 64%), CPIS (101, 71%), and Calandra (102, 72%), reflected in chance-corrected agreement (kappa) of 0.34 across definitions. Most of the possible respiratory infections were treated by the ICU team (118, 83%), and pathogenic microorganisms were identified for 51% of events (n=72). Conclusions: The burden of pneumonia in critical illness depends on the definition. This has implications for diagnosis and treatment, research and quality improvement, hospital policy and healthcare reimbursement.

672 DERIVATION OF A BUNDLE TO IMPROVE FIRST ATTEMPT SUCCESS AT INTUBATION IN THE ICU
Melissa Kelsey, Cameron Hypes, Raj Joshi, Josh Malo, John Bloom, John Sakles, Jarrod Mosier

Learning Objectives: A difficult intubation is defined as requiring >2 attempts or 10 min to perform. Prediction tools exist to anticipate the difficult intubation, yet two problems remain: 1. Performance of these tools is suboptimal and 2. Critically ill patients have limited tolerance for repeated or prolonged attempts at laryngoscopy. Thus, first attempt success (FAS) is the goal for intubations in critically ill patients. Yet two problems remain: 1. Performance of these tools is suboptimal and 2. Critically ill patients have limited tolerance for repeated or prolonged attempts at laryngoscopy. Thus, first attempt success (FAS) is the goal for intubations in critically ill patients. Our objective was to compare the burden of pneumonia in the ICU based on 4 published definitions in current use. Methods: We conducted this study nested in a multicenter pilot randomized control trial examining the feasibility of allocating mechanically ventilated adults to probiotics (L. rhamnosus GG) vs placebo to evaluate the outcomes of ventilator-associated pneumonia and other infections. We prospectively collected data on all possible respiratory infections as suspected by the ICU team from ICU admission to death or ICU discharge. Possible respiratory infections were each adjudicated independently by 2 intensivists, 1 internist and 2 residents; disagreements were settled by consensus. We used 4 published pneumonia diagnostic criteria: (1) Clinical Pulmonary Infection Score (CPIS), (2) Centre for Disease Control PNU1+2, (3) Calandra (International Sepsis Forum) and (4) REDOXs. We recorded any identified microorganisms and antimicrobial treatment. Results: Among 99 patients, the mean age was 59 yr (SD=16), median ICU length of stay was 13 days (IQR=7–19), and hospital mortality was 25%. We adjudicated 142 potential respiratory infections (55 ventilator associated, 54 community acquired, 33 hospital associated). The frequency of pneumonia varied: REDOXs (n=55, 59%), CDC PNU1+2 (91, 64%), CPIS (101, 71%), and Calandra (102, 72%), reflected in chance-corrected agreement (kappa) of 0.34 across definitions. Most of the possible respiratory infections were treated by the ICU team (118, 83%), and pathogenic microorganisms were identified for 51% of events (n=72). Conclusions: The burden of pneumonia in critical illness depends on the definition. This has implications for diagnosis and treatment, research and quality improvement, hospital policy and healthcare reimbursement.
Results: The elements with the highest odds of FAS were: pre-oxygenation to a saturation >93%, use of a neuromuscular blocking agent, and use of video laryngoscopy. Over the study period 461 (57%) patients intubated had all components of the bundle performed and 348 (43%) patients had at least one component missing. FAS was 84.2% when all bundle elements were performed and 69.5% when any component was missing (p < 0.001). After controlling for operator experience and specialty, there were higher odds of FAS (aOR 2.61; 95% CI: 1.83–3.72) and reduced odds of an AE (aOR 0.70; 95% CI: 0.51–0.95) when all bundle elements were performed. Conclusions: These data suggest that a bundle including pre-oxygenation to a saturation >93%, neuromuscular blocking agent use, and video laryngoscopy improved odds of FAS and decreased odds of one or more AE for intubations performed in the ICU. Prospective studies are needed to validate these findings.

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ASSOCIATION BETWEEN EARLY FLUID BALANCE, ORGAN FAILURES AND OUTCOMES IN VENTILATED PATIENTS
Luciano Azevedo, Fernando Ignacio, Ulyses Silva, Vicente Souza-Dantas, Leon- dro Taniguchi, Jorge Salluh, Alvare Rea-Neto, Marco Soares
Learning Objectives: We aimed to evaluate the association between cumulative fluid balance in the first days of ICU stay with organ failures and outcomes in patients under ventilatory support. Methods: Secondary analysis of a prospective cohort study carried out in 45 Brazilian ICUs from June 1st 2001 to July 31st, 2011. Adult patients under invasive or non-invasive mechanical ventilation for at least 24h in the first 48h of ICU stay were included. Cumulative fluid balance in the first 72h of ICU was evaluated, as well as the development of organ failures, occurrence of ARDS and hospital mortality. Univariate and multivariable analysis were used to identify risk factors for ARDS and hospital mortality. Results: The total number of patients analyzed was 613. Median age was 60 (42–75); 57% of the patients were male and median SOFA score was 8 (5–10). Global hospital mortality was 39%. Extremely positive (≤5000 mL) and negative (<−1500 mL) cumulative fluid balance were associated with increased lactate and creatinine values, as well as lower PaO2/FiO2 ratios. In a multivariable analysis, adjusting for source of admission, dialysis and vasopressors’ use, a positive fluid balance was associated with ARDS occurrence (OR: 1.07 per liter; 95%CI=1.02–1.21). Hospital mortality was higher in patients with negative (52%) and extremely positive (75%) fluid balance, as compared to those with fluid balance close to zero (23%, p=0.001 chi-square test). In a multivariable analysis for hospital mortality, adjusting for age, SOFA score, Charlson comorbidity index, ventilatory mode and lactate levels, both extremely positive (OR3.12; 95%CI=1.51–6.44) and positive (OR:2.75; 95%CI 1.58–4.78) fluid balances were independently associated with hospital mortality. Conclusions: In patients under ventilatory support, fluid balance in the first three days of ICU was associated with more organ failures and was an independent predictor factor for ARDS occurrence and mortality. Strategies to evaluate and tailor fluid balance must be implemented in these patients.

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IMPACT OF INFECTIOUS COMPLICATIONS ON OUT- COMES IN CHILDREN HOSPITALIZED DUE TO CYSTIC FIBROSIS
Natália Martinez-Schlurmann, Sankeerth Rampa, Nalliah Romesh, Venkata- purush Allareddy, Alexandre Rotta, Venkatajandhar Allareddy
Learning Objectives: Infections in patients with cystic fibrosis(CF) are a major cause of hospitalization. We sought to examine the impact of infectious complications(IC) on outcomes (hospital charges(HC) and length of stay(LOS)) in hospitalized children with CF in the USA. Methods: We used the Nationwide Inpatient Sample for the years 2006 to 2010. All children(age <=18 yr) with a primary diagnosis for CF were selected. Amongst this cohort, those who developed IC (pneumonia[PN], bacterial infection[B], mycoses[MS], or pneumonia[PN]) were identified. The outcomes examined included HC (adjusted to year 2010 $ value) and LOS. The association between occurrence of IC and outcomes were examined by multivariable regression models. Effect of age, sex, race, insurance status, co-morbid burden, type of CF and hospital teaching status/ region were adjusted in the analysis. Results: A total of 27,177 children were hospitalized due to CF. Mean age was 11.5yr, 89 patients(0.3%) died in hospitals. Occurrence rates of different IC were: SA (0.8%), BI (45.5%), MS (6%), and PN (10.8%). The overall IC rate was 54.7%, The overall mean HC was $64,008 and mean LOS was 10.2 days. Outcomes in CF patients, with vs without IC: mean HC ($72,292 vs $54,069), Mean LOS in days(11.5 vs 8.6), In-hospital mortality rate (0.5% vs 0.2%), respectively. After adjustment for confounders, those who developed SA (Estimate{e}=1.335, 95% CI=0.971–1.659, p=0.0001, positive estimate implies higher), BI (e=0.192, 0.119–0.266, p=0.0001), MS (e=0.562, 0.369– 0.855, p=0.0001) or PN (e=0.231, 0.095–0.367, p=0.009) were associated with significantly higher HC compared to their counterparts. Those who developed SA (e=1.102, 0.787–1.417, p<0.0001), BI (e=0.246, 0.193–0.299, p<0.0001), MS (e=0.283, 0.217–0.349, p<0.0001) or PN (e=0.171, 0.081–0.262, p=0.003) were associated with significantly longer LOS compared to their counterparts. Conclusions: Infections are common and are associated with considerable resource utilization in hospitalized CF children. Aggressive infection preventive strategies are needed to optimize outcomes in this high risk cohort.

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CHARACTERISTICS OF CHILDREN WITH ASTHMA ADMITTED TO PEDIATRIC ICUs: A MULTI-INSTITUTIONAL STUDY
Alexander Cartron, William Pastor, Venkat Shankar
Learning Objectives: Given the increasing prevalence of childhood asthma, we investigated trends in patient characteristics and outcomes for asthma-related ICU admissions over an 8-year period. Methods: A multi-institutional, retrospective cohort study of 41 pediatric hospitals using data from the Pediatric Health Information System for yr 2007 through 2014 was performed. Patients with a primary diagnosis of asthma (ICD-9 code 493.x, APR-DRG 141) and ICU admission were analyzed. Demographic data and outcomes were extracted. Pharmacological interventions, invasive mechanical ventilation (MV), length of stay (LOS), mortalities, and total charges were studied. Results: 28,851 patients were included in this study. Incidence of ICU admission increased significantly from 2007 to 2014 among all inpatients with a primary diagnosis of asthma (12.4% to 21.2%) (p<0.0001). Average age (83.8 mo) (p=0.461) and male preponderance did not change (60.3%) (p=0.916). African Americans had the greatest prevalence of asthma-related ICU admissions throughout all yr (average=67.9%). APR-DRG severity of patients increased (p<0.0001) as did the number of patients with complex chronic conditions (9.76% to 12.20%) (p<0.001). Use of intravenous magnesium sulfate increased (49.0% to 61.5%) (p<0.0001) while use of terbutaline sulfate decreased (22.1% to 11.2%) (p<0.0001). An increasing proportion of children received invasive MV (10.0% vs. 14.3%) (p<0.0001), despite that hospital length of stay decreased (3.43 days to 3.17 days) (p<0.0001) as did ICU length of stay (1.94 days to 1.80 days) (p<0.0001). Percent mortality decreased (0.216% to 0.0612%) but this change was not statistically significant. Despite shorter LOS, average charges per patient increased over this time ($22,601 to 34,272) (p>0.0001). Conclusions: The incidence and severity of asthma in pediatric ICUs across the country is on the rise despite advances in asthma prevention and treatment. Notwithstanding an increase in the resource utilization including pharmacological interventions and mechanical ventilation, the survival outcomes have not changed favorably.

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ULTRASONOGRAPHIC DIFFERENTIATION OF INFILTRATION VERSUS ATELECTASIS IN THE CONSOLIDATED LUNG
Christopher Jordan, Daniel Fein, Jeremy Weingarten, Elizabeth Bachman, Samuel Acquah, Pierre Kory
Learning Objectives: There exist multiple potential causes for the ultrasono- graphic (US) observation of an “alveolar consolidation” pattern (ACP). This pattern routinely challenges clinicians to differentiate between “infiltrative” or “atelectatic” etiologies. We hypothesized that the etiology of ACPs can be deter- mined based on associated US findings. Methods: We conducted a retrospec- tive review of an imaging database (QPATH™) containing US exams performed in hospitalized children. Medical records were reviewed for baseline characteristics and pleural effusion. Results: We conducted a retrospective review of an imaging database (QPATH™) containing US exams performed in hospitalized children. Medical records were reviewed for baseline characteristics and pleural effusion. Conclusions: There exist multiple potential causes for the ultrasonographic (US) observation of an “alveolar consolidation” pattern (ACP). This pattern routinely challenges clinicians to differentiate between “infiltrative” or “atelectatic” etiologies. We hypothesized that the etiology of ACPs can be determined based on associated US findings.

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and attending intensivist ICU discharge diagnosis. US images were qualitatively assessed for bilateral effusions, static or dynamic air bronchograms, sherd sign, ACP at more than one image unilaterally, rhomboid or triangular shaped ACPs, lung tip flapping, ACP to pleural effusion size ratio, homogenous or heterogeneous ACP, complexity of pleural effusion, and abscess or nerosis. Quantitative assessments included ACP tip angle, ACP area, and antero-posterior cranio-caudal index. Results: 274 patient ICU US exams were reviewed. Of 144 (5.5%) with ACPs, 54 (20%) had associated pleural effusion and were analyzed. Baseline characteristics did not differ between groups. Significant US differences were found between patients with atelectatic and infiltrative diagnoses: Presence of bilateral effusions (P<0.02), sherd sign (P=0.02), ACP to pleural effusion ratio >1 (P<0.003) and complex pleural effusion (P<0.04). Using a logistic regression model corrected for baseline characteristics (age, sex, height and weight), both complex effusions (OR 28.37, 95%CI 1.15–697.14) and ACP to pleural effusion ratio >1 (OR 25.02, 95%CI 3.22–164.76) increased the likelihood of infiltrative causes while rhomboid shape (OR 21.29, 95%CI 1.33–340.16) increased the likelihood of atelectasis. Conclusions: Associated US characteristics of both the lung and the surrounding fluid can help differentiate between infiltrative and atelectatic causes of US lung ACP patterns.

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CLINICAL OUTCOMES OF BLASTOMYCOSIS IN THE ICU–A RETROSPECTIVE STUDY

Suartcha Pruesksaritanond, Prashant Jagtap, Bibeek Pannu, Rudy Tedja, Vivek Iyer

Learning Objectives: Blastomycosis is a systemic mycosis endemic to south-central and midwestern United States. Progression to fulminant multilobar pneumonia and acute respiratory distress syndrome (ARDS) is uncommon but associated with high mortality. To date, no studies have described the clinical outcomes of ICU blastomycosis infection. Methods: We conducted a retrospective study of ICU blastomycosis at Mayo Clinic, Rochester, MN, from April 1, 2006 to January 31, 2015. The diagnosis of blastomycosis was confirmed by microbiology and/or pathology. Data collection included demographics, APACHE III and SOFA scores, ARDS (Berlin definition), mechanical ventilation (MV), mortality etc. Results: There were 18 confirmed cases of ICU blastomycosis all from the midwestern US. The median age was 52 yr with 12 males (67%). Median ICU Length of stay (LOS) was 5.5 days with a hospital LOS of 15.5 days. Pulmonary involvement was the most common site of infection (78%, N=14), followed by cerebral (17%, N=3) and disseminated infection (5%, N=1). The patient with disseminated infection had a history of non-Hodgkin lymphoma and stem cell transplant 3 yr prior to ICU admission. Majority (55%, N=10) developed respiratory failure requiring MV for a median duration of 190hr (8 days). ARDS occurred in 80% (N=8) of the MV patients with a 50% mortality rate in ICU. Five intubated patients (50%) required tracheostomy. Overall mortality rate was 44% (N=8). The most common antifungal agent used was liposomal amphotericin B (78%, N=14). Conclusions: The majority of ICU blastomycosis patients have pulmonary involvement (78%) but cerebral involvement and disseminated infection were also observed, especially in immunocompromised individuals. Severe pulmonary blastomycosis is associated with high rates of respiratory failure, ARDS, prolonged mechanical ventilation and high morbidity and mortality. Early recognition and management is essential in suspected cases, particularly in immunocompromised hosts.

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AN ANALYSIS OF THE USE OF CT PULMONARY ANGIOGRAPHY IN YOUNG WOMEN IN AN URBAN EMERGENCY DEPARTMENT

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Learning Objectives: There is increasing concern regarding overuse of diagnostic testing involving ionizing radiation in the emergency department (ED). The use of clinical decision rules (CDRs) can help avoid unnecessary radiation. We hypothesized that in young women receiving CT pulmonary angiography (CTPA) to rule out pulmonary embolism (PE) during an ED visit, there would be a low rule-in rate for PE and opportunities for improved use of CDRs in guiding diagnostic testing. Methods: This is a retrospective review of all women 18–40 yr old presenting to a single urban academic ED during a 27-month period (July 2010 through January 2013) who received a CTPA during their ED visit. Results: There were 432 ED visits by 389 women. The mean patient age at ED visit was 30.8 yr (range 19–40 yr). 86.6% were African American, 9.3% white, and 4.1% other. In 33.1% of the visits (143/432), the patients fulfilled all 8 of the “pulmonary embolism rule-out criteria” (PERC), although we were unable to retrospectively assess how many of these patients had a pretest gestalt probability ≤15% (a preference for use of PERC). A separate CDR advises d-dimer testing if PE is unlikely with Wells score ≤4. Even if we assume that all patients had “no diagnosis more likely than PE” (this parameter could not be assessed retrospectively), 118 patients were PE unlikely by Wells score; only 59 (50.0%) of these 118 patients had d-dimer testing. PERC was mentioned in 4.2% (18/432) of these encounters and probability assessment (e.g. Wells score) combined with d-dimer testing in 5.3% (23/432). The rule-in rate for PE was 7.5% (32/432); 10 CTPAs were suboptimal or equivocal. Conclusions: Patients who fulfill all of the PERC criteria or who are classified as “PE unlikely” by Wells score ≤4 in combination with a d-dimer less than 0.5 have an approximately 0.5% risk of PE with no further testing typically required. In this review, well-validated CDRs were rarely referenced and often not followed. Clinical decision support rules for ruling out PE built into the electronic health record would be a helpful next step.
the inspiratory muscles (IM) to spontaneously inhale) could be maintained in the appropriate range over time. Methods: In this IRB-approved study, intubated adults with respiratory failure from various etiologies treated with PS and positive end expiratory pressure were divided into an Experimental Group (EG, n= 21) and a Control Group (CG, n= 24). Over 8 hr, guidance from the DSS for setting PS was followed for the EG, while PS was set based on conventional methods for the CG, i.e., assessing breathing pattern, accessory IM usage, and breathing comfort. A combined pressure/flow sensor, positioned between the Y-piece of the ventilator breathing circuit and endotracheal tube, directed data to a respiratory monitor (NM-3, Phillips) that contains the DSS software. Data were analyzed using ANOVA; alpha was set at 0.05. Results: Three subgroups were identified in the CG: Subgroup 1 (25% of patients) had excessive PS and IMs unloaded too much, PS 19 ± 5 cm H2O and WOBN/min 4 ± 2 Joules/min; Subgroup 2 (54% of patients) had appropriate PS and IM unloading, PS 16 ± 4 cm H2O and WOBN/min 8 ± 5 Joules/min; and Subgroup 3 (21% of patients) had insufficient PS and IMs loaded too much, PS 17 ± 2 cm H2O and WOBN/min 12 ± 2 Joules/ min. For the EG, on average 100% of patients received appropriate PS and IM unloading, PS 13 ± 3 cm H2O (p<0.05 compared to Subgroup 1) and WOBN/ min 7 ± 2 Joules/min (p<0.05 compared to Subgroups 1 and 3). Conclusions: By following DSS guidance, IMs of patients with respiratory failure were unloaded appropriately. In contrast, with the conventional method for setting PS, approximately half of all patients had their IMs unloaded appropriately, while the other half were either inappropriately unloaded or loaded.

683 TIDAL VOLUME DISPLAYED ERROR WITH THE USE OF INHALED NITRIC OXIDE IN SMALL TIDAL VOLUMES
Courtney Ranallo, Summer Frank, Tracy Thurman, Shirley Holt, Mark Heulitt

Learning Objectives: Inhaled nitric oxide (iNO) is a therapy used in infants with elevated pulmonary vascular resistance for various pathophysiologic reasons. Clinically, it has been observed that when iNO is being delivered at small tidal volumes (VT), displayed inspiratory (VTI) and expiratory (VTE) volumes vary widely. This discrepancy raises concern of the accuracy of volume delivery to the patient during iNO therapy. This was a novel study to measure the VT delivered at small tidal volumes and assess the accuracy of displayed ventilator volumes in a test lung model. Methods: A test lung was connected to the Servo ventilator and INOvent. All tests were performed with pressure regulated volume control, 5 cmH2O positive end-expiratory pressure, rate 50 bpm, and VT of 18, 30, 42, or 60 mL. Flow waveforms were obtained from a pneumotachograph attached directly to the test lung in line with the ventilator circuit and iNO sample line to measure VTI and VTE. The percent error (%e) between these measured values and the ventilator displayed VT and VTE values in iNO/sample line (SL) conditions (with iNO 20 ppm and SL, with iNO but no SL, and SL but no iNO) were compared to baseline (without iNO or sampling line) using Kruskal-Wallis and Steel-Dwass adjusted pair-wise tests. Results: There was no evidence that VTI and VTE error differed between the iNO/sample line conditions and baseline, except for iNO/SL in 18 mL (p=0.0126). In the condition with iNO and SL, the VTE error increased (%e:-14, -20, -26, -34) as VT decreased (mL: 60, 42, 30, 18). The VTE error was significantly higher compared to baseline in all VT (%e:0.01 for all VT). When comparing SL without iNO to baseline, the VTE error was significantly higher in all VT (p<0.01 for all VT). When iNO was added without SL, the VTE error was not significantly different than baseline across all VT. Conclusions: We concluded that removal of volume in the expiratory phase of the breath cycle by the sampling line results in a larger error in the displayed VTE at the ventilator and that the error is more pronounced at smaller VT, though the VTI varies little.

684 FLUID OVERLOAD AND HIGH FLOW NASAL CANNULA RESPIRATORY SUPPORT IN CHILDREN WITH BRONCHIOLITIS
Katherine Slain, Natalia Martinez-Schüermann, Anne Stormokken, Steven Shein

Learning Objectives: Fluid overload (FO) is associated with unfavorable outcomes in children requiring mechanical ventilation. However, associations between FO and outcomes in children on high flow nasal cannula (HFNC) are not established. We hypothesized that increasing FO would be associated with post-intubation chest X-rays (CXRs), hypothesizing that many TTs would be malpositioned, regardless of adherence to Pediatric Advanced Life Support (PALS) and Neonatal Resuscitation Program (NRP) guidelines and intubation site (outside hospital, emergency room, operating room, or PICU). Methods: In a random subset (randomization table) of 2000 initial AP supine CXRs, excluding poor quality CXRs and those with spinal or skeletal deformities, taken in the PICU (01/01/09 to 05/05/12), we recorded from the electronic medical record height, weight, age, gender, TT internal diameter (ID) and the TT cm marking at the lip. We defined adherence to PALS or NRP guidelines as the difference between predicted and actual TT markings at the lip as ≥2.5, ≥4.5, or ≥6.5 mm ID, respectively. We defined proper position on CXR as TT tip below the thoracic inlet (superior border of the clavicular heads) and ≥1 cm above the carina. Descriptive statistics were used for demographics, guideline adherence, and malposition incidence. Chi Square Test assessed relationships between intubation setting and malposition or guideline adherence (p<0.05 significant). Results: We reviewed 907 TTs (ID 3.0–8.0 mm), 56% in males, median (IQR) age 66.8 (62.3) mo. On CXR, 69% of TTs were malpositioned: 39 above the thoracic inlet, and 511 endobronchial or ≤1 cm above the carina. 76 TTs met PALS or NRP guidelines; of those, 22 were malpositioned on CXR. Of 431 TTs not meeting guidelines, 103 were properly positioned on CXR. Intubation setting did not influence malposition or guideline adherence. Conclusions: In infants and children, a high proportion of TTs are malpositioned initially after intubation.

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prolonged oxygen use and hospital length of stay (LOS) in bronchiolitis patients on HFNC. Methods: With IRB approval, electronic charts of children <2yo admitted to our center from 9/13–4/14 with a primary diagnosis of bronchiolitis and HFNC use were reviewed for demographics, hospital and PICU LOS, respiratory support, and fluid balance. Percent fluid overload (%FO) (FL fluid intake – FL fluid out/admit weight) since hospital admission was calculated at the conclusion of each 8hr “shift.” Maintenance requirements were based on Holliday–Seager methods. Statistical methods included chi squared, Wilcoxon rank-sum or Student’s t test, and multivariate logistic regression analysis. Results: The mean age of 60 subjects was 6.5 (±7.7) mo. Mean PICU LOS was 3.6 (±2.2) days and mean hospital LOS was 7.7 (±11.4) days. Mean duration of HFNC was 56.2 (±38.6) hr. In 50/3786 (6%) of shifts, fluid intake (IV plus enteral) exceeded maintenance requirements, and during 139/3786 (18%) of shifts IV fluid alone exceeded maintenance requirements. Subjects with ≥10% FO at any time during PICU stay (n = 47) had longer PICU LOS (3.4 days [2.5–4.7] vs. 2.2 [1.6–3.1], p=0.002), longer hospital LOS (6 days [5–9] vs. 4 [3–5], p<0.001), longer duration of HFNC (57 hr [42–85] vs. 28 [19.8–49.3], p=0.002) and longer duration of supplemental oxygen (101 hr [77–142] vs. 94.5 [38.3–79.3], p<0.001) vs. the remainder of the cohort. Children with ≥10% FO within the first 48h of PICU admission (n = 24) did not have differences in PICU LOS, hospital LOS, duration of HFNC, or duration of supplemental oxygen vs. the remainder of the cohort. Conclusions: Fluid overload during PICU care is associated with unfavorable outcomes in bronchiolitis patients on HFNC, but not when earlier time-points are evaluated.

685 RISK SCORES AS PROGNOSTIC MARKERS OF CLINICAL OUTCOMES IN PATIENTS WITH COMMUNITY ACQUIRED PNEUMONIA
Xubin Huang, Jun Zhang, Xinyan Huang, Mian Zeng, Canmoa Xie
Learning Objectives: The role of clinical risk scores (CURB-65:Confusion, Urea, Respiratory rate, Blood Pressure, Age >65 yr) and Pneumonia Severity Index (PSI) as prognostic markers in Chinese patients with community acquired pneumonia (CAP) is not fully established. The present study retrospectively detected whether CURB-65 and PSI measured at hospital admission are predictive of deterioration and 30-day mortality in patients with CAP. Methods: A total of 804 consecutive patients who were immunocompetent and hospitalized at a tertiary university hospital due to CAP during a 24-month period were enrolled. Clinical characteristics and laboratory data were collected. Clinical and laboratory features at presentation on medical records were extracted to calculate clinical risk scores using CURB-65 and PSI. Deterioration of CAP was defined as requirement for mechanical ventilation or vasopressor support (MV/VPS), respectively. Results: The median age was 64 yr (range, 18–98 yr; IQR, 51–75), and 57.2% of the patients were male. The median level of CURB-65 on hospital admission was 1.0 (range, 0–4; IQR, 0–2), and the median PSI score was 82 (range, 62–102). The deterioration rate was 3.4%. The 30-day mortality rate was 4.9%. In prediction of deterioration of CAP, the area under the curve (AUC) for CURB-65 was 0.77 (95% confidence interval [CI], 0.68–0.87) and AUC for PSI score was 0.82 (95% CI, 0.74–0.91). In prediction of 30-day mortality, AUC for CURB-65 was 0.76 (95% CI, 0.68–0.83) and AUC for PSI score was 0.79 (95% CI, 0.72–0.87). Conclusions: CURB-65 and PSI measured at hospital admission are predictive of deterioration and 30-day mortality in patients with CAP.

686 PREDICTORS OF DIFFICULT INTUBATION WHEN USING VIDEO LARYNGOSCOPY IN THE ICU
Raj Joshi, Cameron Hypes, Josh Malo, John Bloom, John Saldes, Jarrod Mosier
Learning Objectives: Video laryngoscopy (VL) has been shown to improve first attempt success (FAS) and reduce adverse events (AE) when compared to direct laryngoscopy (DL) in the ICU. Despite improved FAS, a significant proportion of intubations with VL require more than 1 attempt. The goal of this study is to identify anatomic characteristics that reduce the likelihood of FAS as intubation when using VL in the ICU. Methods: This is a retrospective analysis of prospective observational data collected through a continuous quality improvement program on all patients intubated in a university medical center from January 1, 2012 to January 1, 2014. Data relating to patient and operator demographics, device used, difficult airway characteristics (DACs), and outcome of each attempt were analyzed. DACs were analyzed using univariate and adjusted multivariate logistic regression analyses to control for potential confounders. Results: Over the study period, 83% (673/809) of all patients were intubated using VL. Univariate analysis identified the following DACs were significant predictors of failed first attempt: blood in the airway (OR 2.0; 95% CI 1.2–3.3), neck movement (OR 0.5; 95% CI 0.3–0.9), small tongue (OR 0.5; 95% CI 0.3–0.9), large tongue (OR 3.3; 95% CI 1.0–10), and vomit in the airway. After adjusting for operator specialty and experience, odds of FAS were significantly reduced in the presence of blood in the airway (OR 0.45; 95% CI 0.28–0.74), limited mouth opening (OR 0.53; 95% CI 0.30–0.94), large tongue (OR 0.49; 95% CI 0.29–0.83), and airway edema (OR 0.32; 95% CI 0.17–0.61). Conclusions: These data show that after controlling for operator specialty and experience, blood in the airway, large tongue, and airway edema were significant predictors of a failed first attempt at intubation using VL in the ICU. The physician should account for these DACs when preparing to intubate a patient in the ICU.

687 LENGTH OF STAY, VENTILATOR DURATION, AND MORTALITY ASSOCIATED WITH VENTILATOR-ASSOCIATED CONDITIONS
Lara Deaton, Mary Sole, Aurea Middleton, Melody Bennett, Xin Yan, Dalseen Penoyer, Sam Venus, Steven Talbert
Learning Objectives: Surveillance for ventilator-associated conditions (VAC) has been recommended by the CDC National Healthcare Safety Network (NHSN). Early studies found a difference in outcomes of those with and without VAC. Using data from an ongoing study, we evaluated hospital and ICU length of stay (LOS), ventilator hours, and mortality in relation to VAC status. We hypothesized that those with VAC would have longer hospital and ICU LOS, longer duration of mechanical ventilation, and higher mortality. Methods: We collected outcome data as part of an ongoing clinical trial to reduce the risk of aspiration in ventilated patients. Consent was obtained from patient or legal proxy. Adult subjects (≥18 yr) were enrolled within 24h of intubation and followed while orally intubated, up to 14 days. VAC was determined using NHSN criteria. Data were extracted from the REDCap™ database and analyzed with chi-square and independent samples t-test. Results: Data were available for 135 subjects; mean age 55.1 (19.2) yr, 60.7% male, 73% white, 27% minority. 19% Hispanic ethnicity. Primary diagnoses were 41.5% medical, 31.9% trauma, 23% neurologic, and 3.7% surgical. VAC was determined in 20 subjects (14.8%): 13 (6.6%) were infection-related (IVAC) and 3 (2.4%) probable ventilator-associated pneumonia (VAP). Those with VAC had significantly longer ICU LOS (15.5 vs. 8.4 days; p<0.01) and time on ventilator (244 vs. 116 hr; p<0.01) compared to those without VAC. Although not significant, the VAC group had longer hospital LOS (18.5 vs. 16.9 days; p=0.76) and mortality was also higher (67% vs. 37%; p<0.05). Conclusions: Findings validate earlier studies demonstrating prolonged LOS and higher mortality in patients who develop VAC. Rates of probable VAP were low, likely secondary to ongoing prevention efforts. Specific strategies to prevent VAC need to be identified and incorporated into care of the ventilated patient to reduce patient harm and mortality. (1R01NR014508)

688 NIV NAVA IMPROVES TRIGGER DELAY COMPARED TO NIV PS IN INFANTS WITH BRONCHIOLITIS
Kyle Lemley, Hugo Esconbar, Howard Stein, Kelly Tieves, Paul Bauer
Learning Objectives: Bronchiolitis affects numerous children yearly resulting in frequent intubations and potential complications of invasive ventilation. Although non-invasive ventilation (NIV) has fewer complications, its use is limited due to inconsistent triggering and cycle termination from poorly sealed masks. Neuromuscular ventilatory assist (NAVA) utilizes the electrical activity of the diaphragm (Edi) to trigger an assisted breath. The aim of this study was to compare trigger delay between NIV pressure support (PS) and NIV NAVA. Methods: This is a single center, randomized, crossover pilot study. All infants
began in NIV PS for five min. The NAVA level was selected to approximate the support provided in NIV PS. Each infant underwent two separate 15-minute arms after being randomized to either start in NIV NAVA or NIV PS. Servo tracker software was used to calculate trigger delay and other asynchronies. Modified T alarm score, a bronchiolitis severity score, was assigned before initiating the study and after each arm. We used a two-tailed paired t-test or Wilcoxon signed rank test for analysis as appropriate. Results: Five patients completed the study. There were no statistical differences in heart rate, respiratory rate, blood pressure, oxygen saturation, minute ventilation, exhaled tidal volume, or leak percentage. There was a statistically significant difference in mean trigger delay (milliseconds) between NIV NAVA and NIV PS (5.2 ms vs. 11.7 ms, p=0.019). There were no statistically significant differences in other asynchronies. Modified T alarm score was not different between comparison groups, but there was a trend toward significance between pre-NIV and completion of the study (7 vs. 5, p=0.066).

Conclusions: The use of NIV NAVA in infants with bronchiolitis is associated with shorter trigger delay. The sample size potentially prevented demonstrating an improved Modified T alarm score. NIV NAVA was tolerated without deleterious effect. Larger, multi-center studies utilizing patient specific outcomes are needed to further evaluate the efficacy of NIV NAVA.

**EFFECT OF DOSE RESPONSE RELATIONSHIP OF NITRIC OXIDE ON PATIENT OUTCOMES IN ARDS**

Killed Patel, Kathy Chiapakoe, Harsh Seethamraju

Learning Objectives: Nitric oxide has been shown to improve oxygenation in the ARDS net trials, however it failed to demonstrate any mortality benefit. We wanted to study the effects of nitric oxide on gas exchange as well as patient outcomes based on whether they responded to inhaled nitric oxide in the first 24 hr by improving the ratio of partial pressure of arterial oxygen (PaO2) and fraction of inspired oxygen (FiO2) or not.

Methods: A Retrospective chart review was performed to identify patients admitted to the ICU in our community hospital between 6/1/2013 and 3/1/2015, who were placed on nitric oxide for moderate-severe ARDS and were included in our study. Patients who demonstrated sustained improvement (PaO2/FiO2 ≥ 150) in their PaO2/FiO2 > 24 hr were classified as responders and the rest as non-responders.

Results: A total of 35 patients were included in the analysis. All patients were placed on an initial dose of 20 ppm of inhaled nitric oxide. We had 18 responders and 17 non responders. Mean PaO2/FiO2 at time 0, 24 hr, 48 hr and 72 hr in responders was 102.79, 260.42, 296.85 and 320.87 respectively. Mortality in responders was 16.67% vs. 47.06% in non-responders.

Conclusions: Patients with ARDS who demonstrated sustained improvement in PaO2/FiO2 for >24 hr after administration of nitric oxide continued to have improvement in their oxygenation over the study course of next 3 days and had better 3 day survival compared to the group who did not respond to nitric oxide. There was no significant effect on PaO2/FiO2 of continuing nitric oxide in patients who failed to respond to it in the first 24 hr after administration.

**THROMBOTIC OUTCOMES WITH AN UNFRACTIONATED HEPARIN GUIDELINE IN EXTRACORPOREAL MEMBRANE OXYGENATION**

Veronica Raco, Amy Dzierba, Justin Muir, Jennifer Cunningham, Matthew Bacchetta, Daniel Brodie

Learning Objectives: Patients receiving ECMO are at increased risk for thrombosis because of the complex interaction of blood and artificial surfaces. To prevent or minimize thrombotic complications during ECMO, systemic anticoagulation is recommended. Unfractionated heparin (UFH) is the most common anticoagulant used during ECMO; however, the optimal anticoagulant and target level of anticoagulation remain elusive. The objective of this study was to assess the effectiveness of a low-dose UFH protocol in adult patients receiving ECMO.

Methods: This IRB-approved, retrospective study evaluated consecutive adult patients receiving ECMO over a 3.5 year period. To be included, patients had to receive UFH within 24 hr of ECMO initiation, maintained at a target activated partial thromboplastin time (aPTT) of 40–60 seconds for the duration of ECMO, and had at least one Doppler ultrasound to evaluate for thromboembolism. Time to achieve target aPTT, time within target aPTT, heparin dosing, and results of Doppler ultrasound were recorded for each patient. Data are presented as median (IQR). Results: A total of 43 patients met inclusion criteria: 23 (53%) with thromboembolism (TE-POS) and 20 (47%) without thromboembolism (TE-NEG). There were no differences in baseline characteristics including time on ECMO. Despite the TE-POS group (vs the TE-NEG) having a slightly higher initial UFH dose [9 units/kg/hr (8.11) vs. 8 (7.10)], there was no difference in time to reach target aPTT (17 hr (12, 21) vs 16 (8, 27), respectively; p=0.6). Median percent time within target aPTT range was also not different between the TE-POS and TE-NEG groups, 55% vs. 50% respectively; p=0.4. All of the clots that were identified were venous and most were catheter related.

Conclusions: Development of venous thromboembolism (VTE) in patients receiving ECMO was not associated with the intensity of anticoagulation or the time to reach goal aPTT. While low dose anticoagulation may be sufficient to prevent circuit thrombosis in most patients receiving ECMO, the optimal dosing to prevent VTE and the long-term consequences in these patients require further study.

**INTRA-ABDOMINAL PRESSURE DURING COUGH AND EXTUBATION OUTCOME IN PATIENTS WHO HAVE PASSED A SBT**

Jun Kataoka, Takaki Naito, Yashiro Nouriue, Steven Trotter, Shigeki Fujitani

Learning Objectives: Assessing ability to clear secretions and protect airway with effective cough is an important part of pre-extubation evaluation. We hypothesize that increase in intra-abdominal pressure (IAP) from baseline (∆IAP) during cough can be a predictor of successful extubation. Measuring intra-abdominal pressure can be performed in most institutions and is potentially a useful tool to determine whether a patient who passed spontaneous breathing trial (SBT) is able to clear secretions and protect airway.

Methods: This study is a prospective observational study to evaluate the usefulness of intra-abdominal pressure (bladder pressure) during cough when assessing the readiness of patients with respiratory failure for extubation. All mechanically ventilated patients ≥ 18 yr old who have been endotracheally intubated for respiratory failure who have passed a SBT are included. Baseline and peak urinary bladder pressures during cough induced by suction catheter are measured via Foley catheter. The primary outcome of this study is extubation failure or success. Patients who do not require re-intubation more than 72 hr after extubation will be classified as having a successful extubation.

Results: A total of 53 mechanically ventilated patients who passed SBT were included in the Tokyo Bay Urayasu/Ichikawa medical center ICU from May to July 2015. 48 patients (90%) had successful extubation and 5 (10%) patients failed. The mean elevation in IAP from baseline during involuntary cough (∆IAP) in patients who failed extubation showed non-significant tendency to be lower than that of patients with successful extubations (28.2 ± 23.3 cmH2O vs 37.9 ± 23.1 cmH2O, p=0.373, OR=0.978 95%CI=0.933–1.026). All patients of unsuccessful extubation showed ∆IAPs of less than 60 cmH2O. Fisher’s exact test using ∆IAP ≥ 60 cmH2O as a tentative cut-off to predict extubation outcome was not significant (p=0.327).

Conclusions: The ∆IAP during cough is a potential predictor of extubation failure. Larger sample size is needed to further determine the usefulness of the test.

**ESOPHAGEAL PRESSURE AND ACHIEVEMENT OF ADEQUATE TRANSPULMONARY PRESSURE IN CRITICALLY OBSESE SUBJECTS**

Enrique Calvo-Ayala, Kinjal Dave, Paul Marik

Learning Objectives: An increasing number of obese subjects are admitted to ICUs with respiratory failure (RF). Obese subjects have an increased pleural pressure due to the weight of the chest wall. Esophageal pressure (Peso) is used clinically as surrogate for pleural pressure and for the calculation of transpulmonary pressure gradient (Pt). Optimal care utilizes esophageal pressure (Peso) to titrate positive end-expiratory pressure (PEEP) such that the end-expiratory Pt (EEPt) is greater than 0 cmH2O to avoid alveolar derecruitment. However, measurement of Peso is time and resource consuming and is not readily available. To our knowledge, there are no reports of measurement of Peso in obese critically ill subjects. We
aimed to describe a cohort of obese subjects who underwent measurement of Pes while critically ill with RF. Methods: A retrospective chart review was performed of patients with BMI > 35 admitted to the ICUs in our institution between 9/1/10 and 7/30/14 with RF requiring mechanical ventilation who had a Pes measured. Basic demographic variables were retrieved along with BMI, Pes and initial end expiratory Pt for each patient. Results: 30 subjects were included, the majority with mixed respiratory failure. Mean age was 55 yr; 59% were female. Mean BMI was 50kg/m2 and mean Pes was 19.9 cmH2O. Mean initial EEPt was -8.97 cmH2O (93% of subjects had a negative initial EEPt). There was a statistically significant correlation between BMI and Pes (r=0.4, p=0.08). The mean time to achieve a Pt of zero was 59 hr, and this time had a significant correlation with the length-of-stay in ICU (r=0.45, p=0.01). Conclusions: As expected, the Pes in obese subjects is high, and it correlates weakly but significantly with the BMI. The initial EEPt on admission to ICU is usually negative in this population and it takes a significant amount of time to make it zero or positive; this amount of time correlates with the ICU length of stay. Initiatives to achieve faster a Pt of zero in this population may lead to shorter ICU stays in these subjects.

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FLOW-DERIVED EXPIRATORY DURATION IMPROVES LUNG INFLATION AND REDUCES EDEMA IN A PORCINE ARDS MODEL
Learning Objectives: Airway pressure release ventilation (APRV) has been a controversial mode of ventilation since its first description in the late 1980s. Many studies have tested the efficacy of APRV with mixed results due to the high variability of the mechanical breath delivered. However, APRV efficacy relies on precise adjustments of the time constants at both inspiration and expiration. We hypothesize that alveolar recruitment/derecruitment would be minimized if the duration of expiration is less than the collapse time constant of the alveolus. Methods: Four Yorkshire pigs were anesthetized, instrumented, and then administered 5% Tween, 1.5 cc/kg, to the dorsal lobe of both lungs by bronchoscopy. The animals were placed on APRV with a plateau pressure of 40cmH2O for 4-5s, and randomized to two different times at low pressure (Tlow). Tlow was precisely adjusted using the expiratory flow curve to maintain an end expiratory flow (EEF) to peak expiratory flow (PEF) ratio of either 25% (1.2-1.8s) or 75% (0.3-0.5s). Hemodynamics, lung function, electronic impedance tomography (EIT), extra vascular lung water (EVLW), and arterial blood gases were monitored for 6h and the animals were sacrificed. Results: Expiratory duration calculated to be faster than the alveolar collapse time constant (EEF/PEF 75%) significantly improves oxygenation (P/F=300) and decreases EVLW (534 ml) compared with EEF/PEF 25% (P/F=200, 3330 ml, p=0.05). EIT showed EEF/PEF 75% resulted in lung recruitment as measured by an increased ventilated surface area (p=0.05) and a trend toward decreased heterogeneity over 6h compared with EEF/PEF 25% (p=0.059). Conclusions: The duration of Tlow of APRV can be precisely set based upon the expiratory flow curve, and must maintain an EEF/PEF ratio of 75% to be lung protective.

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FIXED-DOSE CISATRACURIUM IN ACUTE RESPIRATORY DISTRESS SYNDROME: SEDATION AND ANALGESIA
Rebecca Bootstaver, Rita Bakhru, Catherine Pierce, Amanda Ball
Learning Objectives: Acute respiratory distress syndrome (ARDS) is a life-threatening condition. Neuromuscular blockade (NMB) use in early, severe ARDS patients has shown improved survival. While Bispectral (BIS) monitoring has traditionally been used to titrate sedation during paralysis, a recent study of NMB in ARDS used plateau pressures to guide titration of sedation and analgesia. Our study evaluated the sedation and analgesia requirements in patients with ARDS receiving cisatracurium with and without BIS monitoring. Methods: We conducted a before-after study of adult patients admitted to the medical ICU between October 2012 and February 2015 who received fixed-dose cisatracurium for ARDS. An initial protocol included BIS monitoring to titrate sedation and analgesia; however, the revised protocol utilized plateau pressures for titration to be consistent with recent literature. The medical record was reviewed to determine the amount of sedation and analgesia administered during paralysis. Other outcomes collected: baseline demographics, ventilator-free days, ICU length of stay (LOS), ICU mortality, and pre and post-paralysis pain and sedation scores. Results: A total of 108 patients were included, 65 with BIS monitoring and 43 without. The median (IQR) fentanyl equivalents for the BIS group was 80.8 (49.3–100) mcg/hr compared to 100 (65–140) mcg/hr in the no BIS group (p=0.01). Among the 72 patients receiving midazolam for sedation, the BIS group (n=59) received significantly less midazolam, 1.95 (1.1–2.3) mg/hr vs 4 (2.5–5.4) mg/hr (p=0.001). There was no difference in the amount of propofol administered (n=47) (p=0.80). ICU LOS [7 (4–14) vs 7 (5–12), (p=1.00)], ICU mortality (52.3% vs 55.5%, (p=0.90)), and ventilator-free days [0 (0–14) vs 0 (0–19), (p=0.185)] were similar in each group. Conclusions: In our study, patients on fixed-dose cisatracurium for ARDS with BIS monitoring received less analgesia and midazolam compared to those without. Despite the difference in sedation and analgesia, ICU mortality, ICU LOS and ventilator-free days were similar in each group.

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THE EFFECT OF RECOMBINANT THROMBOMODULIN ON SEPSIS-PRIMED VENTILATOR-INDUCED LUNG INJURY
Yoshiaki Iwashita, Erquan Zhang, Junko Maruyama, Hiroshi Imai, Kazuo Maruyama
Learning Objectives: Recombinant thrombomodulin (TM) is a novel drug available for disseminated intravascular coagulation (DIC) patients in Japan. Recently TM was found to have an anti-inflammatory effect and it may prevent lung injury. Previously we showed that TM is effective for preventing lung injury induced by high level oxygen with high tidal volume mechanical ventilation (HV) (J Intensive Care 2014 2:57). Here we sought to determine whether HV also induces ventilator induced lung injury (VILI) in bacterial sepsis model and whether TM prevents such injury. Methods: Male SD rats, injected with either TM (5mg/kg) or normal saline intraperitoneally underwent cecum ligation and puncture (CLP) to induce sepsis. Three hr later, they were sub-divided into low (6ml/kg; LV) or high (35ml/kg; HV) tidal ventilation groups (LV/Sep/TM(-), HV/Sep/TM(-), HV/Sep/TM(+), HV/Sep/TM(+); n=8–15 in each group). Hemodynamics, blood sample, and lung tissue were taken for assays. Results: In all groups PaO2 increased and peaked at 0.5h from the start of mechanical ventilation. Thereafter PaO2 decreased in HV groups; PaO2 in HV/Sep/TM(-) was significantly lower than LV/Sep/TM(-) (95.9 Torr vs 132.0 ± 0.045). BAL IL6 and lung tissue IL6 mRNA levels were significantly higher in HV groups than LV groups. Although not significant, PaO2 in HV/Sep/TM(+) was lower and BALF total protein and IL6 levels were higher in HV/Sep/TM(+) than HV/Sep/TM(-). BALF TM levels and lung tissue mRNA levels were significantly increased in HV/Sep/TM(+) compared to HV/Sep/TM(-). Conclusions: We successfully achieved a decreased PaO2 rat model induced by sepsis primed-high tidal ventilation compared to low tidal ventilation. TM did not improve the arterial oxygenation in our model and may worsen the clinical state through increasing permeability due to an increase in inflammatory cytokines in the lung.

696
THE ASSOCIATION BETWEEN COMORBIDITY BURDEN AND OUTCOMES IN SURVIVORS OF CRITICAL ILLNESS
Vinay Sriivasan, Parth Maheshwari, Avelino Vareles
Learning Objectives: Survivors of critical illness often have multiple comorbidities both prior to and resulting from their critical illness. However, the association between patient comorbidity burden and discharge disposition has not been well studied in survivors of critical illness. We hypothesize that survivors of critical illness who have a higher number of comorbidities would have a greater incidence of ICU readmission compared to those with fewer comorbidities. Methods: Single center retrospective, cohort study of 288 patients who had all survived an ICU admission at a university affiliated long term care hospital. Comorbidity burden was scored using the Charlson Comorbidity Index (CCI). The primary outcome was ICU readmission (vs. discharge to home, acute rehabilitation facility, or nursing home). The four most prevalent comorbidities, Diabetes Mellitus, ...
PROCALCITONIN AS A PROGNOSTIC MARKER IN CRITICALLY ILL PATIENTS WITH SEVERE PNEUMONIA

Xubin Huang, Jun Zhang, Xinyuan Huang, Wanmei He, Mian Zeng, Yanzhu Chen

Learning Objectives: The efficacy of procalcitonin (PCT) acting as a prognostic marker in critically ill patients with severe pneumonia is controversial. The present study prospectively assessed whether PCT measured on ICU admission is predictive of 28-day mortality in a cohort of critically ill patients with severe pneumonia in a single center. Methods: A total of 179 consecutive patients admitted to the Medical Intensive Care Unit (MICU), in a tertiary university hospital where there were Cardiology ICU and Surgical ICU, between June 2013 and June 2015, were assessed. Patients with recent acute coronary syndromes or major surgery in a month were excluded. Results: The median age was 64 yr (range, 18–93 yr; IQR, 50–75), and 64.2% of the patients were male. There were 67 cases of severe community acquired pneumonia, 78 severe hospital acquired pneumonia and 34 severe healthcare-associated pneumonia. 31 patients required non-invasive ventilation, 96 required invasive ventilation, 38 required both non-invasive and invasive ventilation, and 14 required only oxygen therapy. The median level of PCT on ICU admission was 1.71 ng/mL (range, 0.04–270.40 ng/mL; IQR, 0.38–6.27 ng/mL), and the median APACHE II score was 22 (range, 11–46). The 28-day mortality rate was 55.3%. The 28-day survivors did show significantly lower levels of PCT from non-survivors (1.07 ng/mL [range, 0.04–189.72 ng/mL] vs. 2.39 ng/mL [range, 0.05–270.40 ng/mL], Z=-2.254, P=0.024). In prediction of 28-day mortality, the area under the curve (AUC) for PCT was 0.61 (95% confidence interval [CI], 0.52–0.69) and AUC for APACHE II score was 0.66 (95% CI, 0.58–0.74). AUC was 0.67 (95% CI, 0.59–0.75) when PCT was combined with APACHE II score. Conclusions: The level of PCT on ICU admission in survivors was decreased compared with non-survivors in a cohort of critically ill patients with severe pneumonia. Moreover, combining PCT with APACHE II score added little additional power in predicting 28-day mortality in this cohort of patients with severe pneumonia in a medical ICU.

NUTRITION DELIVERY IN PEDIATRIC ACUTE RESPIRATORY DISTRESS SYNDROME: A RETROSPECTIVE STUDY

Judith Wong, Wei Meng Han, Rehena Sultana, Tsee Foong Loh, Jan Hau Lee

Learning Objectives: Malnutrition in the PICU is common and associated with poor outcomes. We aim to describe nutrition received by children with acute respiratory distress syndrome (ARDS) within the first 7 days of illness and to determine whether provision of adequate nutrition is associated with improved clinical outcomes. Methods: This is a retrospective cohort study from a multi-disciplinary PICU from January 2009 to March 2014. Subjects with ARDS were identified using American-European Consensus Conference criteria. We studied two groups of patients: 1) those who received adequate calories (defined as ≥80% of predicted resting energy expenditure by day 3 of ARDS); and 2) those who received adequate protein (defined as ≥1.5g/kg/day of protein by day 3 of ARDS). Outcomes of interest include mortality, ventilator free days, ICU free days and multigorgan dysfunction. Univariate and multivariate logistic regression models were used to identify nutritional risk factors related to PICU mortality. Results: We identified 107 patients with ARDS. Twenty eight (26.1%) patients received nutrition (enteral or parenteral) early within 24hr. Twenty six (24.2%) patients received adequate calories and 14 (13.6%) received adequate protein by the third day of ARDS. PICU mortality was lower in patients who received adequate calories and protein as compared to those who did not (34.6% vs. 60.5%, p=0.025 and 14.3% vs. 60.2%, p=0.002 respectively). Patients with adequate protein intake had longer 28-day ventilator free days compared to those who did not [median (interquartile range): 12 (3, 19) vs. 0 (0, 15) days; p=0.005]. After controlling for the Pediatric Index of Mortality 2 score and Oxygenation Index, inadequate protein remained significantly associated with PICU mortality [adjusted odds ratio 0.09 (95% confidence interval: 0.01, 0.94); p=0.044]. Conclusions: Our study demonstrated that adequate nutrition in children with ARDS was associated with improved clinical outcomes. Protein delivery potentially has a greater impact than overall caloric delivery.

EFFECT OF BLOOD PRODUCT TRANSFUSIONS ON MORTALITY IN PATIENTS REQUIRING ECMO THERAPY FOR ARDS

Killed Patel, Anil Pal, Chaitali Patel, Pankhooor Saraf, Neelima Tangirala, Harish Sarthramaraju

Learning Objectives: There is an increased need for transfusion of blood products in patients on Extracorporeal Membrane Oxygenation (ECMO) therapy secondary to consumption by the membrane of the oxygenator and also due to bleeding occurring due to anticoagulation therapy. Increased amount of blood transfusions have been associated with poor outcomes in ARDS net trials, however currently we were unable to find any study looking at patient outcomes in relation to amount of blood transfusions required in patients on ECMO therapy for ARDS. Methods: Retrospective chart review was performed on all patients requiring ECMO therapy for ARDS at our institution in 2014. Data was collected on amount of blood products...
required by patients while on ECMO therapy along with final outcomes of patients. **Results:** Nineteen patients required ECMO therapy secondary to ARDS in the year 2014 at our institution. Overall survival was 47.37%. Patients required transfusion of 1.21 blood products/ECMO day out of which they received 0.80 units of packed red blood cells (PRBC)/ECMO day and 0.42 units of platelets/ECMO day. People who survived ECMO received only 0.67 blood products/ECMO day consisting of 0.56 PRBC and 0.11 platelet units / ECMO day compared to 1.71 blood products/ECMO day consisting of 1.01 PRBC and 0.70 platelet units/ECMO day. **Conclusions:** This is the first study delineating the impact of blood product transfusions on survival in patients with ARDS requiring ECMO therapy. In our retrospective analysis patients with ARDS on ECMO therapy requiring less blood transfusions had a better survival compared to patients who required more transfusions. Further prospective studies would be required to validate our findings.

### 701

**REDUCING TIDAL VOLUME BY INCREASING FREQUENCY: A SIMULATION-BASED VENTILATOR PERFORMANCE COMPARISON**

Max Cassell, Robert Chaburn, Eduardo Míreme-Cabodevilla

**Learning Objectives:** Tidal volume (TV) has been correlated with mortality (Am J Respir Crit Care Med 2015;191(2):177–185). TV may be normalized several ways: dosage (TV/weight); strain (TV/FRC); driving pressure (TV/compliance). The unifying assumption is that the lower the TV, the less risk of ventilator induced lung injury (VILI) suggesting that a strategy of minimizing TV may be an effective way to minimize risk of VILI. Therefore, we sought to determine the ability of conventional ventilators to reduce TV by increasing frequency (f) to their maximum capabilities. The purpose of this study was to describe the relationship between normalized TV and frequency for a constant level of ventilation in a simulated passively-ventilated adult patient with ARDS. **Methods:** A math model showed ideal relationship of TV and f. Lung model: Rin = 11 cm H2O/L/s, Rout =16 cm H2O/L/s, C = 29 mL/cm H2O. Effort model: Pmus = 0; patient weight = 60 kg; height = 163 cm; CO2 production = 207 mL/min; dead space = 100 mL; target minute alveolar ventilation = 4.8 L/min. A physical model (IngMar ASL 5000) was used to test the performance of 3 ventilators (Maquet Servo-i, Dräger Evita XL, Covidien PBB40) in pressure control ventilation with fixed I:E at 1:1.4. With constant minute ventilation and total PEEP, we recorded TV (from ventilator) and end expiratory volume (from simulator) for f = 15–100 bpm. Mean normalized TV were compared at the extremes of f using t-test or ANOVA with P < 0.05 used for significance. **Results:** (from simulator) for f = 15–100 bpm. Mean normalized TV were compared at the extremes of f using t-test or ANOVA with P < 0.05 used for significance. Differences among ventilators were not clinically significant (P > 0.01). For all models TV decreased exponentially with f. There were no differences in mean airway pressure or total PEEP (P > 0.05). All comparisons of TV showed significant differences (P < 0.01). Differences among ventilators were not clinically important at either f (≤ 0.25 mL/kg). There was a clinically important difference in mean TV at f = 100 (7.5 mL/kg) than f = 15 (2.6 mL/kg). **Conclusions:** We found differences in tidal volume and frequency to beclinically important at either f (< 0.25 mL/kg). There was a clinically important difference in tidal volume at f = 15 (7.5 mL/kg) than f = 100 (7.5 mL/kg) in mean TV at f = 100 (7.5 mL/kg) than f = 15 (2.6 mL/kg). **Conclusions:** There was a clinically important difference in tidal volume and frequency to be clinically important at either f (< 0.25 mL/kg). There was a clinically important difference in tidal volume at f = 15 (7.5 mL/kg) than f = 100 (7.5 mL/kg). There was a clinically important difference in tidal volume at f = 15 (7.5 mL/kg) than f = 100 (7.5 mL/kg).

### 702

**EFFICACY OF HIGH FLOW/HIGH HUMIDITY NASAL CANNULA THERAPY IN VIRAL BRONCHIOLITIS**

Patricia Abboud, Patrick Roth, Noir Yacoub, Adrienne Stolfi

**Learning Objectives:** Viral bronchiolitis is an acute infection that can result in respiratory failure in infants. High flow high/humidity nasal cannula therapy (HFHH) is a treatment modality that may prevent the need for intubation. We studied HFHH to determine whether initial therapy with HFHH improves respiratory symptoms, and to identify factors associated with failure of HFHH resulting in intubation. **Methods:** We conducted a clinical trial of infants <12 mo old with viral bronchiolitis admitted to a PICU over 5 winters. Patients (pts) were randomized to HFHH (n=36) or NC (n=15) and included if they experienced at least 1 hr of therapy. The primary outcome was therapy failure defined as progression to HFHH (NC group only), CPAP or intubation. Other outcomes included PICU LOS, respiratory rate (RR), work of breathing (WOB), capillary pH and pCO2, desaturations, and grunting pre and 1 hr post therapy initiation. Comparisons were also made within the HFHH group of pts who did vs. did not fail HFHH, to identify factors associated with failure. Statistics included t-tests, chi-square tests, and two-way ANOVA. **Results:** 48/51 pts were included in the HFHH vs. NC analyses. 3 NC pts were excluded because they were changed to HFHH at ≤1 hr. Of the 12 included NC pts, 7 (58%) failed; 4 moved to HFHH after 1 hr, 1 to CPAP, and 2 were intubated. Of 36 HFHH pts, 25% failed; 5 required CPAP and 4 intubation (p=0.073). pH and pCO2 improved in the NC group pre vs. post therapy, but RR, WOB, desaturations and grunting did not change. In contrast, all variables improved in the HFHH group (p<0.01). For analyses within HFHH, 39 pts were included; 10 (26%) failed (5 CPAP, 5 intubated). RR pre therapy was lower in pts who failed (mean±SD 52 ± 20 vs. 64 ± 17, p<0.078). PICU LOS was tripled in pts who failed (184 ± 74 vs. 60 ± 41 hr, p<0.001). Of the 7 intubated pts, 5 were RSV+, 3 had other viruses, and all 7 had bacterial co-infections. **Conclusions:** Infants on HFHH rather than NC have greater improvement in respiratory outcomes. HFHH can decrease the need for invasive monitoring and therapies that may result in increased morbidity.

### 703

**RAPID RESPONSE TEAMS AND TELEPRESENCE: PROJECTING CRITICAL CARE TO EVERY BEDSIDE**

Peter Pappas, Luann Tirelli, James Shaffer, Scott Gettings

**Learning Objectives:** The Rapid Response Team (RRT) concept was developed to improve care for deteriorating patients outside of the ICU setting. Health First, a not for profit healthcare system in Brevard County, FL developed an RRT program in 2003 and established the VitalWatch® tele-ICU service in 2004. Since 2012, the tele-ICU service has employed mobile telepresence platforms to provide critical care support for Rapid Response Teams at four hospitals in Brevard County. **Methods:** A retrospective review evaluating mobile cart activations for RRT calls was performed. Data on mobile cart deployments were recorded over a 42 month period from January, 2012 through June, 2015. Patient demographics, chief complaints, patient disposition, tele-ICU interventions, adverse events and technical issues were analysed for RRT deployments of tele-critical care support. **Results:** 768 mobile cart activations were initiated by RRTs and 765 completed (> 99%). For recorded gender, 311 patients (47%) were male and 348 (53%) were female. Mean recorded age was 69 ± 61 yr (median 71 yr). For 768 calls, the most common chief complaints were respiratory distress (244, 32%), altered mental status (179, 23%) and hypotension (89, 12%). For 765 completed activations, the most common orders were laboratory studies (313, 41%) medication orders (311, 41%), and diagnostic studies (265, 35%). 254 (33%) of patients were managed without transfer to a progressive care or ICU setting. No adverse patient events were identified as a result of tele-critical care interventions. No technical issues were reported for 585 calls (76%). **Conclusions:** Tele-critical care support for Rapid Response Teams is a clinically effective means of providing critical care support to any bedside. Further work will be focused on optimizing the technical aspects of the program and evaluating its financial impact. Mobile critical care has the potential to be a significant evolution of the tele-ICU model that provides new opportunities to optimize delivery of care and appropriately deploy resources.

### 704

**DEXMEDETOMIDINE IN CHILDREN WITH OBSTRUCTIVE LUNG DISEASE TO FACILITATE NONINVASIVE VENTILATION**

Sangita Basnet, Michael Halyko, Giovanna Caprirolo, Ryan Majcina

**Learning Objectives:** Although noninvasive positive pressure ventilation (NIV) has been shown to be safe and effective, anxiety and agitation often leads to difficulty or failure to initiate and/or maintain it in children. The aim of this study was to assess the efficacy and safety of dexmedetomidine in providing sedation to facilitate the initiation and continued delivery of noninvasive positive pressure ventilation to patients admitted to the Pediatric Intensive Care Unit (PICU) for asthma or bronchiolitis. **Methods:** A retrospective chart review was done, after IRB approval, of patients admitted to the PICU with status asthmaticus or bronchiolitis requiring NIV and placed on dexmedetomidine to facilitate continuation of NIV because of agitation/anxiety. Data is presented as median, interquartile range (IQR), mean, and standard deviation. Statistical significance was considered at p <0.05. **Results:** Nine patients, median age 14 (IQR 7 to 84) mo, received dexmedetomidine to facilitate NIV. The median time after NIV to start of dexmedetomidine was 4 (IQR 1 to 12) hr. Median duration of NIV was 38 (IQR 10 to 59) hr and median duration of dexmedetomidine was 24.5 (IQR 15 to 45) hr. Median length of stay in the hospital was 114 (IQR...
86 to 208) hr. Mean heart rate was 170 ± 15 at baseline and 150 ± 14 an hour after dexmedetomidine and NIV, p < 0.05. Mean systolic and diastolic blood pressures were 117 ± 18 and 55 ± 10 at baseline respectively and 99 ± 15 and 47 ± 13 an hour after dexmedetomidine and NIV respectively, p > 0.05. Conclusions: Children were on NIV for several hr after initiation of dexmedetomidine suggesting that it may help initiate and maintain NIV on patients needing NIV for management of status asthmaticus and bronchiolitis. The heart rate and blood pressure decreased but not dangerously suggesting that the children were less agitated after initiation of NIV and dexmedetomidine.

USE OF A COMMON CANISTER METERED DOSE INHALER PROTOCOL IN MECHANICALLY VENTILATED PATIENTS

Mollie Gowan, Jennifer Bushwitz, Peggy Watts, Patty Silver, Mark Jackson, Nicholas Hampton, Marin Kolleff

Learning Objectives: There are no clinical data to guide the use of common canister delivery of metered dose inhalers (MDIs) in mechanically ventilated patients. The goal of this study was to assess the safety and clinical outcomes associated with common canister use in this patient population. Methods: All patients admitted to the medical or surgical ICU were evaluated. Inclusion criteria were age ≥ 18 yr, mechanical ventilation, and MDI bronchodilator therapy. Exclusion criteria were lung transplant, neutropenia, and contact or droplet isolation. Patients received either common canister therapy from a single MDI canister or usual care with an individual MDI based on room number. Respiratory therapists followed a cleaning protocol prior to MDI administration. The primary endpoint was occurrence of ventilator-associated events (VAEs), including ventilator-associated conditions (VACs) and infection-related VACs. Results: 486 patients were evaluated, and 353 met inclusion criteria: 152 received usual care and 201 received common canister treatment. There were no significant differences between groups at baseline, including age, sex, ethnicity, APACHE II score, and Charlson comorbidity index. There were more medical patients in the usual care group, and more surgical patients received common canister therapy. 10 patients (2.8%) developed a VAE, 9 in the common canister group and 1 receiving usual care (4.5% vs. 0.7%, P = 0.048). Of these VAEs, 7 were VACs and 3 were IVACs. 21 patients (5.9%) developed ventilator-associated pneumonia, 14 in the common canister group and 7 receiving usual care (7% vs. 4.6%, P = 0.496). Hospital and ICU length of stay, duration of mechanical ventilation, and mortality were not significantly different between groups. Conclusions: Use of common canister MDIs in mechanically ventilated patients was associated with significantly more VAEs than usual care. Common canister delivery of MDIs should not be employed as a routine practice in mechanically ventilated patients.

STEROID DOSING RELATIONSHIP TO DURATION OF MECHANICAL VENTILATION IN ACUTE COPD EXACERBATIONS

Katherine Kiels, Jennifer McCann, Emily Cochard, Brent Toney

Learning Objectives: The consequences of acute exacerbations of COPD (AECOPD) include frequent exacerbations, a rapid decline of lung function, and 1 year mortality rates up to 40% in patients requiring mechanical ventilation (MV). Steroids reduce the severity of dyspnea, ICU length of stay (LOS), and rate of 30 day hospital readmission. Although considered a standard of care, data is lacking on the optimal dose of steroids in patients requiring MV. The purpose of the study was to describe the relationship of steroid dosing to clinical and adverse effect outcomes in patients with AECOPD requiring MV at St. Vincent Indianapolis Hospital. Methods: This was a retrospective descriptive study of patients admitted to the ICU who required MV for AECOPD, between September 2013 and August 2014. Patients were included if they received MV for ≥ 48 hr and had a diagnosis of AECOPD. Patients were excluded if they had a diagnosis of pneumonic embolism, acute respiratory distress syndrome, or sepsis during hospitalization, history of pulmonary fibrosis, immunocompromised, or ventilator dependent prior to admission. Results: Fifty-four patients were included who received a median daily dose of 100 mg (range 40–390) of prednisone equivalent. Bolus doses were administered to 25.9% of patients (n=14). Doses on the first day of MV were observed to fall into two categories: ≥ 150 mg (n=29) and < 150 mg (n=25). There was no relationship observed between the steroid dose received and duration of MV (p=0.44) or ICU LOS (p=0.63). The 30 day readmission rate
was 7.4% (n=4). Thirteen patients (24.1%) met criteria for a hospital acquired infection (HAI). For those with a HAI, a trend towards higher cumulative steroid doses received was observed. **Conclusions:** A relationship between steroid dose and the duration of MV and ICU LOS was not observed. High dose steroid regimens, including the practice of bolus dosing, may not be warranted and may be associated with preventable adverse drug events. Subsequent studies are needed to evaluate the safe and effective dosing of steroids in this patient population.

### 709

**CHANGING PRACTICE OF TRACHEOSTOMY IN A UK HOSPITAL: FROM MARKER OF EXCELLENCE TO MARKER OF DEATH?**

Orsolya Minik, Frederick Donaldson, Alexandra Cormack, Charlotte Grant, William Barr, Tamas Szakmany

**Learning Objectives:** Tracheostomy practice has changed significantly in recent years as a result of improvements in sedation and ventilation practices and also driven by the realization that early tracheostomy is not associated with better patient level outcomes. We reviewed our clinical practice to identify if this is true for an average sized district general hospital. **Methods:** Retrospective review of all patients who received tracheostomy between 2009–14 using our electronic patient information system in our 10-bedded ICU. Rate of tracheostomy, length of mechanical ventilation, timing of tracheostomy and hospital outcome was collected. **Results:** Years: '09 '10 '11 '12 '13 '14 Number of ICU admissions: 626 633 551 542 565 593 Number of tracheostomies: 55 66 34 36 18 16 Median age (trache pt): 58 62 62 65 70 73 Median length of stay: 13 14 19 21 19 23 Ventilated for >5 days: 71 82 73 81 64 60 Median days before trache: 4 5 5.5 7 9 Median days between tracheostomy and wean: 6 7 10 8 7 10 Mortality w/ tracheostomy: 22% 20% 15% 14% 11% 33% **Conclusions:** Over the 6 yr period we have seen a significant decrease in the number of tracheostomies performed. Weaning times from the point of tracheostomy increased, indicating better patient selection for the procedure. Whilst overall ICU mortality rates remained the same, due to the smaller numbers tracheostomy mortality has increased. As we do the procedures later during the critical care course, these results raise the question whether tracheostomy is now marker of poor outcome. Compared to previous year in 2014 the frailty of patients was much higher in the tracheostomy group, supporting this assumption.

### 710

**NT-PRO-BNP AS A PROGNOSTIC FACTOR IN CRITICALLY ILL PATIENTS WITH ACUTE EXACERBATION OF COPD**

Xubin Huang, Jun Zhang, Xinyan Huang, Wannei He, Mian Zeng, Yanzhu Chen

**Learning Objectives:** The usefulness of N-terminal pro-B-type natriuretic peptide (NT-pro-BNP) acting as a prognostic factor in critically ill patients with acute exacerbation of chronic obstructive pulmonary disease (AECOPD) is still debated. The present study prospectively detected whether NT-pro-BNP is predictive of 28-day mortality in a cohort of critically ill patients with AECOPD. **Methods:** A total of 88 consecutive patients with AECOPD admitted to the Medical Intensive Care Unit (medical ICU), in a tertiary university hospital during a 36-month period between June 2012 and May 2015, were assessed. Patients with recent acute coronary syndromes or major surgery in a month were excluded. **Results:** The median age was 76.5 yr (range, 43–89 yr; IQR, 69–81), and 88.6% of the patients were male. 30 patients required non-invasive ventilation, 51 required invasive ventilation, and 7 required only oxygen therapy. **Conclusions:** The 28-day survivors did show significantly lower levels of NT-pro-BNP compared to non-survivors (630.0 pg/mL [range, 27.2–49,615.0 pg/mL] vs. 2,574.5 pg/mL [range, 27.2–49,615.0 pg/mL; IQR, 291.4–3,043.0 pg/mL]), and the median APACHE II score was 15 (range, 12–36) in survivors compared to 22 (range, 17–40) in non-survivors (p<0.05). The area under the curve (AUC) for NT-pro-BNP was 0.73 (95% confidence interval [CI], 0.63–0.84) and AUC for APACHE II score was 0.68 (95% CI, 0.55–0.81). **Conclusions:** The NT-pro-BNP on ICU admission might be predictive for 28-day mortality in patients with AECOPD.

### 711

**EFFICACY OF LOW-DOSE CICLESONIDE AND FLUTICASONE PROPIONATE FOR MILD TO MODERATE PERSISTENT ASTHMA**

Seyed MohammadReza Hashemian, Hamidreza Jamaati, Majid Malekmohammad

**Learning Objectives:** The aim of this study was to compare the efficacy of ciclesonide (80 mg/day) and fluticasone propionate (200 mg/day) for mild to moderate persistent asthma. **Methods:** Female and male patients older than 12 yr with a history of persistent bronchial asthma for at least 6 mo were enrolled. Patients were eligible to enter into a 2-week run-in period before randomization (baseline) if they had received inhaled corticosteroids (fluticasone propionate 250 µg/day or equivalent) at a constant dose during the last 4 weeks before the run-in period. In order to enter into the double blind 18-week treatment period, patients had to have a forced expiratory volume in 1s (FEV1) of 61–90% of predicted and a decrease in FEV1 throughout the run-in period of more than 10%. Patients (n=230) were assigned to ciclesonide 80 µg once daily or fluticasone propionate 100 mg twice daily group. The primary outcome variable was change in FEV1 compared to its baseline value. Secondary outcome variables were asthma-specific quality of life and asthma control. **Results:** Both drugs significantly increased FEV1 and other lung function parameters compared to baseline (P<0.0001, both groups, all variables). Progress in the percentage of days with no asthma symptoms and no use of rescue medication and asthma-specific quality of life were similar in the two treatment groups. **Conclusions:** Ciclesonide at a dose of 80 µg once daily can provide efficient maintenance therapy for mild to moderate persistent asthma.

### 712

**DIFFERENT VENTILATION STRATEGIES IN ACUTE LUNG INJURY ANIMALS PLACED IN PRONE AND SUPINE POSITIONS**

Rafaelle Fries, Susiane Kellens, Mario Carpi, Marcos Moraes, Carolina Antoniazzi, Jose Fioreto

**Learning Objectives:** Prone positioning (PP) associated with high-frequency oscillatory ventilation (HFOV) may increase lung protection. **Objective:** To compare HFOV and protective conventional mechanical ventilation (CMV) in animals with acute lung injury (ALI) placed in (PP) and supine position (SP) for oxygenation, histopathology, and oxidative stress. **Methods:** Seventy-five rabbits were instrumented and assigned to five groups (n=15/group): healthy-CMV (HG); ALI+CMV in SP (SMGV) or PP (PMGV); ALI+HFOV in SP (HFSGV) or PP (HFPGV). Animals were ventilated for four and ALI was induced by tracheal saline infusion (30Ml/kg, 38°C). Outcomes: oxygenation; histological lung injury and oxidative stress (malondialdehyde acid-MDA) assessed by pulmonary region (ventral and dorsal) in tissue, serum and bronchoalveolar lavage (BAL). Significance: 3% **Results:** Lung injury decreased oxygenation and pulmonary compliance (p<0.05). There was faster oxygenation recovery in the HFV groups, more significantly in PP (p<0.05). The histopathological lung injury score was significantly higher for MVG compared with HFVG (p<0.05), without statistical difference between dorsal and ventral regions. Comparing the HFV groups, histopathological analysis showed greater injury HFV in SP in both regions. A non-significant increase for MDA levels was observed in supine groups. **Conclusions:** HFV provides better oxygenation and histopathological lung injury compared to CMV, effects enhanced by PP.

### 713

**FEEDING PRACTICES AND HIGH FLOW NASAL CANNULA RESPIRATORY SUPPORT IN CHILDREN WITH BRONCHIOLITIS**

Katherine Slain, Natalia Martinez-Schüermann, Steven Shein, Anne Stormorken

**Learning Objectives:** Guidelines for safe initiation of enteral nutrition in children with bronchiolitis on high flow nasal cannula (HFNC) are needed. We hypothesized that adverse events would not be associated with HFNC flow (in liters per minute [LPM]). **Methods:** With IRB approval, the charts of children <2yo admitted to our center from 9/13–4/14 with a primary diagnosis of bronchiolitis and HFNC use were reviewed for demographics, respiratory support, and documented adverse events. Volume of feeds and maximum HFNC flow
were recorded for each 8hr “shift”. Children requiring mechanical ventilation were excluded. Statistical methods included chi squared, Mann-Whitney U test or Student’s t-test, and multivariate logistic regression analysis. Results: The mean age of 69 subjects was 6.5 (±5.7) mo. Mean PICU length of stay (LOS) was 3.6 (±2.2) days and hospital LOS was 7.7 (±11.4) days. Feeds were initiated during PICU care at 28.9 (±21.8) hr after admission. At feed initiation, the HFNC flow was 2–4 LPM in 27 subjects (39%), 5–6 LPM in 21 subjects (30%) and ≥7 LPM in 9 subjects (13%). 12 subjects (17%) were weaned from HFNC prior to feeds. Adverse events were documented in 33/497 (6.6%) shifts, including emesis (n=20), respiratory distress (n=9), and feed refusal (n=4). Occurrence of an adverse event was not associated with age (OR 1.06 [CI 0.90–1.25]), weight (0.87 [0.58–1.31]), or RSV infection (1.18 [0.74–1.87]). Occurrence of an adverse event was not associated with differences in HR (OR 1.02 [CI 0.99–1.04]), RR (1.02 [0.96–1.07]), or feed route (0.47 [0.11–1.99]) at feeding initiation. Prevalence of adverse events was 9/129 (7%) shifts with HFNC, 2–4 LPM, 9/77 (12%) with 5–6 LPM, 1/44 (2%) with ≥6 LPM and 14/247 (6%) after weaning from HFNC (p=0.178). Initiating feeds on ≥4 LPM (vs. ≤4 LPM) was not associated with significant differences in PICU LOS, hospital LOS, duration of HFNC, or duration of oxygen therapy. Conclusions: In this cohort of patients with bronchiolitis requiring HFNC support, adverse events related to enteral nutrition were rare and not associated with concurrent HFNC rate.

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PREDICTORS OF MORTALITY IN PATIENTS WITH PROLONGED MECHANICAL VENTILATION: A SYSTEMATIC REVIEW

Matthew Detmer, Emily Damuth, Jason Barnock, Jessica Mitchell, Stephen Trzeciak

Learning Objectives: Prolonged mechanical ventilation following an acute episode of critical care carries a high long-term mortality (~60% at one year), however long-term mortality of this population is incompletely understood. The objective of this systematic review was to synthesize the worldwide literature to identify predictors of long-term mortality in patients with prolonged mechanical ventilation. Methods: We followed a protocol in accordance with the Cochrane Handbook. We searched PUBMED, CINAHL, and Cochrane Library using a comprehensive strategy without language restriction. We included studies meeting one of the following inclusion criteria: (1) mechanical ventilation ≥14 days, (2) admission to a ventilator weaning unit, or (3) mechanical ventilation for ≥96 hr plus predictor mortality in this population met a priori-defined criteria for “strong association,” all of which were present at day 21 of mechanical ventilation. (4) vasopressor requirement. Conclusions: Few studies have tested the association between clinical factors and the primary outcome of long-term mortality (>6 mo) using multivariable analysis. Utilizing a previously reported methodology, we analyzed the clinical factors and their relative strength of association (odds ratio and confidence intervals) in a semi-quantitative review. Results: Of 6326 studies identified in the search, 402 underwent full manuscript review and 11 studies met criteria for inclusion. A total of 37 clinical factors were reported to be independently associated with long-term mortality. Of these, only four factors met a priori-defined criteria for “strong association,” all of which were present at day 21 of mechanical ventilation. Their were (1) advanced age, (2) thrombocytopenia, (3) hemodialysis, and (4) vasopressor requirement. Conclusions: Few studies have tested the association between clinical factors and long-term mortality in patients with prolonged mechanical ventilation. Patients with advanced age, thrombocytopenia, hemodialysis, or vasopressor requirement on day 21 of mechanical ventilation may have a worse outcome. Future studies to develop and validate prognostic models for long-term outcomes in this population are needed.

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THE ASSOCIATION BETWEEN MOBILITY AND DISCHARGE HOME IN SURVIVORS OF CRITICAL ILLNESS

Parth Maheshwari, Vinay Srinivasan, Avelino Verceles

Learning Objectives: Survivors of a prolonged ICU stay are bedridden and immobilized for an extended amount of time. Although physical therapy mobilization strategies are initiated early many patients are discharged to long term care (LTC) facilities and are eventually readmitted to ICUs. Early ambulation has been associated with improved outcomes and lower readmission rates in hospitalized patients. The aims of this study are to determine the association between ambulatory status with discharge home in survivors of critical illness. Methods: A retrospective cohort study of 288 survivors of critical illness who underwent mobility based physical therapy at a university affiliated hospital LTC facility after an ICU admission. Mobility status was tracked through review of electronic medical records. The primary outcome was discharge status (home vs. acute rehabilitation facility, nursing home, readmission to ICU, death). Results: The cohort included 133 males and 155 females, with mean age of 59 yr and mean BMI of 33. Of those 288 patients, 130 (45%) were African American, 143 (50%) were Caucasian, and 12 (4%) were of other races. Thirty five (12%) patients were discharged home (34 (12%) acute rehab facility, 45 (16%) nursing home, 162 (56%) readmitted, 12 (4%) died). Seventy-five patients (26%) were able to stand/walk after physical therapy, while 213 patients never stood. There were no differences in baseline demographics between those that could stand/walk and those that could not. Of the patients that could stand/walk after physical therapy, 25 out of 75 (33%) were able to go home, while only 10 out of the 203 patients that could not stand went home (5%) (p<0.001). Conclusions: The ability to stand is associated with a greater likelihood of being discharged home in survivors of critical illness following a prolonged ICU admission. These data are evidence that care providers of survivors of critical illness should be more aggressive in increasing mobility training for patients in LTC facilities to improve their chance of being discharged home.

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USE OF PERFLUOROCARBON FOR PULMONARY LAVAGE IN SEVERE PEDIATRIC ARDS

Nikhil Paranjkar, Omar Al-Ibrahim

Learning Objectives: Perfluorocarbon (PFC) liquids are water-clear, dense, low-viscosity, and immiscible with both water and lipids. They do not block oxygen transfer during lavage, do not mix with inhaled liquids or solids, and do not remove surfactant. They are bio inert, minimally absorbed and eliminated by evaporation. Two medical grade perfluorocarbon compounds are commercially available: radiopaque PFB (Perfluorubron), and radiolucent PFD (Perfluorodecalin). Most literature supports their use for ventilation and no studies are found evaluating its use for pulmonary lavage. Methods: PFC was used in three children with severe acute respiratory distress syndrome (ARDS) needing extracorporeal membrane oxygenator (ECMO) support, after obtaining IRB approval and parental consent. First patient was a 6 week old female infant with pertussis and severe pulmonary hypertension and placed on veno-arterial (VA) ECMO for 50 days for worsening hypoxemia and underwent Perfluorubron lavage via bronchoscopy from days 38–42. Second, a 2 year-old male with necrotizing pneumonia due to group A streptococcus with severe ARDS who received veno-venous (VV) ECMO support for 28 days and Perfluorodecalin lavage on days 15–18. Third, a 5-year-old male with severe ARDS secondary to interstitial pneumonitis and placed on VV ECMO for 11 days and had Perfluorubron lavage from days 6–11. Each patient received a total dose of 20 mL/kg of PFC compound in 10–20 mL aliquots via endotracheal tube (ETT) or bronchoscopy, then bagged for 5 breaths and suctioned out. This was repeated every 4 hr till improvement or end of product. Results: All patients had improvement in oxygenation, airway clearance and chest X-ray findings. Less evident in pertussis patient possibly due to late PFC use and fatal lung disease. All three tolerated well with no hemodynamic issues or adverse effects like pneumothorax or pulmonary hemorrhage. Conclusions: PFC lavage could be beneficial in severe pediatric ARDS. It can improve oxygenation, facilitate early weaning and ECMO discontinuation without causing hemodynamic or pulmonary side effects. More clinical experience is needed.

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FRESH GAS FLOW LEVELS NEEDED WITH DELIVERY OF INO WITH LITHIUM AND SODASORB SCRUBBERS

Natalie Napolitano, Nancy Craig, Richard Lin

Learning Objectives: Nitric Oxide (NO) may need to be administered via anesthetia systems in the cardiac catheterization lab and operating room. These systems are ‘semi-closed’ to conserve anesthetic agents and require carbon dioxide (CO2) absorption to allow recirculation. The recirculation and low fresh gas flow (FGF) rates typically used with anesthesia delivery systems lead to higher NO

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concentrations than prescribed and can also lead to an elevation in nitrogen dioxide (NO2) levels. We have shown that calcium (Ca) absorption systems can scavenge NO2 and wanted to test if lithium (Li) systems could do the same. Methods: Our bench model consisted of a Michigan Lung (2 patient configurations: infant: 7 kg/Compliance 0.08 L/cmH2O and toddler: 12 kg/compliance 0.15 L/cmH2O) connected to a Draeger Apollo delivery system with NO injector in the inspiratory limb at the Apollo. NO was delivered at doses of 20 and 40 ppm with each patient condition and appropriate ventilator settings (infant: Vt 60 mL, Ti 0.5; toddler: Vt 95 mL, Ti 0.7). Both had PEEP 5 cmH2O, IMV 25, FiO2 0.5). Relative FGF (rFGF) were varied over a range of 0.5 to 3 minutes minute ventilation. NO and NO2 were measured at 6 inches post injector module and in the inspiratory limb just prior to the patient wye with each patient condition and rFGF Measurements were repeated with Ca and Li absorption systems, and under ‘toddler’ conditions without absorption canister for comparison. Results: Both Ca and Li absorbers were able to scavenge NO2 with the highest measured concentration of 3.2 ppm (5 ppm is the recommended upper limit) at an NO dose of 40 ppm. FGF at 1.0 was sufficient to minimize NO2 with higher rFGF of no benefit. An rFGF of 1.5 was sufficient to make the measured NO match the set dose. NO and NO2 concentrations were slightly higher (by < 2 ppm) measured near the patient wye. Interestingly, NO concentrations at low rFGF were higher with absorbers in-line. Conclusions: NO can be safely delivered via an anesthesia machine as long as there is adequate fresh gas flow. Ca and Li absorbers are equivalent in their abilities to scavenge NO2.

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THE CASE OF THE VANISHING LUNG
Biplab Saha, Barry Kreiswirth, Kristin Fless

Learning Objectives: Staphylococcus aureus (SA) is a rare cause of community acquired pneumonia(CAP) and a major cause of influenza related mortality and morbidity. Necrotizing pneumonia due to Panton Valentin leucocidin (PVL) toxin secreting strains of S. aureus is associated with a mortality rate of up to 40–60%. Both methicillin resistant (MRSA) and methicillin sensitive S. aureus (MSSA) can carry gene for PVL toxin. Methods: A sixty-three year old female with a history of asthma, who had lost her husband 1 week ago from pneumonitis, presented to the emergency room with a fever, generalized malaise, nasal discharge, cough, sputum production and shortness of breath for 3 days. Blood work demonstrated leukocytosis with bandemia. Chest X-ray showed bilateral infiltrates. She was treated for CAP with Ceftriaxone and Azithromycin. Blood cultures were negative. The patient received nafcillin but her condition deteriorated. She required high flow 100% oxygen. Chest CT scans done 7 days apart showed blossoming bilateral infiltrate and development of multiple cavity lesions of the lung. She was started on Linezolid, Clindamycin and intravenous immunoglobulin (IVIG) for suspected necrotizing pneumonia with PVL toxin producing MSSA. She underwent extra corporeal membrane oxygenation with subsequent recovery. The genetic study confirmed PVL gene consistent with MRSA USA 300. Results: PVL toxin causes lysis of the neutrophil with release of pro-inflammatory cytokines. Influenza like prodrome, leukopenia, thrombocytopenia, hemorrhage and pleural effusion are indicators of fatal outcome. Clindamycin and Linezolid have antitoxin effect and may improve clinical outcome. IVIG has also been used with some success. In the U.K. routine testing is done as most European PVL strains are MSSA, however it is not recommended in the U.S. Conclusions: The suspicion of PVL toxin producing SA strain as a cause of necrotizing pneumonia is extremely important. Early initiation of treatment with appropriate antibiotics directed at the toxin and IVIG might be lifesaving. Checking for PVL toxin may help in early determination of a fatal pathogen.

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HIGH DOSE OSELTAMIVIR AND ARDS ADJUNCT THERAPY IN SEVERE INFLUENZA: A COMPARISON OF TWO OUTBREAKS
Miguel Franquiz, Jeffrey Gonzales, Paul Saleeb, Carl Shanboltz

Learning Objectives: 2009 influenza A H1N1 virus was the predominant isolate identified by influenza surveillance during 2009–2010 and 2013–2014, causing significant morbidity and mortality during these outbreaks. Several organizations recommended the use of high dose oseltamivir for critically ill patients with severe influenza, despite minimal supporting evidence. The objective of this study was to evaluate the use of oseltamivir and ARDS adjunct therapies in critically ill patients across two severe influenza outbreaks. Methods: Single center, retrospective study of patients admitted to the ICU receiving oseltamivir for the treatment of influenza during peak outbreak periods, based on influenza related hospitalization data reported to the Influenza Hospitalization Network. Demographics, comorbidities, and APACHE II scores were abstracted from the medical record. Primary outcomes included use of oseltamivir and ARDS adjunct therapies. Secondary outcomes include: complications of influenza (ARDS, sepsis, coagulation, AKI), length of stay, duration of mechanical ventilation, and mortality. Descriptive analysis is presented for the total population across both influenza seasons. Results: 124 patients were included (n=53, 2009; n=71, 2013) Demographics were age 52.3 ± 14.2 yr, APACHE II score 19.4 ± 9.2, 71% had ≥2 comorbidities, and 27% died. Use of high dose oseltamivir decreased by 54% (n=18 (31%), 2009; n=11 (15%), 2013, p=0.02). Inhaled nitric oxide was more prevalent in 2009 (p=0.001), while neuromuscular blockade, and inhaled prostacyclin were more prevalent in 2013 (p=0.05). There was no difference in prone positioning or HFOV. Differences in complications of influenza, with the exception of an increase in AKI in the 2013 patients (p=0.02). No difference in length of stay, duration of mechanical ventilation, or mortality was observed. Conclusions: The use of high dose oseltamivir decreased across the 2009 and 2013 outbreaks. ARDS adjunct therapy changed significantly since 2009. These findings likely represent evidenced-based changes in practice. Mortality was similar across the 2009 and 2013 outbreaks.

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DEAD SPACE SURROGATES FROM ROUTINE CLINICAL DATA IN CRITICALLY ILL CHILDREN
Anoopindar Bhalla, Christopher Newth, Robinbinder Khemani

Learning Objectives: High dead space measured by capnography is consistently associated with increased mortality in mechanically ventilated adults and children. However capnography data is rarely available in existing databases of mechanically ventilated patients. This has limited our ability to assess the use of dead space for risk stratification. Alternative methods using available clinical data to evaluate dead space have been suggested. We sought to investigate the correlation between volumetric capnography measured physiologic dead space and two proposed dead space surrogates. Methods: Mechanically ventilated children with arterial lines were monitored with volumetric capnography. We calculated at the time of arterial blood gas 1) physiologic dead space from volumetric capnography (Vd/Vt (volatile) + (PaCO2-mean expired PCO2)/(PaCO2) 2) corrected minute ventilation (VeEcorr=((minute ventilation x PaCO2)/40)/(kg) and 3) physiologic dead space from the rearranged alveolar gas equation (Vd/Vt(agar)=1.086 x VC02)/ (minute ventilation x PaCO2) where VC02 is estimated CO2 production using calculated energy expenditure). Results: We enrolled 65 children (52% male) with a median age of 4.9 yr (interquartile range (IQR) 1.7, 12.8). The children had a median Vd/Vt( volatile) of 0.51 (IQR 0.45, 0.60), median VeEcorr of 0.181/ min/kg (IQR 0.13, 0.22), and median Vd/Vt(agar) of 0.37 (IQR 0.20, 0.49). The correlation between Vd/Vt( volatile) and VeEcorr was moderate (r2=0.46). The correlation between Vd/Vt( volatile) and Vd/Vt(agar) was poor (r2=0.28). Conclusions: Dead space surrogates calculated using available clinical data have moderate to poor correlation with capnography measured dead space in critically ill children. Further research should focus on their ability to stratify mortality risk before they are used as substitutes for capnography measures of dead space.

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CHILDREN AT RISK FOR PEDIATRIC ACUTE RESPIRATORY DISTRESS SYNDROME REQUIRING HIGH FLOW NASAL CANNULA
Katherine Slain, Natalia Martinez-Schlurmann, Anne Stormorken, Steven Shein

Learning Objectives: New definitions of pediatric acute respiratory distress syndrome (ARDS) were recently published, including criteria to identify children “at risk for PARDS.” Such children may have acute respiratory failure treated with high flow nasal cannula (HFNC), an increasingly prevalent support modality. We hypothesized that among bronchiolitis patients on HFNC, those “at risk for PARDS” would have longer PICU and hospital length of stay (LOS), and increased duration of HFNC and supplemental oxygen. Methods: We retrospectively reviewed the
charts of children <2 yr old with bronchiolitis supported by HFNC at our center from 9/2013 - 4/2014. Children requiring mechanical ventilation were excluded. Collected data included demographics, highest HFNC flow during each 8 hour “shift,” oxygen saturation, and chest radiograph interpretation by staff radiologist. Oxygen flow (FiO2 x flow rate [L/min]) was calculated when SpO2 was 88-97%. Statistical methods included chi squared (categorical variables) and Wilcoxon rank-sum (continuous variables). Results: The mean age of 69 subjects was 6.5 (±5.7) mo. Mean PICU LOS was 3.6 (±2.2) days and mean hospital LOS was 7.7 (± 11.4) days. The criteria for “at risk for PARDS” was met in 2013 (37.7%) subjects. At risk criteria were met during shift number 1 (1–2) after PICU admission. Meeting these criteria was associated with a longer PICU LOS (4.2 days [3.5–5.9] vs 2.4 [1.8–3.4], p<0.001), hospital LOS (6.5 days [5–10] vs 5 [3–6], p=0.002), duration of HFNC (64 hr [46.8–92.8] vs 40 [20–60], p=0.001), and duration of supplemental oxygen use (101 hr [82.5–144] vs 72 [51–110], p=0.004). Children who met risk criteria in the first shift after PICU admission had no significant difference in PICU LOS, hospital LOS, duration of HFNC or duration of supplemental oxygen use versus children who did not meet criteria by this time point. Conclusions: Our data support that the recent definition of “at risk for PARDS” can identify bronchiolitis subjects requiring HFNC who have relatively unfavorable clinical courses.

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THE CHALLENGE OF DIAGNOSIS OF VENTILATOR-ASSOCIATED PNEUMONIA IN THE ICU: A RETROSPECTIVE STUDY
Julio Tapia, Jacqueline Duran, Carla Romo, Adriana Rosas, Francisco Godínez, Guadalupe Aguirre, Luís Colunga-Lorazo, Francisco Espinosa

Learning Objectives: Ventilation-associated pneumonia is one of the main problems in ICUs worldwide. The incidence of VAP varies from 5 to 65% suggesting discrepancy in the diagnostic criteria and sometimes over diagnosis. In 2013 the Centers for Disease Control and Prevention released new surveillance definitions for ventilator-associated events. The new definitions broaden the focus of surveillance from ventilator-associated pneumonia alone to all significant complications of mechanical ventilation. We begin to have strict control of patients with this diagnosis since 2012. A retrospective study was performed to evaluate the diagnostic criteria as well as the influence of the recommendations of the CDC in the diagnosis. Methods: A 4 year retrospective observational study utilizing base data of our 14-bed Critical Care Unit, from January 1 2012 to June 30 2015, all patients with diagnosis of VAP were included. Logistic regression analysis was used to compare diagnosis criteria and determined the presence of increased ventilator requirements and fall in relation PO2 / FiO2 ratio. Results: 1358 received mechanical ventilation and we had 219 patients with diagnosis of VAP in the period of study that represents 16% of incidence (IC 95% 14–18%), the median age was 36 yr (IC 95% 32 to 41%) and 44% were female. In 2012 we had an incidence of 21% (IC 17–25%) with CDC diagnostic criteria 17% (IC 95% 10–27%) and tracheal aspiration sample (TAS) 67% (IC 95% 56–76%), 2013 incidence of 14% (IC 95% 11–18%) with CDC criteria 29% (IC 95% 19–42%) and TAS 67% (IC 95% 56–74%), 2014 incidence of 15% (IC 95% 11–19%) with CDC criteria 41% (IC 95% 30–54%) and TAS 65% (IC 95% 52–75%) and Broncho alveolar lavage (BAL) 5% (IC 95% 1–14%), 2015 incidence 13% (IC 95% 8–18%) with CDC criteria 13% (IC 95% 3–32%), TAS 65% (IC 95% 44–81%), BAL 26% (IC 95% 12–46%). Conclusions: Although there is a tendency to use CDC criteria is still necessary to have a more detailed assessment if patient presents with a ventilator-associated condition or not to avoid diagnosis of VAP.

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PEDIATRIC CYSTIC FIBROSIS (CF) PATIENTS REQUIRING ENDOTRACHEAL INTUBATION: NATIONAL MORTALITY TRENDS
Matthew Siuba, Amy Attaway, Susan Bannon, Steven Strausbaugh, Frank Jacoно

Learning Objectives: Traditionally there has been a restrictive approach to endotracheal intubation (ETI) of CF patients given the lack of benefit in many cases. The largest existing pediatric study on this topic reported on 33 total patients with a mortality rate of 75% in ages 5–34. However, with the advent of more advanced CF and ICU treatment modalities, overall survival has increased. This study was conducted to assess the trends in mortality rate of pediatric patients with CF requiring intubation during hospitalization. Methods: Healthcare Cost and Utilization Project (HCUP) Kids’ Inpatient Database (KID) for ages 4–17 yr was queried for procedure “endotracheal intubation and mechanical ventilation” in patients with primary diagnostic code of “cystic fibrosis” over the time period 2002–2012. Neonatal discharges were excluded; age greater than or equal to 4 yr old was chosen to exclude infants and toddlers with other congenital and chronic illnesses which may have confounded the data. Results: A total of 104 admissions meeting criteria during 2002–2012 were identified. Hospital mortality rate over the study period was 42.6% (44/104). Sample size was small enough to preclude comparison of 2002 mortality with that of 2012. The three most common primary diagnostic codes were “Cystic fibrosis.” “Pneumonia (except that caused by TB or STDs)” and “Complication of device; implant or graft.” 69.5% (31/44) patients who had died were female but gender difference was not statistically significant. Conclusions: To date, this is the largest study evaluating hospital mortality rates in this population. Over 50% of pediatric CF patients aged 4–17 who underwent ETI from 2002–2012 survived to hospital discharge. These findings may help intensivists weigh the risks and benefits of endotracheal intubation in this patient population.

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MORTALITY IN PATIENTS PRESCRIBED CORTICOSTEROIDS IN EARLY ARDS: A MIMIC II DATABASE STUDY
Chintan Desai, Marcello Schmid, Joseph Ramzy, Ahad Ayaz, Radhika Kakarala, Susan Smith, Frazer Wadenstorfer

Learning Objectives: Corticosteroid therapy in early ARDS has been studied but remains a controversial topic. Due to the central pathophysiological role of systemic inflammatory markers, anti-inflammatory therapy, specifically steroids, have been tried without much success in decreasing mortality. Methods: We included all patients ≥15 yr from the Multiparameter Intelligent Intensive Care Monitoring (MIMIC II) database who were ventilated for ≥48 hr and had ARDS on the first day of mechanical ventilation and were also prescribed systemic corticosteroids. We excluded patients who were transferred from other hospitals, had a diagnosis of heart failure or acute coronary syndrome. The main outcome was in hospital mortality, and secondary outcomes were 28-day and 90-day mortality. Results: A total of 993 patients were included in the analysis. Of these, 58.6% were male, 28.8% had sepsis and 22.3% were post-operative. The mean SOFA score on the first day of mechanical ventilation was 10.19 (SD=3.65), the median PF ratio was 105 (IQR 79 – 168) and the mean driving pressure was 15.45 (SD=4.69). Overall inhospital mortality was 28.5%. Of all included patients, only 67 had a record of steroid prescription during the first week of mechanical ventilation, with a median total dose of 1200 mg of prednisone (IQR 300 – 4000). When adjusted for age, gender, PF ratio, diagnosis, cumulative amount of blood products received during the admission, SOFA score and driving pressure, the prescription of steroids was related to an increased in-hospital mortality (OR 1.79, CI 1.01 – 3.20, p=0.046), but not related to 28day mortality (OR 1.37, CI 0.78 – 2.41, p=0.27) or 90day mortality (OR 1.32, CI 0.75 – 2.32, p=0.33). Other independent predictors of mortality were age (OR 1.03, CI 1.02 – 1.04, p<0.001), SOFA score (OR 1.09, CI 1.05 1.13, p<0.001), diagnosis of sepsis (OR 2.16, CI 1.39 – 3.17, p<0.001) and driving pressure (OR 1.06, CI 1.02 1.10, p<0.001). Conclusions: In this retrospective cohort, prescription of corticosteroids in the first week of mechanical ventilation was associated with higher in-hospital mortality.

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EFFECTIVENESS OF HELIOX AS ADJUNCT THERAPY WITH HFNC IN CHILDREN WITH RESPIRATORY DISTRESS
Hanna Sahlar, Kim Cantrell, Darlene Myles, Sami Rishmawi

Learning Objectives: High Flow Nasal Cannula (HFNC) therapy has become an acceptable way of oxygenating and delivering medications to patients with Respiratory Distress. HFNC is the delivery of gas to a patient via nasal canula at a flowrate that exceeds inspiratory demands; it allows gases to be heated and humidified. Heliox is helium-oxygen mixture used as an adjunct therapy to an acceptable way of oxygenating and delivering medications to patients with Respiratory Distress. HFNC is the delivery of gas to a patient via nasal canula at a flowrate that exceeds inspiratory demands; it allows gases to be heated and humidified. Heliox is helium-oxygen mixture used as an adjunct therapy to an acceptable way of oxygenating and delivering medications to patients with Respiratory Distress. HFNC is the delivery of gas to a patient via nasal canula at a flowrate that exceeds inspiratory demands; it allows gases to be heated and humidified. Heliox is helium-oxygen mixture used as an adjunct therapy to
lesen the respiratory distress. **Methods:** This is a prospective randomized controlled study of patients admitted to PICU with respiratory distress that is treated with HFNC. Patients were randomly assigned to 2 treatment arms. One received standard HFNC therapy driven via oxygen and the other received HFNC therapy driven via 80/20 Heliox mixture. In either group, FIO2 may vary depending on patient saturation goal of 88–95%. Standard medications were given to participants in both arms. The study evaluated the LOS in the PICU and time to resolution of respiratory distress using a standardized scoring tool; MPIS. **Results:** Forty-four eligible subjects were included with the average age being 33 mos and 59% being male. Both HFNC/Heliox group (N=26) and HFNC/Air group (N=28) were comparable in demographics and severity of illness (p-value > 0.05). Both groups had similar average MPIS score at admission being 10.69 +/- 2.41 for the Heliox group and 9.79 +/- 2.49 for the Air group (p=0.2). Heliox and Air groups had similar average LOS in PICU (2.62 +/- 1.27; 2.96 +/- 1.83; respectively) and similar time to resolution of respiratory distress (16.38 hrs and 17.11 hrs; respectively), p=0.8. **Conclusions:** HFNC with Heliox and HFNC with air are comparable in terms of effectiveness as measured by LOS in PICU and time to resolution of respiratory distress; therefore we do not recommend adding Heliox routinely to the HFNC delivery system as part of standard of care in the management of respiratory distress in children.

**726 NONINFECTIOUS INTERSTITIAL LUNG DISEASE FOLLOWING AUTOLOGOUS HEMATOPOIETIC STEM CELL TRANSPLANTATION**
Joonbun Cho, Minji Kim, Hea-Kyoungh Yang

**Learning Objectives:** High dose chemotherapy cell transplantation (HDCT) followed by autologous hematopoietic stem cell transplantation (HSCT) is widely used in pediatric cancer patients, but few data about noninfectious interstitial lung disease (ILD) following this treatment are known. Therefore, we aimed to evaluate the incidence, clinical features and risk factors of noninfectious ILD after HDCT in pediatric patients. **Methods:** This was a retrospective cohort study of pediatric solid tumor patients who underwent HDCT and autologous HSCT between 1997 and 2012. ILD was diagnosed using clinical symptoms and radiography after excluding cardiac, renal and infectious causes. Risk factors were analyzed using a Cox proportional hazard regression model. **Results:** Three hundred forty patients were enrolled and the median age was 3 yr (interquartile range 1–7). Eight patients (2.5%) were diagnosed with noninfectious ILD. The median duration of symptom onset was 30 mo (range 7–74). Six (75%) of 8 ILD patients died during the study period, even though steroids were administered for treatment. High dose cyclophosphamide use (HR = 11.37, 95% CI = 1.38–93.32, P = 0.023) and sex (HR = 0.10, 95% CI = 0.01–0.84, P = 0.034) were associated with late-onset, noninfectious ILD upon multivariate analysis. **Conclusions:** The incidence of noninfectious ILD after HDCT and HSCT was not negligible and the clinical features of ILD showed a late-onset and a poor prognosis. Patients who are female and undertake high-dose cyclophosphamide treatment may need to be carefully followed up for the development of late-onset ILD.

**727 OUTCOMES OF PATIENTS RECEIVING HIGH FLOW NASAL CANNULA OXYGEN THERAPY IN A MEDICAL ICU**
Alisha Bhatia, Justin Wang, Gerald Weinhouse

**Learning Objectives:** The use of High Flow Nasal Cannula (HFNC) has become widespread with little data to guide its use. We hypothesized that the duration of HFNC use may predict ICU outcomes and that failure of HFNC therapy to obviate invasive intubation would predict poor outcomes. **Methods:** We did a retrospective data analysis to track the outcomes of patients in the medical ICU, from January 1, 2014 to December 31, 2014, who were started on HFNC for hypoxemia initially, rather than NIPPV or intubation. We examined the relationship between length of HFNC therapy, rate of intubation, comorbidities, hospital length of stay (LOS), and mortality. We excluded all ICU patients who were made comfort measures only (CMO) or went on to receive lung transplants during the same admission. **Results:** 80 patients were started on HFNC therapy in the MICU. 34 were on HFNC for one day, 10 for two days, and 36 for more than three days with the longest therapy lasting for 27 days. 23 patients were intubated after 1–13 days of HFNC therapy. Of the patients who were intubated, six expired. LOS ranged from 1–102 days. The shortest LOS in a patient who was intubated after HFNC therapy was ten days. A total of 12 pts expired, therefore patients who were intubated after HFNC therapy had a higher mortality (6/23 vs 6/57). **Conclusions:** In this cohort, we did not find a relationship between the duration of HFNC therapy and intubation rates, mortality rates, or LOS. Though we cannot correlate duration of therapy with worse outcomes, failure of HFNC was associated with a higher rate of death. As with NIPPV, therapeutic goals of HFNC should be monitored very closely, likely in an ICU setting, with consideration of invasive ventilation as soon as those goals are not met.

**728 ANTI-OSTEOPONTIN ANTIBODIES ATTENUATE GUT ISCHEMIA-REPERFUSION-INDUCED ACUTE LUNG INJURY**
Yohei Hirano, Monowar Aziz, Yang Weng-Lang, Mahendar Ochani, Ping Wang

**Learning Objectives:** Acute lung injury (ALI) and its severe form acute respiratory distress syndrome (ARDS) are the life-threatening complications of gut ischemia/reperfusion (I/R) injuries. Although osteopontin (OPN), a glycoprotein secreted from the leukocytes, plays a pro-inflammatory role in various inflammatory diseases, its role in gut I/R remains unexplored. We hypothesized that blocking of OPN by its neutralizing antibodies (anti-OPN Ab) protects mice against gut I/R-induced ALI. **Methods:** Gut I/R was induced in 8-week-old male C57BL/6 mice by superior mesenteric artery (SMA) occlusion with vascular clip. After 45 min of occlusion, clip was removed and anti-OPN Ab (25 µg/mouse) or isotype IgG control (n=8/group) was injected via tail vein immediately. Blood, lungs and small-intestine were collected after 4-h of reperfusion for examining several parameters. **Results:** Gut I/R injury significantly increased serum levels and lung mRNA and protein levels of OPN after 4-h of reperfusion than the sham mice. As compared with IgG control group, treatment with anti-OPN Ab in gut I/R mice significantly reduced serum levels of organ injury markers (ALT: 25 ± 5 vs. 53 ± 12; AST: 75 ± 6 vs. 101 ± 26; LDH: 429 ± 60 vs. 725 ± 128 U/L; p<0.05) and pro-inflammatory mediators (IL-6: 270 ± 128 vs. 129 ± 305; MIP-2: 312 ± 53 vs. 860 ± 154 pg/ml; p<0.05). Expressions of pro-inflammatory mediators in lungs were dramatically reduced in anti-OPN Ab-treated gut I/R mice than the IgG control mice at both mRNA (IL-6: 5 ± 1 vs. 23 ± 7; MIP-2: 32 ± 14 vs. 229 ± 77 folds) and protein levels (IL-6: 47 ± 4 vs. 109 ± 33; MIP-2: 474 ± 25 vs. 657 ± 61 pg/mg protein). The lung histology, myeloperoxidase (MPO) levels (1.0 ± 0.3 vs. 2.6 ± 0.1 U/mg tissue, p<0.05) and neutrophil infiltrations in anti-OPN Ab-treated gut I/R mice showed significant improvement than the IgG control mice. An improved outcome in 24-h survival study was also noticed in anti-OPN Ab-treated gut I/R mice than the IgG control mice (n=16–19/group). **Conclusions:** These findings clearly demonstrate that anti-OPN Ab treatment has a therapeutic potential in gut I/R-induced ALI.

**729 DETECTION OF ABNORMALITIES IN DYSPNEIC PATIENTS BY USING A NEW LUNG IMAGING MODALITY**
Zhen Wang

**Learning Objectives:** Although chest radiography is a useful examination tool, it has limitations. Because not all chest conditions can be detected on a radiograph, radiography cannot necessarily rule out all irregularities in the chest. Therefore, further imaging studies may be required to clarify the results of a chest radiograph, or to identify abnormalities that are not readily visible. The aim of this study was to compare traditional chest radiography with acoustic-based imaging (vibration response imaging) for the detection of lung abnormalities in patients with acute dyspnea. **Methods:** The current investigation was a pilot study. Respiratory sounds throughout the respiratory cycle were captured using an acoustic-based imaging technique. Consecutive patients who presented to the emergency department with acute dyspnea and a normal chest radiograph on admission were enrolled and underwent imaging at the time of presentation. Dynamic and static images of vibration (breath sounds) and a dynamic image score were generated, and assessments were made using an evaluation form. **Results:** In healthy volunter controls (n=61), the mean dynamic image score was 6.3 ± 1.9. In dyspneic patients with normal chest radiographs (n=51) and abnormal chest radiographs

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The text contains multiple sections detailing studies, treatments, and outcomes related to various medical conditions. Here are some key points:

- **Respiratory Failure, Length of Stay, and Periostin Levels in Children with Bronchiolitis:**
  - Critical asthma and bronchiolitis are prevalent Pediatric Intensive Care Unit diagnoses with overlapping pathophysiology. Periostin, an extracellular matrix protein, is a downstream marker of Th2 inflammation and is associated with asthma severity. Periostin levels in bronchiolitis have not been evaluated.
  - Methods: With IRB and parental consent, a subset of children <2yo admitted to our hospital 10/14 – 04/15 with bronchiolitis had serum periostin levels measured using a commercially available multiplex kit (RTD Systems).
  - Results: Dynamic image scores were 4.7 ± 2.7 and 5.1 ± 2.5, respectively (P <0.05). The final assessment of the vibration images indicated abnormal findings in 15%, 86% and 90% of the participants in the above groups, respectively (P <0.05).

- **High Flow Nasal Oxygen Therapy Utilization: 6-Year Experience at a Tertiary Care Center:**
  - Critical asthma and bronchiolitis are prevalent Pediatric Intensive Care Unit diagnoses with overlapping pathophysiology. Periostin, an extracellular matrix protein, is a downstream marker of Th2 inflammation and is associated with asthma severity. Periostin levels in bronchiolitis have not been evaluated.
  - Methods: With IRB and parental consent, a subset of children <2yo admitted to our hospital 10/14 – 04/15 with bronchiolitis had serum periostin levels measured using a commercially available multiplex kit (RTD Systems).
  - Results: Dynamic image scores were 4.7 ± 2.7 and 5.1 ± 2.5, respectively (P <0.05). The final assessment of the vibration images indicated abnormal findings in 15%, 86% and 90% of the participants in the above groups, respectively (P <0.05).

- **Preoperative CPAP in OSA Patients Decrease Opioid Use and Pain in the Postoperative Setting:**
  - Critical asthma and bronchiolitis are prevalent Pediatric Intensive Care Unit diagnoses with overlapping pathophysiology. Periostin, an extracellular matrix protein, is a downstream marker of Th2 inflammation and is associated with asthma severity. Periostin levels in bronchiolitis have not been evaluated.
  - Methods: With IRB and parental consent, a subset of children <2yo admitted to our hospital 10/14 – 04/15 with bronchiolitis had serum periostin levels measured using a commercially available multiplex kit (RTD Systems).
  - Results: Dynamic image scores were 4.7 ± 2.7 and 5.1 ± 2.5, respectively (P <0.05). The final assessment of the vibration images indicated abnormal findings in 15%, 86% and 90% of the participants in the above groups, respectively (P <0.05).

- **Novel Micropatterned Tracheal Tubes Reduce Occlusion Associated with Artificial Airway Narrowing:**
  - Critical asthma and bronchiolitis are prevalent Pediatric Intensive Care Unit diagnoses with overlapping pathophysiology. Periostin, an extracellular matrix protein, is a downstream marker of Th2 inflammation and is associated with asthma severity. Periostin levels in bronchiolitis have not been evaluated.
  - Methods: With IRB and parental consent, a subset of children <2yo admitted to our hospital 10/14 – 04/15 with bronchiolitis had serum periostin levels measured using a commercially available multiplex kit (RTD Systems).
  - Results: Dynamic image scores were 4.7 ± 2.7 and 5.1 ± 2.5, respectively (P <0.05). The final assessment of the vibration images indicated abnormal findings in 15%, 86% and 90% of the participants in the above groups, respectively (P <0.05).
**BIPHASIC CUIRESS VENTILATION USE IN BRONCHIOLITIS: A PROSPECTIVE STUDY**

Kerry Shum, Omar Al-Ibrahim, Christopher Heard

**Learning Objectives:** Acute respiratory failure from viral bronchiolitis for children 0–2 yr of age is one of the leading causes of pediatric intensive care admissions. Non invasive ventilation with positive pressure has shown promise in decreasing the need for intubations. Continuous negative extra-thoracic pressure ventilation by way of Biphasic Chest Cuirass, BCV, is an alternative noninvasive modality of ventilation for use in bronchiolitis. The purpose of this study was to see if BCV is a means of noninvasive ventilation that is easy and safe to use in infants with respiratory failure from bronchiolitis. There are no prospective clinical studies in pediatrics using this promising modality of ventilation. **Methods:** A prospective single center pilot study of infants admitted with respiratory failure from bronchiolitis to the PICU from 2012–2013. Study participation involved placement on BCV and monitoring the patient using a severity score. Safety was determined by development of adverse outcomes including skin breakdown, agitation, delay in enteral nutrition, and pneumothorax. Additional secondary outcomes were length of stay need for escalation of respiratory support and length of time on supplemental oxygen. **Results:** Of the 15 patients enrolled (67% male), the median severity score was 3.7 at initiation of BCV. There were no reported adverse outcomes. Average length of stay in the PICU was 2.9 days. Number of days until full feeds was 1.6. Number of day on supplemental oxygen was 3.1. Two patients required higher level of respiratory support. **Conclusions:** Continuous negative pressure ventilation by Biphasic Chest Cuirass is a safe and easy to use as a means of respiratory support in bronchiolitis among children 1 to 24 mo of age.

**ICU READMISSIONS FOR CHILDREN WITH TRACHEOSTOMIES PLACED FOLLOWING CARDIAC ARREST**

Julia Heneghan, Amanda Lanell, Denise Lopez-Domowicz, Steven Shein

**Learning Objectives:** Limited data are available when considering tracheostomy after pediatric cardiac arrest, including the burden of PICU readmissions. **Methods:** The Virtual PICU Performance System (VPS, LLC) was interrogated for children <18yo admitted to a participating PICU from 1/09-9/14. An “index admission” had both cardiac arrest and initial tracheostomy. Demographics, diagnoses, procedures, and PRISM (Pediatric Risk of Mortality) and PCPC (Pediatric Cerebral Performance Category) scores were obtained from index admissions and each subject’s subsequent VPS admissions (“readmissions”). Data shown as median (IQR). **Results:** Among 373 index admissions, median age was 1.7yr (0.4–9.6), 56.3% were male, 51.5% were Caucasian, and PRISM scores (11[5–20]) indicated severe illness. Most children had age-appropriate neurologic function at baseline (admission PCPC score 1[1–2.5]). Post-tracheostomy mortality was 13.9%. The most common primary diagnosis categories were cardiac (CV) (28.5%), respiratory (RESP) (28.5%), and injury/poisoning (including drowning) (I/P) (19.9%). Among all survivors, 46.6% had ≥1 readmission. Readmission occurred in 60.0% of CV cases, 52.7% of RESP cases, and 46.4% of I/P cases. For readmitted patients, median number of readmissions was 2(1–3), similar among subgroups. Readmission PRISM scores were 6(3–12.5) for CV cases, 10(5) for RESP cases, and 3(0–7) for I/P cases. LOS for readmissions was 2.6 days (1.0–6.1) and similar among subgroups. Readmission mortality was 5.2% for CV cases, 1.4% for RESP cases, and 1.4% for I/P cases. The most common indication for readmission was respiratory illness (CV cases: 39.9%, RESP cases: 57.1%, and I/P cases: 40.5%). During readmissions, central venous and arterial catheters were placed in 25.5% and 8.5% of CV cases, 17.8% and 6.4% of RESP cases, and 12.1% and 1.4% of I/P cases. Of 5 total deannulations, 3 occurred in I/P cases and 1 in RESP cases. **Conclusions:** ICU readmission among children who undergo post-arrest tracheostomy is common and often includes invasive procedures. Stakeholders may find these data useful.
highly significantly associated with decreased LOS in the ICU and hospital, and therefore should be encouraged.

ASSOCIATION BETWEEN SERUM C-REACTIVE PROTEIN LEVELS AND PULMONARY ARTERIAL HYPERTENSION
Pradyumna Agasthi, Srinadhi Annangi, Sivakanth Aloor, Anvatika Chenna, Marilyn Foreman

Learning Objectives: Accumulating evidence implicates the role of systemic inflammation in the pathogenesis of pulmonary arterial hypertension (PAH). C-reactive protein (CRP) is an established marker of inflammation that is active in the physiopathology of the vascular wall. It is hypothesized that the proinflammatory properties of CRP contribute to pulmonary vascular remodeling via modulation of the nuclear factor-κappa B pathway. The association between CRP and PAH is unclear. We conducted a meta-analysis to evaluate the relationship between serum CRP levels and PAH. Methods: We searched MEDLINE, CINAHL and COCHRANE databases for studies reporting serum CRP levels in the PAH and non PAH study population. We included case controls, cohort and cross-sectional studies. We calculated the weighted standardized mean difference (SMD) in serum CRP levels between the PAH and control groups. Results: Our search strategy yielded 124 articles. We included eight studies enrolling 861 participants. PAH was diagnosed either by Doppler echocardiography (52%) or right heart catheterization (48%). The median age of the PAH group was 55 yr. (IQR 41 - 61) vs 48 yr. (IQR 34 - 56) in the control group. The median body mass index in the PAH group was 25.6kg/m2 (IQR 24.7–26.4) vs 25.9kg/m2 (IQR 25.1–27.3) in the control group. The unweighted median serum CRP levels in the PAH group were 6.75 mg/l (IQR 3.9-12.5) vs 3.15 mg/l (IQR 2 – 6.9) in the control group. The SMD of CRP level was 0.75 (95% CI 0.31 – 1.18) p<0.001 comparing the PAH group vs the control group. Conclusions: An elevated serum CRP level is significantly associated with the presence of PAH. Given the significance of elevated CRP levels in PAH, directing further studies in understanding the role or CRP in the etiopathogenesis of PAH would help determine new modalities of therapeutic options and prognostic indicators.

MECHANICALLY VENTILATED PATIENTS REPORT IMPROVEMENT IN COMMUNICATION WITH TALKING TRACHEOSTOMY TUBES
Vinciya Pandian, Therese Cole, Kate Holden, Dana Kilonsky, David Feller-Kopman, Lonny Yarmus, Marek Mierski

Learning Objectives: Communication is limited in mechanically ventilated patients. While tracheostomy with one-way speaking valve may help facilitate communication, it requires cuff deflation. Several patients are unable to tolerate cuff deflation. Talking tracheostomy tube enables communication without the need for cuff deflation. The purpose of our study was to evaluate the feasibility of measuring outcomes of patients with a talking tracheostomy tube using a pretest-posttest research design prospectively. Methods: Design: Pilot prospective randomized controlled clinical trial Intervention: Talking tracheostomy tube followed by 3 intensive sessions with a Speech Language Pathologist (SLP). Control: No talking tracheostomy tube Inclusion Criteria: Mechanically ventilated via tracheostomy, awake, alert, and attempting to communicate, ≥18 yr, understand English Exclusion Criteria: Delirium, fresh tracheostomy within 48 hr, laryngectomy Instruments: Quality of Life for Mechanically Ventilated Patients (QOL-MV), Voice Related Quality of Life (VR-QOL), and Sentence Intelligibility Test (SIT). Results: 25 patients were enrolled in the study, (control group = 10, intervention group = 15). The mean age was 50 yr. 64% were women. There were approximately an equal number of African Americans (40%) and Caucasians (48%). 92% of patients received a tracheostomy tube for chronic ventilator dependence. The mean severity of illness score measured by the sequential organ failure assessment tool was 6.16. The mean QOL-MV score was 50.8 and the mean VR-QOL score was 32.9. There was no significant difference in the QOL-MV scores and VR-QOL scores between pre and post among the control group. Among the intervention group a trend was noted towards an improvement in QOL-MV and VR-QOL. Conclusions: Our study demonstrates improvement in quality of life and intelligibility of mechanically ventilated patients. Talking tracheostomy allows mechanically ventilated patients to communicate and in turn helps optimize ICU care. This empowers patients and allows healthcare staff to obtain a more accurate assessment of patients’ condition.

VALIDATION OF AN ELECTRONIC SNIFFER FOR CALCULATION OF SIMPLIFIED PULMONARY EMBOLISM SEVERITY INDEX
Bashar Alkinji, Bibeck Pannu, Kumar Suvorovtam, Melissa Pase, Vivek Iyer, Rahul Kashyap

Learning Objectives: The simplified pulmonary embolism severity index (sPESI) is a robust and well validated tool for identifying patients at a high risk of complications after a pulmonary embolism (PE). A patient is classified as high risk if any of the following conditions are met: age > 80; history of cancer; history of chronic cardiopulmonary disease; heart rate ≥ 110; systolic BP < 100mmHg or oxygen saturation < 90% at time of PE. We aimed to create an electronic sniffer to identify patients with high risk of PE using the sPESI score. Methods: A 100 patients with PE were randomly selected from an electronic database. A manual chart review was performed to calculate the sPESI. An electronic sniffer was developed to calculate the same variables in an automated fashion using the electronic medical record. Results: From the electronic sniffer were then validated using the manually calculated sPESI score as the gold standard. Results: We found ‘excellent’ co-relation for the age > 80 variable (observed agreements 100/100; Kappa = 1.00). We found ‘very good’ co-relation for the heart rate ≥ 110 variable (observed agreements 93/97; Kappa = 0.91). We found ‘good’ co-relation for history of cancer (observed agreements 86/100; Kappa = 0.7) and systolic BP ≥ 100mmHg (observed agreements 88/97; Kappa = 0.79). We found ‘moderate’ co-relation for oxygen saturation < 90% (observed agreements 78/97; Kappa = 0.54) and history of cardiopulmonary disease (observed agreements 85/100; Kappa = 0.50). Overall we found the electronic sniffer to be reliable in the identification of high risk individuals with the sPESI score along with a low misclassification rate. Further study and refinement of the sniffer will identify and mitigate risk of misclassification.

MECHANICAL VENTILATION IN PEDIATRIC HEMATOPOIETIC STEM CELL TRANSPLANTATION
Courtney Rowan, Jennifer McArthur, Julie Fitzgerald, Shira Gertz, Loomis Ashley, Robert Tamburro, Ira Cheifetz, PALISI Subsection on HSCT

Learning Objectives: Acute respiratory failure occurs in as many as 25% of pediatric hematopoietic stem cell transplant (HSCT) recipients. We hypothesized that poor oxygenation and elevated ventilator pressures are associated with mortality. Methods: We are reporting a retrospective study of 222 pediatric allologenic HSCT recipients with respiratory failure from 12 US hospitals. Ventilator and respiratory parameters were collected for each day of mechanical ventilation (MV). Primary outcome was mortality. Variables were evaluated for mortality using univariate analyses, ROC curves, and logistic regression. A multivariate logistic regression model was developed. Results: Compared to survivors, nonsurvivors had worse oxygenation with higher peak oxygenation index (OI) (41.9 ± 26.7 v 21.3 ± 19.2, p<.0001) and oxygen saturation index (OSI) (27.5 ± 16.0 v 14.2 ± 11.3, p<.0001). They had higher peak FiO2 (0.80 ± 0.20 v 0.90 ± 0.20, p<.002) and greater days with FiO2 ≥ 0.6 (5.8 ± 7.3 v 1.6 ± 2.4, p<.0001). For each increase in OSI by 1 there was a 6.3% increase in mortality. For each day spent with FiO2 ≥ 0.6, mortality increased by 12.8%. Nonsurvivors spent more days with an OI >18 (4.4 ± 6.4 v 1.0 ± 3.8, p<.0001) and OSI > 11 (5.5 ± 7.1 v 1.2 ± 3.0, p<.0001). Nonsurvivors also had higher peak inspiratory pressure (PIP) (36.8 ± 10.5 v 30.5 ± 8.7 cmH2O, p<.0001) and spent a longer time with PIP > 31 cmH2O (4.1 ± 7.5 v 1.5 ± 3.9 days, p<.0001). For every increase in PIP by 1 cmH2O, mortality increased by 5.4%. Nonsurvivors were ventilated longer (19.0 ± 17.3 v 14.3 ± 16.0 days, p=0.047) and spent a longer time on high frequency ventilation (3.8 ± 6.6 v 1.3 ± 3.0 days, p<.0001). Tidal

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volume per kilogram (VT/Kg) was not different between survivors and nonsurvivors. Peak VT/Kg was the same 9.2±3 vs. 9.1±3 ml/kg (p=0.9), and time spent on VT/Kg > 7ml/kg was not different, 5.7±7 vs 6.2±12 days (p=0.7). **Conclusions:** Worse oxygenation and higher ventilator pressures were associated with increased mortality in our multicenter cohort of pediatric allogeneic HSCT patients with acute respiratory failure.

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**EFFECT OF INSULIN LIKE GROWTH FACTOR-1 RECEPTOR BLOCKER ON LIPOPOLYSACCHARIDE-INDUCED LUNG INJURY**

Chi Young Kim, Ji ye Jung, Moo Suk Park, Young Sam Kim, Se Kyu Kim, Jun Chang, Kyung Soo Chung

**Learning Objectives:** The insulin-like growth factor-1 (IGF-1) pathway is an important determinant of survival and proliferation in many cells. However, little is known about the role of the IGF-1 pathway in inflammation and lung injury. To investigate whether IGF-1 receptor blockade modulates macrophage function and attenuates lipopolysaccharide (LPS)-induced mouse lung injury **Methods:** To evaluate the role of IGF-1 pathway in activated macrophage, we use IGF-1 receptor siRNA in bone marrow derived macrophage treated with LPS and ATP. And next, we investigated the effect of IGF-1 monoclonal antibody in LPS induced mouse lung injury model. **Results:** Bone marrow derived macrophage treated with LPS and ATP showed increase of inflammatory cytokines such as monocyte chemotactic protein 1(MCP-1), chemokine (C-X-C motif) ligand 1 (CXC1L1), chemokine (C-X-C motif) ligand 2 (CXC2L2), tumor necrosis factor alpha (TNF-alpha) IL–1β, and IL-6. On the contrary, pretreatment of IGF1 receptor siRNA significantly reduced all of inflammatory cytokines. We also investigated the effect of IGF-1 receptor monoclonal antibody on mouse lung injury model with intranasal instillation of LPS (25ug). IGF-1 receptor monoclonal antibody treatment (intraperitoneal injection) reduced total cell count, protein and inflammatory cytokines in broncho-alveolar lavage fluid as well as lung injury score on H&E stain. Expressions of IRS1, PI3K, Bcl-2 decreased in group with IGF-1 receptor monoclonal antibody treatment compared with control group on western blot analysis of lung lysate. **Conclusions:** Our data supports that blockade of IGF-1 pathway can inhibit macrophage activation and ameliorate lung injury. Grant acknowledgment: This study was supported by a faculty research grant of Yonsei University College of Medicine for 2013 (I-2013-0055).

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**USE OF RADIOLOGIC AND CLINICAL MARKER TO PREDICT TRACHEAL LENGTH AND CORRECT TRACHEAL TUBE PLACEMENT**

Teresa Volsko, Allison Shepka, Neil McNinch, Michael Rubin, Donald Prough, Michael Bigham

**Learning Objectives:** Detecting and correcting tracheal tube (TT) malposition is essential for intubated infants and children. The aim of this study was to identify demographic, anatomical or radiographic variables that predicted correct TT position. **Methods:** In a random subset (randomization table) of 2000 initial AP Supine CXRs taken in the PICU between 01/01/09 and 05/05/12, we recorded data on TT malposition. In a random subset (randomization table) of 2000 initial AP Supine CXRs taken in the PICU between 01/01/09 and 05/05/12, we recorded data on TT malposition. **Results:** The majority of TT malpositions were due to distance differences among the different distances measured, including distance of TT tip to the carina. BSA, height and weight were higher (p<0.01) in those with TT malposition. **Conclusions:** The distance from the superior margin of the clavicular heads to the carina presents an opportunity to construct and validate tables to guide correct TT depth placement and evaluate their utility.

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**AMYLASE IN TRACHEAL SECRETIONS OF MECHANICALLY VENTILATED PATIENTS**

Aura Middleton, Mary Sole, Janet Conard, Melody Bennett, Lara Deaton, Xin Yan, Daleen Penoyer, Devendra Mehta

**Learning Objectives:** Oral secretions often leak around the cuff of an endotracheal tube (ETT) despite maintaining cuff pressure in a recommended range. Aspiration increases the risk for lung injury and infection. This study evaluated tracheal amylase levels as a biomarker for aspiration of oral secretions. We hypothesized that amylase would be detected in tracheal secretions. **Methods:** Following consent, mechanically ventilated patients (218 yr) were enrolled within 24h of intubation to test an aspiration-prevention intervention. We collected oral and tracheal specimens to measure alpha-amylase, a biomarker of aspiration of oral secretions at enrollment and every 12h while intubated. We used 5mL of normal saline to rinse the tracheal secretions into the specimen trap. An amylase value of 396 Units/L (based on Roche Diagnostic Linearity Standards) was considered positive. Data from subjects in the control group were extracted from the REDCap database. Data were analyzed with Chi-square, and independent samples t-test and median tests. **Results:** Data were analyzed from 61 ventilated patients; mean age 55.5 (19.1) yr, 57.4% male, 72% white, 28% minority, 21% Hispanic. Primary diagnoses were 47% medical-surgical, 28% neuro, and 25% trauma. At enrollment, median cuff pressure was 25cm H2O; oral amylase, 279,664 Units/L; tracheal amylase 2,756 Units/L; 85% of subjects had a positive tracheal specimen. Subjects were enrolled an average of 5 days, and the median oral amylase across time was 471,049 Units/L; tracheal, 6,005 Units/L. Although not significant, average tracheal amylase levels were higher in subjects who were more deeply sedated (RASS 7 or higher; p=0.01), and lower in those with a subglottic suction ETT (SS-ETT; p=0.06). **Conclusions:** The majority of subjects had aspiration at intubation, which continued throughout ventilation. Tracheal specimens, even with dilution, were positive despite adequate cuff pressure and SS-ETT. The impact of positive tracheal amylase levels on outcomes such as ventilator-associated conditions and duration of mechanical ventilation warrant further study. (I801NR014508)

**745**

**PARAQUAT POISONING CAUSING MULTI-ORGAN FAILURE IN SOUTH-INDIA**

Arun Rajasekaran, Sandeep Dayanand, Faraz Afridi, Jorge Morales, Uuyanga Battram, Shubha Sheshadri, Vinay Pandit

**Learning Objectives:** Poisoning by pesticides is a major problem in developing countries. Paraquat (1,1’-dimethyl-4,4’-bipyridylium dichloride) is a widely used herbicide. Severe paraquat poisoning is characterized by multi-organ failure, predominantly the lungs, kidneys, and liver. Respiratory failure from lung injury is the most common cause of death. Death primarily results from progressive pulmonary damage secondary to diffuse alveolar damage with resultant acute respiratory distress syndrome (ARDS). It is important to make an early diagnosis and to start appropriate treatment as soon as possible. Immunosuppressants (combination of glucocorticoids and cyclophosphamide) have shown to be promising. It is not warranted in mild poisoning, while patients with fulminating poisoning generally die before the therapy takes effect. Thus, it is with patients in the moderate to severe group (lung injury) who would benefit from immunosuppressants. We report seven cases of paraquat poisoning treated in our South-Indian center. **Methods:** Record based study of paraquat poisoning over the last 5 yr was performed. General characteristics of patients’, complications, treatment received and outcomes were recorded. Variables among survivors and non survivors were compared. **Results:** Seven patients were admitted with paraquat poisoning. All had acute renal failure with mean peak creatinine of 4.95 ± 1.40 mg/dl. Respiratory failure was seen in six cases. Multi organ failure,
severe mucosal ulcerations and hepatic dysfunction were seen in six, five and four cases respectively. Four cases died, of whom three had died within the first two days of admission. All of the deceased had severe poisoning, respiratory failure and multi-organ dysfunction. Immunosuppressants were given in four cases and three died early in the course of treatment. Conclusions: Paraquat poisoning is uncommon in India and carries a high mortality. Early referral, monitoring for pulmonary and other organ involvement, therapy with gastric adsorbents, antioxidants, dialysis and immunosuppressants in moderate to severe poisoning is essential to reduce the mortality.

THE IMPACT OF AN OXYGEN SUPPLEMENTATION PROTOCOL ON INPATIENT PEDIATRIC BRONCHIOLITIS
Anthony Olivero, Brian LeCleir, Leslie Jurecko, Tracy Koehler, Matthew Pridgeon, Stephanie Raymundo, Alan Davis, Surender Rajaekaran

Learning Objectives: Bronchiolitis is the leading cause of hospitalization in young children in the United States, resulting in a mean length of stay (LOS) of 3.3 days and costs exceeding $500 million annually. A primary determinant of the duration of hospitalization is the need for oxygen supplementation, prolonging LOS by an average of 38–66 hr. National guidelines that outline the oxygen saturation thresholds for supplementation are well established, but there are few published reports that provide guidance to the titration of supplemental oxygen. Methods: We performed a retrospective case series of children ≤2 yr of age who were hospitalized with bronchiolitis in a tertiary care pediatric hospital between November 1, 2011 through April 30, 2012, and November 1, 2013 through April 30, 2014. A team of clinicians implemented an oxygen supplementation protocol in February of 2013. Data was extracted through automated and manual electronic chart review. Patients were excluded if they were initially admitted to the PICU or had previously diagnosed chronic respiratory conditions. Results: Outcomes were compared between patients with bronchiolitis who presented 1 year immediately prior to (n=141) and 1 year immediately after (n=122) protocol implementation. There were no significant differences between pre- and post-implementation groups with regard to mean LOS (60.6 vs 72.5 hr; p=0.74), length of oxygen supplementation (38.3 vs 40.9 hr; p=0.73), rate of transfer to the PICU (7.1% vs 10.7%; p=0.31), or 7 day readmission rates (0.7% vs 1.6%; p=0.60), respectively. The post-implementation group had higher initial respiratory distress score (RDS) on average compared to the pre-implementation group (2.72 vs 1.19; p<0.001). Further analysis of the post-implementation group revealed that patients with an RDS of 3 or more demonstrated a 17.9 hour longer mean LOS, while patients with an RDS of 2 or less demonstrated an 18.8 hour shorter mean LOS. Conclusions: The use of an oxygen supplementation protocol in children hospitalized with mild bronchiolitis (RDS of 2 or less) may decrease length of stay.

HIGH- VS. LOW-DOSE CORTICOSTEROIDS IN COPD EXACERBATIONS REQUIRING MECHANICAL VENTILATION
Jennifer Cortes, Elizabeth Franco, Mark Warner

Learning Objectives: Treatment of acute exacerbations of COPD (AECOPD) includes oxygen therapy and systemic corticosteroids. Steroids are beneficial in treating AECOPD by shortening recovery time, improving lung function and oxygenation and reducing risk of early relapse. Currently, there is no standardized initial dose of corticosteroids in patients admitted for AECOPD requiring mechanical ventilation (MV). The objective of this study is to compare outcomes in patients with AECOPD that required invasive or non-invasive MV and received either high or low dose corticosteroids. Methods: Retrospective observational study evaluating patients admitted to the medical ICU between October 1, 2010 and June 30, 2014 with a diagnosis of AECOPD requiring MV and treated with high dose (HD) (methylprednisolone > 240 mg/day equivalents) or low dose (LD) (methylprednisolone ≤ 240 mg equivalents) corticosteroids within the first 2 days of ICU admission. The primary outcome is ICU length of stay (LOS) and secondary endpoints are corticosteroid adverse effects, hospital LOS, hospital mortality, duration of MV, escalation of ventilation requirements, and readmission within 30 days. Results: Ninety patients received LD steroids and 20 received HD. There were no statistical differences in patient demographics except lactate on admission, 2 in LD vs 1.1 mMol/L in HD group, p=0.02. APACHE II score was 22 for both groups, p=NS. Steroids were initially delivered via IV route in 65.6% of LD patients and 100% HD, p=0.004. Methylprednisolone was the initial steroid used in 72.2% of LD and 100% HD, p=0.017. Invasive MV was used in 57.8% of patients in LD and 60% HD. Total ICU LOS in LD was 3 vs 5 days for HD, p=0.03. Median duration of MV for patients who received LD or HD steroids was 3 vs 4.5 days, respectively p=0.04. There were no statistical differences in the remaining secondary endpoints. Conclusions: Results suggest that patients whom received HD corticosteroids have a greater ICU LOS of 2 days; therefore, there is no added benefit of administering HD compared to LD corticosteroids in the treatment AECOPD in patients requiring MV.

TRANSLATIONAL SCIENCE: MEASURING UNINTENDED OXIDATIVE DAMAGE DURING HYPEROXIA IN CRITICAL ILLNESS
Letitia Close, Chris Winkelman

Learning Objectives: Critically ill patients are often exposed to high levels of oxygen leading to hyperoxia. Little is known about the relationship between hyperoxia and formation of reactive oxidative species (ROS). The purpose of this abstract is to illustrate real time utilization of 8-hydroxydeoxyguanosine (8OHdg) as marker of ROS during critical illness through periods of normo- and hyperoxemia. Methods: Descriptive, prospective, feasibility study completed in a Surgical ICU. After IRB approval, blood samples were drawn to measure 8OHdg, an indicator of DNA damage from ROS. Subjects had an 8-hour period of either hyperoxemia (PaO2≥100mmHg) or normoxemia (PaO2 80-99mmHg). PaO2 was measured via ABG analysis and patients were included if no major events occurred in the observed 8 hour period. 8OHdg was cleared by kidneys. Results: 15 patients were enrolled. 10 patients were hyperoxic (mean PaO2 167mmHg) and 5 were normoxic (mean PaO2 90mmHg). The patients with hyperoxia received a mean FiO2 of .59 and the normoxic patients received room air (mean FiO2=.21). Mean 8OHdg level was 9.6 in subjects with hyperoxemia and 12.3 in those with normoxemia. Kidney dysfunction was common, with mean creatinine level of 2.0 (range of 0.52–11.8) among subjects with hyperoxemia and mean 2.1 (range 0.5–6.65) with normoxemia subjects. The mean SOFA score for subjects with hyperoxia group was 2.5 compared to 4.2 for those with normoxia. Conclusions: Periods of hyperoxemia occurred during critical care and persisted for more than 8 hr. Patients who received .4 FiO2 experienced relative hyperoxia. No differences in 8OHdg levels in this feasibility study occurred likely due to the small sample size, limited observed time of hyperoxia, and incidence of kidney dysfunction. This study provided feasibility and context for future studies evaluating the role of oxidative damage in the ICU. Acknowledgement: Funded by CWRU FBP Alumni Association
respectively. The mean age for men and women were 62.6 and 61.5, respectively. Several patients demonstrated multiple emboli to wit, 275 distinct PEIs were noted among the 160 individual patients. 107 right sided emboli were found (39.2%), 50 left sided (18.3%), and 116 patients demonstrated bilateral PEIs (42.5%). Conclusions: Incidence of right-sided PE exceeded left-sided PE and bilateral involvement exceeded both. Additionally, PE were more common in lower segments (24.9%) than upper segments (17.6%). The increased size of the right lung compared to the left may contribute to the tendency of emboli to lodge to the right side. The clinical significance of the right-sided preference suggests an elevated PE-associated mortality risk in patients with unilateral left lung disease.

752 NON-INVASIVE VENTILATION USAGE AND ADVERSE EVENTS IN AN ACADEMIC PICU
Megan Benckert, Marilyn Morris, Patrick Wilson

Learning Objectives: The overall use of non-invasive ventilation (NIV) has increased over the last two decades and is considerably safer than invasive forms of ventilation. Further evidence to support its safety, effectiveness and limitations in pediatrics is needed. We aim to describe the current use and rate of adverse events with NIV in a U.S. academic Pediatric Intensive Care Unit (PICU).

Methods: All patients receiving non-invasive continuous positive airway pressure (CPAP), bi-level positive airway pressure (BiPAP) or high flow nasal cannula (HFNC) in the pediatric ICU over a 6 week period were included in the study. Adverse events, NIV settings and interface used were obtained prospectively from a bedside nurse, respiratory therapist or physician daily using standardized questions. Demographics and indication for NIV were obtained from electronic medical records and reviewed by an ICU nurse and pediatric critical care physician.

Results: 58 patients were identified. BiPAP (n=26), CPAP (n=18), HFNC (n=9) and bubble CPAP (n=5) using nasal prong (n=40), mask (n=11) and face mask (n=7) were used. The mean age, weight and duration of NIV was 5.9 yr, 19.5 kg and 3.4 days. 69% of the individuals were male and 64% had gastric tubes present. Indications for NIV were post-extubation (n=31), pneumonia (n=5), neurodegenerative weakness (n=4), heart failure (n=4), chronic lung disease (n=4), asthma (n=3), pulmonary edema (n=2), sepsis (n=1), upper airway obstruction (n=1), central apnea (n=1), bronchiolitis (n=1) and administration of inhaled nitric oxide (n=1). 18 patients (31%) had 27 reported adverse events: stage 1 skin breakdown (n=14), abdominal distention (n=4), stage 2 skin breakdown (n=3), nose bleed (n=2), vomiting (n=2), irritability (n=1) and aspiration (n=1). Eight (57%) of the stage 1 skin breakdowns were patients with nasal prongs. Conclusions: NIV usage is common in the pediatric ICU. BiPAP was the most used form of NIV and nasal prongs were the most used interface. Post-extubation from mechanical ventilation was the most common indication. Most reported adverse events were minor.

753 EARLY HIGH FLOW NASAL CANNULA BEFORE EXTUBATION CAN HAVE PREDICTABLE OXYGENATION
Kenzo Iishi, Hiroshi Motimatsu, Kazumi Oso, Hidekuni Hidaka, Yunsuke Koyama

Learning Objectives: Effects of high flow nasal cannula (HFNC) for respiratory dysfunction have been reported and there are some reports of HFNC using after extubation. In this study, we started HFNC just before extubation aiming to avoid hypoxemia after extubation. Research hypothesis of this study is that, starting HFNC just before extubation will avoid hypoxemia and respiratory complication at post-extubation. Methods: We performed prospective observational study in patients with mechanical ventilation in our surgical ICU. We compared following two groups; Group of HFNC starting just before extubation and tradition extubation group as historical control. The protocol of HFNC starting just before extubation is as follows; first, during manual ventilation with bag, we put on HFNC and start oxygen with 30-40L/min and FiO2 100%. Second, we extubate endotracheal tube, and remove the sputum in patient oral cavity. We observed and recorded vital signs (heart rate (HR), respiratory rate (RR), mean arterial blood pressure (ABP (mmHg)), PaO2/FiO2 ratio (P/F ratio). We also compare the re-intubation ratio between the two groups. We used two way repeated measure ANOVA and chi-square test for statistics analysis. Results: 27 patients are received HFNC and 28

751 HEALTHCARE-ASSOCIATED PNEUMONIA TREATMENT CHARACTERIZATION IN MEDICAL ICU PATIENTS
Ryan D’Angelo, Jeffrey Gonzales, Asha Tata, Emily Heil, Devang Patel, Carl Shanholtz

Learning Objectives: Recent studies have illustrated that broad spectrum anti-biotic therapy may not be vital for all patients admitted for healthcare-associated pneumonia (HCAP). The primary objective of this study is to describe patient characteristics and antibiotic treatment regimens of HCAP patients admitted to a tertiary care medical intensive care unit (MICU).

Methods: This prospective, observational study from December 2014 to July 2015 included patients admitted to the MICU who met guideline criteria for HCAP. Patients with malignancy on chemotherapy or AIDS were excluded. Data related to pneumonia severity, antibiotic regimens and outcomes was collected on hospital days 1, 3, 5, 7, 10, 14, and 21 or until antibiotics were stopped. Guideline concordant (GC) regimens were defined as those with pseudomonal and MRSA activity. Clinical cure, based on resolution of radiologic findings and improvement in clinical pulmonary infection score (CPIS), was evaluated at completion of antibiotics. Results: 40 patients were included in the study. The mean age of patients was 60.8 ± 13.7 and 50% were male. 80% required mechanical ventilation. Mean APACHE II score was 22.7 ± 7.8. In-MICU mortality was 20%, 37.5% of patients met ≥3 HCAP risk factors. 85% of patients received GC empiric therapy with vancomycin and piperacillin-tazobactam or cefepime. 22 patients received GC regimens with azithromycin, 15 patients received GC regimens without azithromycin, and 3 patients received a non-GC regimen. CPIS decreased by a mean of 4.6 ± 2.1 points by the end of antibiotics in all patients. 72.7% of patients who received GC regimens with azithromycin reached clinical cure, compared to 33% of patients who received GC regimens without azithromycin (p=0.02). Antibiotic duration was similar between patients receiving GC with or without azithromycin, 7.5 (IQR:4–9) and 8.5 (IQR:5–12) respectively. Conclusions: In this population of ICU patients, adherence to current HCAP guidelines regarding empiric antibiotics and duration of therapy was well documented. Addition of azithromycin was common and showed potential benefit in treatment of HCAP.

750 EVALUATING METHYLPREDNISOLONE DOSES IN ICU PATIENTS FOR ACUTE COPD EXACERBATION
Ijang Ngando, Grace Liu, Jeffrey Garavaglia, Jeffrey Qudado, Corbin Hodder, Richard McKnight

Learning Objectives: Treatment of Acute Exacerbated Chronic Obstructive Pulmonary Disease (AECOPD) consists of multiple therapies including systemic steroids. AECOPD may require hospitalization and mechanical ventilation. Controversial literature exists regarding optimal dosing and duration for steroid therapy.

Methods: A retrospective review of medical intensive care unit (MICU) patients admitted at WVU Healthcare from January 1, 2009 through December 31, 2014. Patients receiving ≥72hr of MP during hospitalization were screened. Selected patients were stratified by the initial daily MP dosing regimen - (low dose-LD ≤ 160mg, medium dose-MD 161 -239mg and high dose-HD ≥ 240mg). Descriptive statistics were used for baseline characteristics and to compare variables between groups. Results: Total of 157 patients screened, 116 were enrolled (LD [n=47], MD [n=7] and HD [n=62]). Included patients had a history of smoking (29%), home oxygen therapy (46%) and diabetes (35%). Only 1% of patients (n=2) were re-intubated within 30 days of initial extubation and 2 patients died. There was no difference in ICU length of stay or days on the ventilator in all groups (3–6 days). Overall, patients received 7–9 days of therapy. Interestingly, 25% of patients had changes to insulin therapy.
Learning Objectives:

- Patient experience unplanned ICU transfer (UIT), with the usual protocol (median 18.5 hr vs 23 hr, with Support Pressure P = 0.034, and 26.8 hr with T-Piece P= 0.023). Total duration of mechanical ventilation and duration of the ICU stay were 7.4 day in the SmartCare group and 11.4 day in the Other groups (21.1% vs. 20.0%, P = 0.935).
- Conclusions: Automatic Weaning Protocol (SmartCare®) was superior in weaning than others.

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**BISPECTRAL INDEX FOR MONITORING THE SEDATION LEVELS IN PATIENTS WITH MECHANICAL VENTILATION IN THE ICU**

Xiaoping Shao, Wang Fang, Yonghua Xu

Learning Objectives: Prior studies have shown the effect of the Bispectral (BIS) index for tracking sedation levels during anesthesia, but it remains unknown if the BIS index is a reliable method to monitor sedation levels during mechanical ventilation in critically ill patients in ICU. Methods: During January 2013 to January 2015, forty critically ill patients who were treated with mechanical ventilation in ICU were reviewed retrospectively. The patients consisted of 26 males and 14 females with a mean age of 47.9 yr (aged 23 to 78 yr). These patients were divided into Group I (n = 23) and Group II (n = 17) according to the score of Ramsay. The score of Ramsay in patients of Group I were between 2 and 3 while those in patients of Group II were between 3 and 4. All the patients were sedated by transfusing propofol and midazolam with injecting pump. The changes of heart rate(HR), mean blood pressure(MAP) and the BIS index were analyzed. Results: The BIS index in patients of Group I were between 70 and 80 while those in patients of Group II were between 60 and 70. The hemodynamic variables were stable in patients of Group I. There were no significant differences of both HR and MAP in patients of Group I (P>0.05). However, compared with the pre-sedation, the MAP of the patients in group II declined from (72.52 ± 8.96) mmHg to (63.77 ± 8.55) mmHg while HR improved from (91.7 ± 8.9) /min to (99.2 ± 9.3) /min, which had significant difference (P< 0.05). Conclusions: There had the feasibility and effectiveness of using the BIS index to monitor the depth of sedation in patients with mechanical ventilation. By using the BIS index, different choices for various needs can be selected to obtain ideal sedation effect and avoid from the complication of sedation.

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**THE EFFECTS OF AROUSALS TO THE REGIONAL CEREBRAL OXYGEN SATURATION IN CHILDHOOD OSA**

ONSUTHI PHARADORNNUWAT

Learning Objectives: Obstructive sleep apnea (OSA) is syndrome caused by chronic intermittent partial or complete upper airway obstruction during sleep, resulting in intermittent hypoxemia, hypercapnia, and increasing arousals. Childhood OSA is common problem and related to neurocognitive morbidity which has unclear mechanism but may be associated with decreasing in the regional cerebral oxygen saturation during specific-hypocapnic episodes. Near-infrared spectroscopy (NIRS) monitoring is non-invasive regional tissue oxygen saturation monitoring that reflects the balance between oxygen supply and oxygen consumption. In this study, we hypothesized that arousals may be impact factor which causes the change in the cerebral oxygen saturation (measured by NIRS) during REM sleep in children who diagnosed with moderate-to-severe OSA (AHI > 5 events/hour) by overnight polysomnography. Methods: Study design: Prospective observational study. Inclusion criteria: Pediatric patients, aged from 1 to 15 yr who suspected OSA and underwent overnight polysomnography between 1st August 2014 – 31st January 2015 with parents’ informed consents. Exclusion criteria: Anatomical defects of upper airway and craniofacial anomalies, neuromuscular and genetic disease, cerebral AVM, AHI < 5 events/hour in polysomnography. Methods: The demographic data will be recorded. NIRS monitoring will be established along with the overnight polysomnography. Statistical Analysis: linear and multi-variable regression, Pearson correlation, Wilcoxon matched-pairs sign rank test, median, mean ± SD. Results: Arousals is not effect to REM duration (P=0.7554) and has substantial correlation with AHI (R square = 0.7579, P=0.0001). The cerebral oxygen saturation is significant lower in period with highest arousals index (P=0.0110), compared with period with lower arousals index when the peripheral oxygen saturation is not significant different (P=0.2842). Conclusions: Arousals plays important role in determine cerebral oxygen saturation with inverse correlation.

Research Snapshot Presentations: Quality and Safety

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**A CRITICAL ANALYSIS OF UNPLANNED TRANSFER TO THE ICU WITHIN 48 HOURS OF ADMISSION FROM THE ED**

Cassidy Dahn, Alan Manasco, Alan H Breaud, Victor Lopez Avenida, Natalia Rumas, William Baker, James Feldman

Learning Objectives: Patients who experience unplanned ICU transfer (UIT), within 48 hr of admission from the Emergency Department (ED), have a higher mortality and increased LOS than directly admitted ICU patients. The study purpose was to describe reasons for all UIT, proportion of critical interventions (CI), performed within 48 hr, length of stay (LOS) and mortality. Methods: Single center, retrospective cohort study of ED patients admitted to a non-ICU bed and had a UIT within 48 hr from 2008 - 2013 at an urban academic medical center. We excluded those under 18 and those with ‘do not resuscitate’ (DNR) and ‘do not intubate’ (DNI) on admission. Trained investigators abstracted: demographics, comorbidities, time and reason for UIT; total LOS, CIs, and mortality. We used a modified Delphi process to determine CI. We calculated descriptive statistics with 95%CI for all outcomes. Results: A total of 837/512,525 (0.17%) non-ICU admissions from the ED had a UIT within 48 hr and 86 admitted patients died prior to transfer. We excluded: 23 DNR/DNI, 117 post-operative transfers, 177 planned ICU transfers, and 4 with missing data. Of the 516 patients remaining, 65% (95% CI 61%-69%) received a CrI and transfer reasons included: 33 medical
errors, 90 disease processes not clearly present on arrival, and 393 deterioration of presenting symptoms. In patients who received a CrI, the mortality rate was 10.5% (95% CI 8.4%-14%) and mean LOS was 258 hr (95% CI 233–283). Those without a CrI had a mortality rate of 2.8% (95% CI 1.6%-6%) and mean LOS was 177 hr (95% CI 157–197).

**Conclusions:** We found UIT (or death prior to UIT) is a rare event and only 65% of UIT’s, or died prior to UIT, had a CrI. Although UIT is used as a screening tool for quality of care, this measure does not include patients who die prior to UIT or differentiate those who do not have a CrI performed from those patients who have a CrI. Further research should determine whether post-hoc analysis of UIT affects ED triage practices and the need to prospectively test and develop validated tools to reduce UIT.

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**TREND AND OUTCOMES OF VIDEO LARYNGOSCOPE USE ACROSS PICUS**

Jocelyn Grunwell, Pradip Kumar, Karen Watson, Ashwin Krishna, Eleanor Gradle, Vinay Nadkarni, Akira Nishikawa

**Learning Objectives:** Video (indirect) laryngoscope (VL) is often traditionally reserved as a tracheal intubation (TI) device for a difficult airway (DA). VL is widely used as a primary TI device in emergency departments and has been studied in several adult ICUs. The use and outcome data of VL has not been quantified in multiple pediatric ICUs (PICUs).

**Methods:** Data was extracted from a multicenter TI database (NEAR-4KIDS) for all TIs performed with either direct laryngoscope (DL) or VL in PICUs during 7/2010–6/2015. Utilization rate of VL as a primary device over the study period was associated with patient factors such as age and history of a DA. Outcomes evaluated included: adverse TI associated events (TIAEs), severe TIAEs, and ≥3 attempts with the use of VL versus DL. Patient-level covariates were accounted for using logistic regression to measure the association between TI outcomes and VL use. A p-value < 0.05 was considered significant. **Results:** 35 PICUs reported 8,813 TIs: DL: 7,813 (89%), VL: 882 (10%). Wide variability in VL use exists across PICUs (median 3%, range 0–55%). VL was more often used in children with history of a DA and older children (p<0.01). After adjusting for patient-level covariates (history of DA and age), use of VL significantly increased over time (OR: 7.1, 95% CI 4.4–11.3 for FY 2014, and OR: 11.2, 95% CI 7.0–17.8 for FY 2015, baseline-FY 2010). The use of VL was independently associated with lower occurrence of TIAEs (OR: 0.56, 95% CI 0.45–0.71, p<0.001), but not with severe TIAEs (OR: 0.78, 95% CI 0.57–1.1, p=0.11) or multiple attempts (OR: 0.92, 95% CI 0.74–1.1, p=0.43) after adjusting for covariates. **Conclusions:** In the NEAR4KIDS database, although the primary use of VL in PICUs increased over the studied time, there is substantial variation in its use across PICUs. Primary VL use was associated with lower occurrence of adverse TIAEs after adjusting for patient characteristics. Further studies are needed to evaluate the clinical impact of primary VL use across multiple PICUs.

**IMPACT OF AIRWAY PROXIMITY IN PROCEDURES ON SERIOUS ADVERSE EVENT (SAE) RATE IN PEDIATRIC SEDATION**

Nahdhal Mahmood, Mary Ann O’riordan, Anne Stormorken, Veerajalalndh Allareddy

**Learning Objectives:** Risk identification is a key component of avoiding AE during pediatric sedation. The association of procedure type with the incidence of SAE is unknown. We hypothesized that procedures with greater airway proximity are associated with increased occurrence of SAE. **Methods:** Retrospective analysis of 133,223 cases from Pediatric Sedation Research Consortium database from 11/2011–5/2015. Primary outcome was incidence of SAE, defined as laryngospasm, apnea, airway obstruction, aspiration, desaturation, emergent consult, emergent airway, seizure, increased level of care, aborted procedure, cardiac arrest, and death. Independent variables included age, procedure location, provider, indication, co-existing medical conditions and sedative agent. The use of propofol, ketamine, benzodiazepines and opioids were recorded. Patients were divided into two procedural groups. Group 1 (Gp1) included procedures with close proximity to the airway (EGD, TEE, dental, bronchoscopy). Group 2(Gp2) included all other procedures. Provider types of intensivist and anesthesiologist were compared with all others. Location was divided such that Gp1 included a sedation unit and Gp2 was all other locations. Multivariable logistic regression analysis was used. **Results:** SAE observed in 4.18% procedures (4.48% Gp1, 4.15% Gp 2, p=0.08). Regression analysis showed no difference in SAE based on procedure type (OR 0.965, CI 0.870–1.066). Patients with respiratory diagnosis as primary indication for the procedure (OR 2.052, CI 1.675–2.515) and those with coexisting respiratory problems (OR 2.161, CI 2.032–2.298) were more likely to experience SAE. Provider type of intensivist or anesthesiologist was associated with fewer SAE (OR 0.821, CI 0.774–0.871). There was no difference in SAE by location (OR 0.970, CI 0.913–1.030). Propofol (OR 3.719, CI 3.235–4.275), ketamine (OR 1.880, CI 1.667–2.120), or opioid (OR 1.100, CI 1.025–1.182) use was associated with SAE. **Conclusions:** Procedure type with greater airway proximity is not independently associated with increased risk of SAE in children receiving procedural sedation.

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**BURNOUT IS COMMON AMONG CRITICAL CARE PHYSICIAN ASSISTANTS**

Muneer Bhatti, Danny Liziano, Anthony Carless, Vladimir Kvetan, Hayley Gershengorn

**Learning Objectives:** Burnout rates among critical care nurses and doctors are both high, yet factors influencing burnout in the two differ. **Methods:** We conducted a survey of US critical care PAs (SCCM PAs and personal contacts). The survey was comprised of the Maslach Burnout Inventory (MBI) coupled with questions on demographics and work environment. On the MBI, higher total scores are associated with burnout; severe burnout is suggested by higher scores on the exhaustion (≥30) and depersonalization (≥12) subscales and lower scores for personal achievement (≤33). We used standard summary statistics to report survey results. To identify risk factors independently associated with burnout, we used a multivariable logistic regression including available demographic and work environment data. **Results:** We surveyed 431 people and, to date, received 132 responses (31%). Respondents are 54% female with the majority (52%) between 26–35 yr old; 40% work overnight and 10% moonlight outside their primary institution. Most practice in 4 ICU types: 24% mixed medical-surgical, 20% surgical, 18% medical, and 17% cardiac-hematologic. Median total MBI was -10 (interquartile range: -20.1). 54% gave responses consistent with severe burnout on at least one subscale-10% based on exhaustion (median MBI (IQR): 17 (11,24)), 45% based on depersonalization (10 (6,16)), and 26% based on personal achievement (38 (33,42)). Working in a hematologic ICU was independently associated with higher burnout scores (regression coefficient 95% confidence interval) compared with a reference mixed-medical-surgical ICU: 14.4 (0.3,28.6), p=0.046) while reporting being satisfied with one’s job was independently associated with lower burnout scores (-12.6 (-23.4,-1.8), p=0.023). **Conclusions:** A majority of critical care PAs exhibit evidence of severe burnout. Working in a hematologic ICU is associated with higher burnout scores; further study is needed to better understand this association.

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**CREATION OF AN ADVERSE EVENT PREDICTION MODEL FOR PEDIATRIC SEDATION**

Kevin Couloures, Claude Hill, Michael Anderson, Mark Buckmaster

**Learning Objectives:** Appropriate allocation of patients to receive sedation by non-anesthesiologists or anesthesia remains subjective and varies by institution. **Methods:** We conducted a survey of US critical care PAs (SCCM PAs and personal contacts). The survey was comprised of the Maslach Burnout Inventory (MBI) coupled with questions on demographics and work environment. **Results:** We surveyed 431 people and, to date, received 132 responses (31%). Respondents are 54% female with the majority (52%) between 26–35 yr old; 40% work overnight and 10% moonlight outside their primary institution. Most practice in 4 ICU types: 24% mixed medical-surgical, 20% surgical, 18% medical, and 17% cardiac-hematologic. Median total MBI was -10 (interquartile range: -20.1). 54% gave responses consistent with severe burnout on at least one subscale-10% based on exhaustion (median MBI (IQR): 17 (11,24)), 45% based on depersonalization (10 (6,16)), and 26% based on personal achievement (38 (33,42)). Working in a hematologic ICU was independently associated with higher burnout scores (regression coefficient 95% confidence interval) compared with a reference mixed-medical-surgical ICU: 14.4 (0.3,28.6), p=0.046) while reporting being satisfied with one’s job was independently associated with lower burnout scores (-12.6 (-23.4,-1.8), p=0.023). **Conclusions:** A majority of critical care PAs exhibit evidence of severe burnout. Working in a hematologic ICU is associated with higher burnout scores; further study is needed to better understand this association.
MRL: 2. Lumbar punctures and bone marrow biopsies had a null score. The sum of the patient's condition and procedure gives a total C-score. Total C-score values were then analyzed for their sensitivity and specificity in predicting any adverse event. A total score of 5 had a sensitivity of 82.69% and a specificity of 26.22%. As scores increased the sensitivity decreased but the specificity rose. A score of 8 has a sensitivity of 37.54% and specificity of 75.79%. And a score of 11 had a sensitivity of 12.70% but a specificity of 95.25%. Conclusions: TOTAL C-scores of 5 or greater were predictive of adverse events during sedation. The score can be used to objectively triage patients and allocate scarce resources with institution specific cut-off scores to determine the best route for sedation.

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CLINICAL AND SOCIOCULTURAL FACTORS CAUSING FAILURE-TO-RESCUE EVENTS
Firas Elmulidi, Nishant Sahni, Susan Burton, Craig Weinert

Learning Objectives: Hospitals frequently have in-house medical emergencies. Understanding why clinicians fail to rescue deteriorating patients can improve professional education curriculum, EMR alert systems and RRT programs. Methods: For 8 mo at two teaching hospitals, all Code Blue or ward emergencies with unplanned ICU admissions were recorded. Within 48hr, F.E. interviewed RNs and MDs at the event. EE. and 3 study MDs independently analyzed 225 pages of transcript to discover cognitive or organizational themes about deteriorating ward patients. Themes were modified in later group meetings and semi-quantitatively linked to the original transcript using the text analysis program NVivo. Results: There were 40 interviews on 30 events. Themes 1–4 were detected independently by all study MDs: 1) Institutional hierarchy delays autonomous escalation of care (transcript link in 19/40 interviews–48%). 2) Clinicians delay escalation anticipating simple interventions will suffice–45%. 3) Clinicians blame physiological abnormalities on less serious explanations–40%. 4) Clinicians tolerate abnormal physiology until a threshold or new abnormality, then the rescue system is activated–35%. Themes 5–7 were detected by 3 study MDs: 5) Ward culture encourages exhausting all interventions available on the floor before transfer to ICU–28%. 6) Lack of timely or accurate handoff makes clinicians unprepared–25%. 7) An opinion to not escalate is overly influential–5%. Themes 8–9 were detected by 2 MDs: 8) Judgment about appropriateness of aggressive intervention influences escalation behavior–13%. 9) Providers respond to deterioration by making ineffective (“heads-up”) call to the ICU–8%. Conclusions: Clinicians had optimism bias in themes 2, 3. A novel finding is that “moral distress” affects escalation behavior for poor prognosis patients (5, 8). Organizational issues (1, 6) create failure-to-rescue events. Most themes indicate reluctance to move to a higher level of care. This is relevant in hospitals where ICUs are increasingly isolated from ward practice; ward clinicians may wait until the last minute to transfer patients.

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A SIMPLIFIED PEDIATRIC EARLY WARNING SYSTEM THAT RELIES SOLELY ON OBJECTIVE MEASURES
James Lin, Jing Yang, Swan Bee Liu, Yingui Huang, Jeffrey Hoffman, Richard Brill, Tiensing Maa, Simon Lin

Learning Objectives: Delayed intervention of deteriorating pediatric ward patients increases morbidity and mortality. We sought to develop a completely objective, automated real-time risk stratification tool to accurately identify high-risk pediatric inpatients before a serious clinical event. Methods: Electronic health record (EHR) data from 2011 to 2015 of inpatients in a quaternary children’s hospital was retrospectively reviewed. Eligible patients were restricted to ward patients < 18 yr old who had an emergency assessment consult, transferred to the PICU, or experienced a cardiopulmonary arrest. Matched controls without deterioration were used. Dynamic variables for model predictors were chosen based on local expert opinion and current literature. A predictive model was constructed using multivariate logistic regression, and three machine-learning methods were used to perform prediction. Dynamic variables were initially identified as candidates to predict deterioration. Removal of the 2 variables requiring subjective assessment or manual measurement (capillary refill and level of consciousness) only decreased the area under the receiver operating characteristic curve (ROC) from 0.94 (+/- 0.018) to 0.93 (+/- 0.018). At a threshold of 0.45 (out of 1.00), the false positive rate is 15%, with a sensitivity of 97% (+/- 0.88%) and specificity of 85% (+/- 1.13%). Conclusions: Our data suggest that we developed an accurate, automated ward risk-stratification system that can identify deteriorating pediatric inpatients using objective variables collected from the EHR. Such a tool may help prevent cardiopulmonary arrests, critical deterioration, and unplanned transfers to the PICU. To our knowledge, an accurate early warning system independent of caregiver subjective measurements, has not been described. Prospective validation continues with a clinical implementation trial in our hospital–currently underway.

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UNDERSTANDING COMPLEXITY: USING RESILIENCE ENGINEERING TO OPTIMIZE SEPSIS QUALITY IMPROVEMENT
Kimia Raie, Jordana Goldman, Tassy Thomas, Corey Chartan, Pamela Marshall, Tonita Fontenot, Eric Williams

Learning Objectives: Although ACCM/PALS Guidelines for pediatric sepsis resuscitation direct care within the first hour, the complexity of health care delivery introduces variation within and beyond this timeframe. The Resilience Engineering tool of Functional Resonance Analysis (FRAM) can minimize hindsight bias by analyzing performance and considering all sources of variability in a complex socio-technical system. We hypothesized that serially applying FRAM to pediatric sepsis could understand complexity and identify areas for quality improvement. Methods: A team of clinical and non-clinical staff serially developed a FRAM of pediatric sepsis. The method illustrates the “ideal” system for treatment, consistent with ACCM/PALS guidelines, through modeling the required functions to deliver care. We quantified the # of functions per FRAM and iteratively quantified the # FRAM Aspects(Time, Control, Precondition, Resource) for each FRAM. The # of functions per FRAM and the # Aspects per FRAM are presented as Mean ± SEM, and were compared via One-Way ANOVA. *p<.05. Results: 171 functions and 108 Aspects were found in the serial FRAMs as applied to 6 cases. The # functions/FRAM increased serially (2.0 ± 0.7, 2.5 ± 1.0, 4.0 ± 1.2, 4.2 ± 0.5, 4.2 ± 0.5, 10.0 ± 2.4). Aspect #FRAM were Time (4.2 ± 1.0), Control (4.2 ± 1.3), Precondition (4.7 ± 0.7), and Resource (5.2 ± 2.5). Although there was a trend in Resources, variation was equally distributed across other Aspect domains. Repeated Functions and Aspects that manifested variability included: physician, nurse, and respiratory staff (Resource), and the declaration of sepsis to communicate awareness to the care team (Function). The identification of these variable Functions created the targets for subsequent quality improvement initiatives. Conclusions: Resilience Engineering principles can be used to understand performance variability in pediatric sepsis care delivery. Importantly, FRAM can direct QI efforts specific to institutional variables that impact the ability to meet ACCM/PALS Guidelines by targeting improvements to how work is actually done.
for all post-intervention, p<0.01). Significant improvement was noticed in discussion of Spontaneous Breathing Trials, Pain, Sedation Breaks and Need for Devices (45–57% pre- vs. 100% for all post-intervention, p<0.01). Rounding time (mean ± SD) increased by a minute (5.9 ± 2.9 min pre-intervention vs. 6.8 ± 3.3 min post-intervention, p=0.04). Staff reported improved perception of rounding aspects such as discussing pertinent information, clarity with daily goals and reduced potential for missing information (8.6, 8.3, 3.2 pre-intervention vs. 9.5, 9.3, 2.0 post-intervention respectively, p<0.01).

Conclusions: Utilization of the CERTAINp rounding tool led to perfect compliance with best practice guidelines, had minimal impact on rounding time and improved PICU staff satisfaction. Its impact on clinical outcomes is currently being evaluated by a multinational trial (NCT0239898).

EVALUATION OF A PEDIATRIC EARLY WARNING SCORE ACROSS DIFFERENT SUBSPECIALTY PATIENTS
Nathan Dean, Michael Spaedter, JB Fenix, Amanda Levin

Learning Objectives: Early identification of deteriorating patients is critical to promoting patient safety. Early warning scores can improve identification but validity is unclear in pediatric subspecialty patients. Our objective is to determine whether or not different pediatric subspecialty patients with elevated pediatric early warning scores (PEWS) are more likely to require transfer to the ICU and to receive specific intensive care unit therapies. Methods: This is a cohort study conducted over a 6 month time period from September 2012 to March 2013 involving all hospitalized acute care patients. Daily maximum PEWS were recorded. The relationship between the PEWS and either (1) transfer to the pediatric or intensive care unit (ICU) or (2) transfer and requiring specific ICU therapies (intubation, initiation of high flow nasal cannula, initiation of non-invasive ventilation, initiation of inotropes or aggressive fluid hydration within 12hr of transfer) by subspecialty-cardiology (card), hematology/oncology (ho), surgical (surg), neurology/neurosurgery (neuro), and general medical (gen med) were evaluated. Sensitivity and specificity and receiver operating characteristic curves were calculated for each subspecialty group. Logistic regression was used to quantify the relationship between scores and risk of deterioration via odds ratios and 95% confidence intervals.

Results: The PEWS performs well for identifying patients who require ICU transfer (area under the curve (AUC) gen med= 0.85, ho=0.84, neuro=0.71, cards=0.77, surg=0.88), and excellently for identifying patients who require transfer plus receipt of specific interventions (AUC gen med= 0.96, ho=0.95, neuro = 0.93, cards= 0.93, surg=0.92). Conclusions: PEWS was shown to be fair to good at discriminating between patients who did and did not require ICU transfer and excellent at discriminating between patients who did and did not require ICU specific therapies. PEWS appears to have similar utility for subspecialty patients and general medical patients.

CHLORHEXIDINE TREATMENTS AS AN ADJUNCT TO A COMPREHENSIVE PROGRAM FOR REDUCTION OF CLABSI IN A PICU
Rainer Gedekt, Jeanne Braby, Wendi Redfern, Mary Rotar

Learning Objectives: Studies on chlorhexidine bathing or treatments (CHG-TX) on prevention of hospital acquired infection have shown mixed effectiveness. In 2010. This study was IRB exempt. All children between 1 to 18 yr who underwent major surgical procedures (MSP) in the USA. Learning Objectives: Clostridium difficile is the most frequent infectious cause of healthcare-associated diarrhea. The incidence of C difficile infection (CDI) in hospitalized pediatric surgical population is unclear at a national level. We sought to examine the incidence and patient related factors associated with occurrence of CDI in children who underwent major surgical procedures (MSP) in the USA. Methods: We used the Nationwide Inpatient Sample for the years 2009 and 2010. This study was IRB exempt. All children between 1 to 18 yr who underwent a MSP were selected for analysis. Amongst this cohort, the occurrence of CDI during hospitalization was examined. A mix of patient and hospital level factors (independent variables) associated with occurrence of CDI(outcome variable) was examined by a multivariable regression model. Results: The baseline period included 12,512 patient-days (PD) and reporting period included 67,158 PD. PD with 6+ pain assessments immediately increased by 53% after institution of unit-level reporting (p<0.01). Documented pain control also increased 75% in the reporting period (p<0.01). Pain metrics subsequently remained steady. PD with 6+ agitation assessments initially increased by 10% (p<0.02), but continually improved by 0.9% per week (p<0.03). PD without deep sedation or agitation immediately improved by 61% (p<0.01), and was maintained. PD with at least 2 delirium assessments did not initially improve in level or trend after report implementation. Delirium control did not immediately change, but did increase by 0.6% per week (p<0.01). The lack of immediate improvement in assessment prompted a refinement in delirium documentation at week 67. Subsequently, both delirium assessment and control improved (21% and 8% respectively; p<0.01) and remained constant. Conclusions: Implementation of a novel audit and feedback report was associated with a significant improvement in the assessment and control of PAD across study units. While each PAD element improved significantly after instituting the reporting process, the magnitude and profile of improvement varied between elements.

769 INCIDENCE AND PREDICTORS OF C. DIFFICILE IN CHILDREN UNDERGOING MAJOR SURGICAL PROCEDURES IN THE USA
Natalia Martinez-Schlurmann, Sankeerth Rampa, Nalliah Ramesh, Verasathpurush Allareddy, Alexandre Rotta, Veerajalalndhar Allareddy

Learning Objectives: Chlorobium difficile is the most frequent infectious cause of healthcare-associated diarrhea. The incidence of C difficile infection (CDI) in hospitalized pediatric surgical population is unclear at a national level. We sought to examine the incidence and patient related factors associated with occurrence of CDI in children who underwent major surgical procedures (MSP) in the USA. Methods: We used the Nationwide Inpatient Sample for the years 2009 and 2010. This study was IRB exempt. All children between 1 to 18 yr who underwent a MSP were selected for analysis. Amongst this cohort, the occurrence of CDI during hospitalization was examined. A mix of patient and hospital level factors (independent variables) associated with occurrence of CDI(outcome variable) was examined by a multivariable regression model. Results: The baseline period included 12,512 patient-days (PD) and reporting period included 67,158 PD. PD with 6+ pain assessments immediately increased by 53% after institution of unit-level reporting (p<0.01). Documented pain control also increased 75% in the reporting period (p<0.01). Pain metrics subsequently remained steady. PD with 6+ agitation assessments initially increased by 10% (p<0.02), but continually improved by 0.9% per week (p<0.03). PD without deep sedation or agitation immediately improved by 61% (p<0.01), and was maintained. PD with at least 2 delirium assessments did not initially improve in level or trend after report implementation. Delirium control did not immediately change, but did increase by 0.6% per week (p<0.01). The lack of immediate improvement in assessment prompted a refinement in delirium documentation at week 67. Subsequently, both delirium assessment and control improved (21% and 8% respectively; p<0.01) and remained constant. Conclusions: Implementation of a novel audit and feedback report was associated with a significant improvement in the assessment and control of PAD across study units. While each PAD element improved significantly after instituting the reporting process, the magnitude and profile of improvement varied between elements.

EFFECT OF AN AUDIT AND FEEDBACK PROCESS ON PAIN, AGITATION, AND DELIRIUM DOCUMENTATION IN 15 ICUS
David Murphy, Elizabeth Overton, Stacey Polse, Carolyn Holder, Jim McMurry, Mary Zellinger, Jonathan Sevransky

Learning Objectives: Informed by revised national guidelines, Emory Healthcare implemented a multifaceted intervention, including a novel audit and feedback reporting process, to improve pain, agitation, and delirium (PAD) assessment and control across all ICUs. This study evaluates the effect of the reporting process on PAD assessment and control. Methods: The semi-automated reporting process included EMR data extraction, analysis, report generation, and dissemination. Performance metrics reflected unit-level adherence to assessment and control for each of the PAD elements. An interrupted time series analysis was used to evaluate changes in PAD assessment and control across 15 target units over 93 weeks (May 2013-January 2015). We compared the baseline education period (weeks 1–13) with the subsequent reporting period (weeks 26–95). Results: The baseline period included 12,512 patient-days (PD) and reporting period included 67,158 PD. PD with 6+ pain assessments immediately increased by 53% after institution of unit-level reporting (p<0.01). Documented pain control also increased 75% in the reporting period (p<0.01). Pain metrics subsequently remained steady. PD with 6+ agitation assessments initially increased by 10% (p<0.02), but continually improved by 0.9% per week (p<0.03). PD without deep sedation or agitation immediately improved by 61% (p<0.01), and was maintained. PD with at least 2 delirium assessments did not initially improve in level or trend after report implementation. Delirium control did not immediately change, but did increase by 0.6% per week (p<0.01). The lack of immediate improvement in assessment prompted a refinement in delirium documentation at week 67. Subsequently, both delirium assessment and control improved (21% and 8% respectively; p<0.01) and remained constant. Conclusions: Implementation of a novel audit and feedback report was associated with a significant improvement in the assessment and control of PAD across study units. While each PAD element improved significantly after instituting the reporting process, the magnitude and profile of improvement varied between elements.
Patients in the pre and post periods (2204 and 2357, respectively) had similar analysis was performed to evaluate the impact on blood culture rates. Results: Interrupted time series testing with an emphasis on obtaining peripheral venipuncture specimens instead of standard evaluation of patients with fever and guided blood culture collection and healthcare costs. Our academic tertiary care PICU implemented a new clinical practice guideline with an emphasis on obtaining peripheral venipuncture specimens instead of central venous catheters (CVC). Results: Hospitalizations occurring on an elective basis were associated with lower odds for CDI compared to E/U admissions (OR= 0.73; 0.56–0.90, p<0.02). Race and insurance status were not associated with occurrence of CDI. TH were associated with higher odds for CDI compared to non-teaching hospitals (OR= 2.35, 1.63–3.39, p<0.01). No geographic variation in CDI was observed across USA. Conclusions: One in 285 hospitalized children who had a MSP developed CDI. Patients in teaching hospitals, those who had emergent/urgent hospitalizations or those with higher comorbid burden were at a higher risk of CDI compared to their counterparts.

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REstrictive transfusion protocols in critical care: do they affect transfusion practice? Kevin Seitz, Jonathan Sevransky, Greg Martin, John Roback, David Murphy

Learning Objectives: Research supports the efficacy and safety of Restrictive Transfusion Protocols (RTP) to reduce avoidable red blood cell transfusions, but evidence that they change practice in routine care is limited. We assessed whether RTPs are associated with the likelihood of transfusion for adult ICU patients.

Methods: Observational study utilizing data from the multicenter, prospective cohort Critical Illness Outcomes Study in the US. Patient-level analyses were conducted with RBC transfusion on the day of enrollment as the outcome. Admission to an ICU with an RTP was the exposure of interest. Nadir Hematocrit (Hct) was modeled continuously with spline knots at 21% and 30% to account for differential effects of RTPs at different degrees of anemia. Other covariates included demographic, hospital course (e.g. blood loss), severity of illness (e.g. SOFA score), and interventions (e.g. vasopressors), as well as ICU factors (e.g. type, size). A mixed-effects logistic regression model with hospital-level clustering was developed to evaluate the independent effect of RTPs on transfusions at different Hcts.

Results: We included 6,027 patients in 59 ICUs, of whom 2,510 (41.6%) were exposed to an RTP. The prevalence of blood loss and degree of anemia were similar between the groups. In crude analyses, patients in ICUs with an RTP were transfused more often (14.8% vs 10.9%, p<0.0001) with less severe anemia (Hct 24.3% vs 23.4%, p=0.003). However, on adjusted analysis, RTPs were associated with a reduction in the odds of transfusion for patients with a Hct ≥ 21–30% (Odds Ratio=0.59, 95% CI: 0.36–0.96) and no effect in more or less anemic cases (p=0.9 and p=0.5, respectively). Conclusions: In this sample of critically ill patients, transfusions often occurred above evidence-based thresholds, and ICUs with RTPs provided more transfusions. Yet RTPs were associated with an independent reduction in the likelihood of transfusion for a patient when controlling for other patient and ICU factors. Transfusion protocols may have a significant role in ensuring that appropriate care is consistently delivered in the ICU.
INCIDENCE, PREDICTORS, AND IMPACT OF C. DIFFICILE AND MRSA INFECTIONS IN PATIENTS UNDERGOING ECAOHS
Veerajandhar Allaredy, Natalia Martinez-Schlurmann, Sankeerth Rampa, Nalliah Romesh, Veerasanthpurush Allaredy, Alexandre Rotta

Learning Objectives: Health care associated infections are important quality metrics. We sought to identify patient and hospital level factors associated with occurrence of C. difficile infections(CDI) and MRSA infections in a cohort of adults who underwent extracorporeal circulation auxiliary to open heart surgeries (ECAOHS). We examined the impact of occurrence of CDI and MRSA on in-hospital mortality(ICHM). Methods: Nationwide Inpatient Sample for the yr 2009 and 2010 was used. All adult patients aged >18 yr who underwent an ECAOHS were selected. Amongst this cohort, the occurrence of CDI and MRSA was examined. The association between a mix of patient/hospital level factors and occurrence of CDI and MRSA was examined by multivariable regression models. Results: A total of 552,425 had an ECAOHS. Mean age was 65y; 67.3% were males. 18,411(3.3%) died in hospitals. CDI occurred in 0.8% while MRSA occurred in 0.6% of patients. Females were associated with higher odds for having CDI (OR=1.33, 95%CI=1.14–1.54, p<0.01). Hispanics were associated with higher odds for developing CDI compared to Whites (1.30, 1.01–1.66, p<0.04). Increasing age was associated with lower odds for MRSA (0.97, 0.96–0.98, p<0.01). Increase in co-morbid burden was associated with higher odds for CDI (1.31, 1.25–1.36, p<0.01) and MRSA (1.35, 1.28–1.43, p<0.01). Elective admissions were associated with lower odds for CDI (0.54, 0.46–0.63, p<0.01) and MRSA (0.42, 0.34–0.52, p<0.01) compared to emergency/urgent admissions. Teaching hospitals(TH) were associated with higher odds for CDI compared to non-TH (1.82, 1.47–2.24, p<0.01). Following adjustment for confounders, those who developed CDI (2.67, 2.32–3.56, p<0.01) or MRSA (2.50, 1.88–3.35, p<0.01) were associated with significantly higher odds for ICHM compared to their counterparts. Conclusions: CDI and MRSA infections are not uncommon in assessed cardiac surgical population and are associated with significantly higher mortality. Robust preventive measures are needed to optimize outcomes.

RETROSPECTIVE EVALUATION OF THE PEDIATRIC ROTHMAN INDEX AS A PREDICTOR OF CARDIAC ARREST IN A CARDIAC ICU
Christopher Horvat, Joan Sanchez De Toledo, Sarah Wilson, Fereshteh Palmer, George Almasi, Stacey Finn, Michael Rothman, Ricardo Munoz

Learning Objectives: The ICU is an increasingly complex environment, with large volumes of data regularly generated through a wide array of patient monitoring strategies. Novel approaches are needed to aid bedside clinicians and nurses in data synthesis. We examined the predictive capabilities of a commercially-available, electronic medical record (EMR)-integrated acuity score for identifying eventual cardiac arrest in a pediatric cardiac intensive care unit (CICU) population. Methods: Retrospective analysis was performed for patients admitted to the CICU from 08/2011 to 07/2014 at our tertiary Children's Hospital. Clinical and demographic data for patients suffering cardiac arrest during the study period were reviewed. Patients were classified as single-ventricle (SV) or non-SV physiology. For patients who suffered a cardiac arrest, pediatric Rothman Index (pRI) data were extracted for a 24 hour time period preceding the arrest. A control dataset consisted of pRI data collected >24 hr prior to cardiac arrest or collected from patients who did not experience a cardiac arrest. ROC curves were constructed using the pRI, SV, previous cardiac arrest (pCA) during the CICU stay and a 30% fall in pRI as additive dependent variables. Results: The study period included 920 admissions with 1326 CICU stays. Thirty-one cardiac arrests were identified (9 in single ventricle patients). The mean age of cardiac arrest patients was 1 year 10 mo and 58% were males. Calculated area under the curve (AUC) for prediction of cardiac arrest was 0.67 for pRI alone, 0.68 for pRI + SV, 0.69 for pRI + SV + pCA, 0.70 for pRI + SV + CA + 30% fall in pRI, and 0.71 for pRI + SV + pCA + 30% fall in pRI + pRI <25 in the previous 24 hr. Conclusions: The pRI is a fair predictor of cardiac arrest in a pediatric CICU population, with added variables improving the discriminatory power. Additional refinement, including adjusting the pRI for physiologic saturations in SV patients, may improve the discriminatory power.

IMPLEMENTATION OF AN EXTUBATION RISKSCREENING AND PLANNING PROTOCOL TO IMPROVE AIRWAY SAFETY
Ian Oppenheim, Joshua Atkins, Mark Mikkelsen, Katherine Choi, Damien Leri, Yevgenyi Gitelman, Barry Fuchs

Learning Objectives: Airway emergencies (AE) post-extubation are sentinel events associated with high morbidity and mortality. To mitigate the risk of unexpected AE, we designed a process with the goal to screen all newly intubated MICU patients for their risk of AE post-extubation, develop extubation plans (EP) for all high-risk patients, and alert providers of high-risk patients and incomplete screens to ensure compliance. Methods: We conducted a retrospective observational study following the implementation of our extubation risk screening and planning protocol. We designed an extubation risk screen (ERS) within our electronic health record, to be performed post-intubation, with high risk criteria chosen based on Difficult Airway Society guidelines and local expert opinion. Once identified, high-risk patients were reviewed by an anesthesiologist to create an EP. Three mo post-implementation, we identified low compliance with the ERS. Using Plan-Do-Study-Act (PDSA) cycles we developed software to alert providers to screen post-intubation, educational tip cards, didactics on airway safety, and visual reminders (an airway safety mascot). In later cycles we deployed a real-time, audit and feedback system with concurrent alerts sent to the MICU medical director, who would communicate with providers when the ERS was not completed. Comparisons were made using the chi^2 test. Results: During the first 3 mo of the initiative, 58 of 120 patients intubated in the MICU underwent ERS (48%), of which 13 were high risk. In the 3 mo after the interventions, significantly more patients were screened (116 of 124 patients, 94% vs. 48%, p<0.001), identifying 25 high-risk patients. Extubation plans were created for 7 of 13 high risk patients (54%) pre-intervention, and 16 of 25 high risk patients (64%) post-intervention (p=0.54). Conclusions: Implementing an initiative to improve extubation safety required innovative approaches based on the principles of PDSA and audit-and-feedback that led to significant increases in compliance with screening. Further efforts are being directed to increase EP completion.
preventable and non-preventable readmissions. We then calculated the incidence of preventable readmissions, summarized the causes of readmissions, and compared clinical characteristics between preventable and non-preventable readmissions. Results: Of 136 patients in the final analysis, 16 (11.8%, 95% CI: 6.9% - 18.4%) were considered preventable and 120 (88.2%, 95% CI: 81.5% - 93.1%) were considered non-preventable. Of non-preventable readmissions, 67 were due to a new clinical problem and 53 were due to an existing clinical problem. Among preventable readmissions, 6 were attributable to system errors, 6 were attributable to management errors, 2 were attributable to procedural errors, 1 was attributable to a diagnostic error, and 1 was attributable to medication error. Compared to non-preventable readmissions, potentially avoidable readmissions tended to have shorter ICU lengths of stay (2 days vs. 3 days, p = 0.05) and a shorter duration of time on the ward prior to readmission (16.6 hr vs. 23.6 hr, p = 0.05). Conclusions: A large majority of early ICU readmissions are non-preventable, calling into question the value of the efforts to reduce ICU readmissions and raising important concerns about ICU readmission rates as a hospital performance measure.

ICU CAPACITY STRAIN AS A RISK FACTOR FOR INCREASED BEDSIDE EMERGENCY EVENTS IN A PICU
Charlotte Woods-Hill, Jordan Duval-Arnould, Erik Su, Elizabeth Hunt, James Fackler
Learning Objectives: Healthcare safety research has historically targeted improving outcomes of discrete, patient-centered tasks. However, dynamic systemic factors that affect provision of care for critically ill patients – factors related to ICU capacity strain—are not often described in pediatric critical care literature. This project aimed to characterize the influence of one aspect of pediatric ICU (PICU) capacity strain on outcome, by examining relationships between PICU census, weekday, time of day and provider shift change with the incidence of bedside emergency alarm events. Methods: Retrospective review of 2.5 yr of census and bed utilization data between hospitals at 5 sites. Data were analyzed for the full census period (2012-2015). Fisher’s Exact test, chi-square test, and linear regression models were used to examine associations between time-stamped bedside emergency alarm events and PICU census, weekday, and time of day. Results: The total number of non-arrest emergency events was significantly increased during 3-4 PM, compared to other hr (p<0.005). Total number of arrest events also showed a tendency toward significant increase at 3-4 PM (p=0.058). Regression analysis revealed an association between increasing census and bed utilization, similar to findings in adult critical care. When examining the highest and lowest rate of CPR events, a cardiac arrest was 9.4 times more likely to occur at 1AM than at 11AM (0.39 vs 0.04 cardiac arrests per 1,000 patient hr, p<0.003). Neither the 3-4 PM nor 1 AM time periods correlated with peak average daily census or provider shift change. Conclusions: This study demonstrates a significant increase in bedside emergency alarm events at specific hour in the PICU. Intriguingly, these times do not coincide with provider shift change, weekends, or peak average daily census, although 3-4 PM does overlap with periods when unit throughput tends to increase, and 1AM occurs during night shift. These findings suggest that specific time periods coincide with periods of increased staffing, and consequent PICU capacity strain may make a unit more vulnerable to adverse events, such as bedside emergencies.

TEMPORAL VALIDATION OF PRISM III SCORE AS A PREDICTION MODEL OF MORTALITY IN CRITICALLY ILL CHILDREN
Bereketeab Haileselassie, Erik Su, Melanie Bembea, Theodore Abraham, Aaron Milstone
Learning Objectives: Pediatric critical care medicine is a dynamic specialty with variable age range, physiologic norms and pathologies. Thus, the predictive potential of standardized assessments of outcome, such as the Pediatric Risk of Mortality (PRISM III) score, can evolve. Additionally, evolution of clinical practice could unveil new variables that could augment the performance of PRISM III. Methods: This is a multicenter retrospective review of critically ill pediatric admissions from 5 referral children’s hospitals in the US between February 2008 and September 2010. PRISM III was assessed as a predictor of mortality, using logistic regression. Covariates including demographic data, colonization status, presence of a central venous line (CVL), presence of a complex chronic condition (CCC), as well as cardiac ICU status were tested in multivariable models using AIC and backwards stepwise methods for model selection, and compared to PRISM III alone as predictors of mortality. Results: In this cohort of 4169 patients the PRISM III score had good discrimination in predicting mortality (ROC 0.78, 95% CI 0.74 - 0.82). The Hosmer-Lemeshow chi-square goodness-of-fit demonstrated absence of significant calibration errors (p = 0.22). When compared to previously published PRISM III data (Pallack et al, 1996), there is a significant decrease in PRISM III performance (ROC 0.94 ± 0.021 vs. 0.78 ± 0.021). In a multivariable model, PRISM III (p<0.01), CVL status (p<0.01), ICU type (p=0.01) and sex (p=0.02) showed significant association with ICU mortality. A prediction model including covariates available within 24h of admission (PRISM III, CCC, ICU type and race), showed no improved performance over PRISM III alone (0.80 ± 0.02 vs. 0.78 ± 0.02, p = 0.07). PRISM III along with sex, CVL status, and ICU type (cardiac vs non cardiac), showed significant improvement over PRISM III alone in predicting mortality (0.83 ± 0.02 vs. 0.78 ± 0.02, p = 0.0001). Conclusions: These data suggest a temporal decrease in PRISM III performance. Additional parameters may augment the performance of PRISM III in predicting mortality.

TELEMEDICINE EFFECT ON HOSPITAL DISPOSITION IN ILL PEDIATRIC TRANSPORT PATIENTS
Kimberly Fugok, Nicholas Slamoa
Learning Objectives: Pediatric transport teams rely on communication to report patient data to medical command officers (MCOs) responsible for the medical care. MCOs use this to create care plans and determine the patient’s disposition. Common destinations are the emergency department (ED), PICU or regular in-patient care area (RIPCA). Telephone report alone does not always result in a clear understanding of the patient’s condition thus requiring additional evaluation in the ED. This can overburden the ED resulting in unnecessary testing and subsequent charges to the patient. Using telemedicine allows the patient to be directly seen, parents to be interviewed, and objective data to be reviewed. We hypothesized using telemedicine would improve our understanding of the patients’ needs and provide more accurate pre-arrival disposition. Methods: This is a retrospective chart analysis comparing the arrival disposition of patients transported to our hospital prior to the telemedicine program between 2012-2014 to those transported after its implementation in April 2014. Results: From 2012-14, 8327 transports were preformed. 4679 patients were sent to ED (57%), 2108 were sent to RIPCA (25%) and 906 were sent to PICU (11%). Over the last year, 212 patients were analyzed using telemedicine showing that ED utilization decreased to 27% (p<0.0001), PICU utilization increased to 34% (p<0.0001) while RIPCA rates remained the same at 28% (p=0.203). Of ED dispositions 59% were admitted to RIPCA for further care, 10% to PICU for escalation of care, and 24% discharged home. Of RIPCA dispositions 10% had rapid responses; 0% had code blues. 89% of patients sent to the RIPCA required intensive care support while 10% were managed without escalation of therapies. Conclusions: Use of Telemedicine in transported pediatric patients can positively alter disposition patterns upon arrival. It allows patients with critical care needs to be directly admitted to the PICU and assures patients admitted to RIPCA have been prescreened for stability while decreasing ED resource deployment.

THE EFFECT OF TELE-ICU INNOVATION ON PROGRESSIVE CARE UNIT (PCU) PATIENT POPULATION
Donna Armaignae, Carlos Valle, Louis Gidel, Xiaorong Mei, Irfan Zaidi, Leslie Gross, Lisamarie Williams, Emir Veldeiran
Learning Objectives: Although, Télé-ICU is integrated into 11% of US critical care delivery, Télé-innovation’s advanced monitoring, clinical decision-support functions and cognitive affordances have not been examined in PCU. We compared significant well established outcomes and quality measures between PCU standard of care and PCU Télé-intervention, namely; hospital length of stay (LOS), mortality, APACHE IV severity adjusted mortality and MDRG severity adjusted mortality. Methods: Data about n = 13, 421 patients from 6 hospitals (Observational Case Control design) from Jan 2012 – Mar 2015 were analyzed. PCU standard of care control n=7047, PCU Télé-intervention n=6374. PCU inclusion
time was defined as PCU Index = first contiguous PCU census encounter > 24 hr (time thresholds derived from greater than median LOS). Intervention group inclusion defined as > 24 hr Tele-intervention during PCU Index time. Results: The two groups were fairly balanced. Comparing outcomes in PCU Tele-intervention vs. PCU standard of care, respectively, the intervention group is older (70 +/-16 vs. 65 +/-18, p<0.0001); of the patients who had MSDGR expected mortalities (6359, 7018), expected mortality (6.59% vs. 5.62%, p=0.0025); however, actual mortality direction was reversed and lower (4.65% vs. 5.10%, p=0.2444). PCU Index LOS was shorter (67 hr vs. 95 hr, p=0.0001); and as expected hospital LOS (9.7 vs. 9.1, p<0.0008). Of the patients who had an APACHE IV prediction (5852; 1319), predicted mortality (10.43% vs. 17.36%, p<0.0000); however, actual mortality is lower (4.41% vs.10.42% vs. p<0.0000). Conclusions: In our population, Tele-ICU approach resulted in significantly decreased mortality and much shorter PCU Index LOS. These findings provide evidence of the effectiveness of Tele-innovation and validate the impact on quality and cost in the progressive care setting, providing a rationale for extension of access to Tele-PCU care services across broader hospital populations. Further investigation is needed to examine influence of Tele-PCU care service on severity adjusted predictions across varying practice settings.

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HYPONATREMIA AND IVF TONICITY ARE ASSOCIATED WITH UNFAVORABLE OUTCOMES IN CRITICAL BRONCHIOLITIS

Natalia Martinez-Schlurmann, Katherine Slain, Steven Shein

Learning Objectives: In select pediatric cohorts, hypotonic maintenance intravenous fluids (mIVF) and hyponatremia (Hypona) are associated with unfavorable outcomes such as mechanical ventilation (MV). Similar associations with Hypona and mIVF tonicity during Pediatric Intensive Care Unit (PICU) care of bronchiolitis are not well established. Methods: With IRB approval, charts of PICU patients <2yo with bronchiolitis from 09/13-04/14 were reviewed for demographics, PICU length of stay (pLOS) and hospital LOS (hLOS). For each 8-hour “shift”, patients were categorized as mIVF-none, quarter normal saline (QNS) (any IVF with <70mEq/L of Na), half normal saline (HNS) (IVF of 70–100 mEq/L of Na) and normal saline (NS) (all IVF had >100mEq/L of Na). Any serum Na <136 defined Hypona. Variables associated with outcomes (pLOS, hLOS, use of MV, duration of MV [dur-MV] and supplemental O2 [dur-O2]) in univariate analyses (chi squared, Wilcoxon rank-sum, Kruskal-Wallis ANOVA and simple linear regression) were included in multiple linear regressions. Data shows as median (IQR). All results reported had p<0.05. Results: Among 141 subjects (age 6 [2–11] mo, 49% black, 65% male), 12% underwent MV, pLOS was 2.3 (1.2–4.4) days and hLOS was 5 (3–9) days. Before the end of shift #3, 13% had hypona and 60% had nonnormonatremia (normoNa). MV use varied by Na: 28% in hypoNa, 13% in normoNa and 3% in normoNa. In multivariate analysis, hypona was independently associated with increased dur-MV, pLOS and dur-O2 vs. Na-none. Excluding Na-none, hypona was independently associated with increased dur-MV, pLOS and dur-O2 vs. NormoNa. During the first 3 shifts, 9% received QNS, another 59% received HNS and 46% only received NS. MV use varied by mIVF: 42% in QNS, 15% in HNS, 6% in NS and 0% in mIVF-none. QNS was independently associated with increased dur-MV and dur-O2; HNS and NS were not (all vs. no mIVF). Excluding no mIVF QNS and HNS were independently associated with increased dur-MV and pLOS vs. NS. Conclusions: Hypotonic IVF and Hypona are both independently associated with unfavorable outcomes in PICU patients with bronchiolitis.

INTERPROFESSIONAL COLLABORATION ON DELIRIUM MANAGEMENT IN A PICU

Shari Simone, Patricia Wolz, Allison Lardieri, Sarah Edwards, L. Kyle Walker

Learning Objectives: Delirium is a neuropsychiatric syndrome associated with cognitive impairment and psychiatric symptoms, and if left untreated can result in significant morbidity and mortality. Despite increasing evidence that delirium presents in children, it often goes undetected, in large part, because staff is not knowledgeable of the signs, symptoms, or screening tools. To address this important clinical issue, we examined the impact of an interprofessional collaboration (IPC) to improve detection of pediatric delirium. We hypothesized that implementation of an IPC clinical practice protocol would enhance systematic screening, detection and improve delirium treatment. Methods: Pediatric, pharmacy, nursing, and psychiatry professionals developed a clinical protocol for assessment, prevention, diagnosis and treatment of delirium in December 2013. The Cornell Assessment of Pediatric Delirium (CAP-D) tool was used to screen for delirium. If CAP-D scores were elevated and symptoms consistent with delirium, the protocol called for identification of potential causes of delirium. If delirium persisted despite initial treatment to address potential causes, non-pharmacological treatments were initiated followed by pharmacological treatment. Delirium cases were discussed and staff learning enhanced at monthly case conferences. Results: In 2012, the PICU did not screen for delirium and 4 cases were identified in a retrospective review. One year after protocol implementation, 100% of patients were screened and scores consistently reported in multidisciplinary rounds. Of the 1298 patients screened, 184 (14%) developed delirium. Of those who were intubated (N=128), 87 patients had delirium for >48 hr. This group consisted of more males (p=0.03), more with a psychiatric history (p=0.05), and longer LOS (19 vs. 7 days, p<0.001) compared to intubated patients with <48 hr of delirium. Fifteen patients required pharmacological treatment. Conclusions: An IPC approach to pediatric delirium that combines a clinical practice protocol and multimodal education is effective in increasing delirium screening, detection, and treatment.

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DURATION OF MECHANICAL VENTILATION IS ASSOCIATED WITH HIGHER RISK OF C. DIFFICILE AND MRSA INFECTIONS

Natalia Martinez-Schlurmann, Sankeerth Rampa, Veerasathipurush Allareddy, Alexandre Rotta, Veerajaldanbhar Allareddy

Learning Objectives: Acute Respiratory failure (ARF) needing invasive mechanical ventilation (IMV) is a common occurrence in PICUs. Hospital acquired infections (HAI) such as C. difficile and MRSA are a major cause of morbidity and mortality, and are important quality metrics. It is unclear whether duration of IMV is an independent predictor of occurrence of such HAIs. We sought to examine the impact of prolonged (>96 hr) IMV on occurrence of MRSA and C. difficile infection (CDI) in children hospitalized with acute respiratory failure (ARF). We hypothesized that prolonged IMV would be associated with higher risk of occurrence of CDI and MRSA. Methods: The Nationwide Inpatient Sample for the
yr 2006 to 2010 was used. All hospitalized children (<18 yr) with ARF requiring IMV were selected. The independent variable of interest was duration of IMV. The outcomes were occurrence of CDI and MRSA. The association between outcomes and duration of IMV was examined by multivariable logistic regression models. The confounding effects of age, sex, race, insurance status, co-morbid burden, hospital region, and hospital teaching status were adjusted in the analysis. Results: During the study period a total of 124,810 hospitalized children had ARF and underwent IMV. The age groups included up to 1 yr (43.8%), 2 to 10 yr (27.8%), and 11 to 18 yr (28.4%). Males comprised 57.5% of hospitalizations. The overall incidence rate of CDI and MRSA infections was 1.9% and 1.4% respectively. 47.2% of all hospitalizations had IMV of >96 hr. Following adjustment for patient and hospital level confounding factors, those who had IMV for >96 hr were associated with higher odds for CDI (OR=2.89, 95% CI=2.38–3.52, p<0.001) and MRSA infections (OR=3.51, 2.59–4.76, p<0.001) when compared to those who had IMV for <96 hr. Conclusion: In hospitalized children with acute respiratory failure needing IMV, the duration of mechanical ventilation (>96 hr) is an independent predictor of occurrence of CDI and MRSA. Strategies to decrease duration of IMV may be needed to optimize the risk of occurrence of assessed HAIs.

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IMPACT OF ADVERSE TRACHEAL INTUBATION ASSOCIATED EVENTS ON PICU OUTCOMES
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Learning Objectives: Adverse tracheal intubation associated events (TIAEs) and severe TIAEs are common in pediatric ICU (PICU) tracheal intubations (TIs). They are used as quality improvement (QI) indicators. However, the ICU clinical impact of the occurrence of TIAEs and severe TIAEs has not been reported. Methods: Data were extracted from a multicenter TI database (NEAR4KIDS) for all TIs in PICUs from 4/12013 to 3/2015. We evaluated the association between ICU mortality, duration of ICU stay, and duration of mechanical ventilation (MV) with TIAEs. Inclusion criteria were primary TIs with reported ICU outcomes. We adjusted for known patient-level covariates associated with TIAEs (age, cardiac disease, respiratory failure, procedural indication, shock, upper airway obstruction). For univariate analysis, Chi2 and Wilcoxon rank-sum. For multivariate analysis, logistic and linear regressions with natural log transformation for normality. Results: 31 PICUs reported 4,577 TIs. ICU survival status, duration of ICU stay, and duration of MV were reported in 78%, 76%, and 70% of TIs, respectively. In a univariate analysis, occurrence of any TIAEs was associated with duration of ICU stay (median: 14d in TIs with TIAE vs. 12d in TIs without TIAE, p=0.02) and MV (Median: 5d vs. 4d, p=0.0001), but not with mortality (11% vs. 10%, p=0.55). Occurrence of severe TIAE was associated with ICU mortality (19% in TIs with severe TIAE vs. 10% in TIs without, p<0.001), duration of ICU stay (median:16d vs. 12d, p=0.05) and MV (median:5d vs. 4d, p=0.002). After adjusting for covariates, occurrence of any TIAE was independently associated with duration of MV (p=0.04), but not with ICU mortality (p=0.72) or duration of ICU stay (p=0.29). Occurrence of severe TIAEs was independently associated with mortality (OR 1.6, 95% CI: 1.1–2.4, p=0.008) and duration of MV (p=0.03) but not with duration of ICU stay (p=0.13). Conclusion: The occurrence of any TIAEs and severe TIAEs was associated with important ICU outcomes. Further studies are needed to evaluate whether QI interventions to decrease TIAEs will lead to improvement in these ICU outcomes.

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MULTI-CENTER VALIDATION OF AN ICU REAL-TIME PREDICTION OF MORTALITY (RPM) MODEL
Omar Badawi, Xinggang Liu, Erkan Hassan
Learning Objectives: Although several scoring systems evaluate mortality risk, to use a risk model for pt care, the model needs to be reliably calculated and highly correlated with mortality through prospective validation. The goal of this study is to prospectively evaluate the performance of an electronic, continuously calculated ICU RPM model (DOI: 10.1371/journal.pone.0048758). Methods: All pts admitted before April 2015 to an ICU using Philips eCareManager v3.9 or later and participating in the Philips eICU Research Institute were included. Exclusions: ICU LOS < 4hr. The RPM score was calculated continuously between 4 hr into ICU admission and ICU discharge. The predictive values of the following measures on ICU mortality were evaluated by AUC with bootstrap 95%CI: max score w/n 24 hr of admit (admit score); mean and median score of entire stay. The performance was further assessed in strata by hospital, ICU type and admission diagnosis (among subgroups with >200 pts). Results: 75,083,926 scores were calculated from 344,538 pts representing 256 hospitals and 383 ICUs. The mean APACHE score, ICU mortality and LOS was 55.8, 4.85% and 3.0 days respectively, 60% of pts were in a mixed ICU, 19% in a cardiac or CTICU, 8% MICU and 13% other. The AUC of admit RPM score w/ ICU mortality was 0.866 (.865–.868). The AUC for the mean and median RPM score throughout the ICU stay were similar; 0.922 (.920–.924) and 0.916 (.914–.918). Upon stratifying by the 166 hospitals with >200 pts, the mean (SD), 25th and 75th percentile of AUCs was: 0.91 (SD=0.03); 0.90–0.94. When stratifying by ICU type, the units with the lowest and highest AUCs were MICU (0.92) and Neuro (0.95) respectively. The admit dx groups with the highest and lowest AUCs were: DKA (0.97), CVA (0.95), trauma (0.94) and pneumonia (0.85), CHF (0.86) acute renal failure (0.87). Conclusion: This continuously calculated RPM model has extremely high correlation with ICU mortality when measured on admission and throughout the ICU stay in a large, heterogeneous population. Further research is needed to compare this model to other ICU risk scoring systems.

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LONGITUDINAL TRENDS IN US DRUG SHORTAGES FOR MEDICATIONS USED IN CRITICAL CARE (2001–2014)
Suleman Umar, Munish Goyal, Erin Fox, Mark Zocchi, Jesse Pines, Kristy Hawley, Maryann Mazer-Amirshahi
Learning Objectives: Drug shortages have become more severe in recent yr; however, there are limited data describing how shortages impact critical care drugs. We characterize longitudinal trends in U.S. drug shortages within the scope of critical care (CC) practice from 2001–14. Methods: Drug shortage data from the University of Utah Drug Information Service were analyzed from January 2001 to December 2014. A medical toxicologist/clinical pharmacologist, board certiﬁed intensivist and a critical care fellow identiﬁed drug shortages within the scope of CC practice, whether they are used for high-acuity conditions, marketing status, formulation, and therapeutic category. Trends in the length of shortages for CC drugs were described using standard descriptive statistics and regression analysis. Results: 1,774 drug shortages were reported over the 14-year period. 902 shortages (50.8%) were classiﬁed as within the scope of CC practice. Although the number of CC drug shortages initially fell from 2001 – 2003, the number of shortages per year increased from 18 to 91 (405%) from 2004 to 2014. Of all CC drug shortages, 224 (24.8%) were for drugs used for high acuity conditions. The majority of CC drugs (73.6%) were parenteral. 354 (39.2%) were single source drugs. Of CC drugs on shortage that had an alternative, 192 (21.3%) had alternatives impacted. Infectious disease drugs were the most common CC drugs on shortage, with 176 (19.3%) drug shortages totaling 2,540 mo during the study period. The median duration for resolved shortages of ICU drugs was 6.3 mo, 170 (18.8%) CC drugs remained on active shortage at the end of the study period. Conclusion: Drug shortages impacting critical care have grown dramatically since 2001. Many of these drugs are used for life-saving interventions or high acuity conditions and are without available alternatives.

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CURRENT NATIONAL TRENDS IN INFERIOR VENA CAVE FILTER USE
Jeffrey Gruner, Danielle Tatum
Learning Objectives: Published studies of the National Trauma Data Bank (NTDB) reported that use of inferior vena cava (IVC) filters for thromboprophylaxis in trauma patients had increased significantly in the past two decades, with 2007 being the last year examined. An internal study of our Level I trauma center mirrored these findings but showed a dramatic decrease in filter placement beginning in 2008. We aim to determine if this trend is unique to our facility or rather is representative of current national trends. Methods: The most recent 3 yr (2010–2013) of the NTDB were queried for all patients ≥18 yr of age. ICD-9 procedure code 38.7 “interruption of vena cava” indicated IVC filter placement. Placement was deemed therapeutic if either deep vein thrombosis (DVT) or
pulmonary embolism (PE) were listed in the complication or diagnosis field, or prophyllactic if neither DVT nor PE was indicated in either field. Results: Of the 1,970,117 patients identified, 23,558 (1.2%) received an IVC filter. Overall use of IVC filters decreased significantly from 2010-2012, sliding from 1.3% to 1.1% (P<0.001). This was not due to variation in venous thromboembolism (VTE) incidence, which remained constant at 1.1% for the yr examined. Likewise, therapeutic use of IVC filters remained constant at ~0.5% for each year of the study. However, use of prophylactic IVC filters significantly decreased from 1.0% to 0.8% (P=0.001) during the study period, which is nearly half of the previously reported 1.4% (Dessert et al. 2011. J of Trauma). Conclusions: In the US, prophylactic use of IVC filters has significantly decreased in recent years, suggesting widespread changes in practice patterns. This is a dramatic shift away from the upsurge in usage observed from 1993–2007. This reduction may be partially attributable to the 2008 CHEST guidelines which strongly recommend against IVC filters as thromboprophylaxis and starkly contrast the earlier and more liberal guidelines of both EAST and CHEST.

IMPLEMENTATION OF A WITHDRAWAL PREVENTION PROTOCOL IN A PEDIATRIC CARDIAC ICU
Rambod Amirnovin, Lazaro Sanchez-Pinto, Phuong Lieu, Joyce Koh, John Rodgers, Lara Nelson

Learning Objectives: Long-term opioid infusions are often required in the care of critically ill children in the cardiac ICU (CICU). Their use is associated with complications including delirium, dependence, and withdrawal syndrome. These complications lead to significant morbidity such as extended drug tapers and prolonged hospital stay. Our aim was to implement an opioid withdrawal prevention protocol (WPP) to reduce the length of drug exposure and length of stay of children at high risk for withdrawal. Methods: The WPP was implemented in the pediatric CICU of a large academic children’s hospital, and included a guide for drug conversion and weaning, and education of the clinical staff. Patients on ≥7 days of continuous opioids were included in the study. Outcome metrics were length of scheduled opioids, length of opioid taper, hospital length of stay, and withdrawal symptoms. The pre- and post-intervention periods were 1/2013-1/2014 and 2/2014-1/2015. Continuous variables were analyzed using the Mann-Whitney U test and categorical variables using the Yates-corrected Chi-squared test. Results: 105 critically ill children met the inclusion criteria (52 pre- and 53 post-intervention). The age, gender, and mortality categories on admission did not differ between the two groups. Patients in the pre-intervention group had significantly shorter median lengths of scheduled opioids (19 vs. 30 days, p<0.01) and opioid taper (7 vs. 18 days, p<0.01) than those in the pre-intervention group. There was also shorter hospital length of stay (34 vs. 42 days, p<0.01). There was no difference in the withdrawal symptoms between the two groups. Conclusions: We successfully implemented a WPP in the pediatric CICU that led to a significant reduction in the length of opioid exposure and decreased hospital length of stay in patients at high risk for withdrawal. Given the association between long-term use of opioids and significant morbidities, such as delirium and feeding intolerance, these gains potentially have impact beyond cost-reduction. Future studies are needed to refine our approach to sedation and withdrawal prevention.

RETROSPECTIVE ANALYSIS OF LENGTHY STAYS IN A SURGICAL ICU
Albert Nguyen, Timothy Webb, Erik Kistler

Learning Objectives: Studies addressing determinants of survival in ICU patients have been done largely in the medical population. To date, there has not been a study specific to surgical ICU patients. It is of great importance to study this population separately as their issues frequently differ from the medical ICU cohort. Methods: This is a retrospective study of patients who required an ICU admission following a surgical procedure. Patients were included if they had an ICU stay greater than 48 hr or died at any time during their ICU stay. Patients were excluded if their ICU stays were less than 48 hr and not due to death. Primary outcomes were total ICU length of stays (LOS), in-hospital mortality, and mortality by surgical procedure. In addition, immediate post-discharge location and post-discharge follow up at up to 12 mo were tracked. Secondary outcomes were ICU length of stays and mortality attributed to sepsis, duration of mechanical ventilation, acute kidney insufficiency (AKI), and aspiration. Results: 573 patients met the defined criteria. In-hospital mortality was 7.2%. Non-survivors had significantly longer ICU LOS than survivors (394 ± 644 [range 3-5363] hr vs 139 ± 248 [range 48-4509] hr; p<0.05). At discharge, 46% of survivors required health care resources in the form of home health care, skilled nursing facility, or hospice. Mortality following discharge was 11.1%. In hospital mortality was highest for surgical oncology and vascular surgery patients. An increase in surgical oncology and neurosurgical patients death was observed post-discharge. AKI, ICU sepsis, mechanical ventilation, and aspiration were associated with increase ICU LOS. Only aspiration events were not associated with in-hospital mortality. Conclusions: Prolonged surgical ICU LOS is significantly associated with in-hospital mortality and mortality continued to increase post-discharge. Mortality was increased 3 fold with AKI, 2.2 times with prolonged mechanical ventilation, and 1.9 times with sepsis. Surprisingly, aspiration did not affect mortality.

CRITICAL CARE TRANSITION PROGRAMS AND THE RISK OF READMISSION OR DEATH AFTER DISCHARGE FROM AN ICU
Henry Stelhos, Jaime Bastos, Daniel Niven, Sean Bagshaw, T Türün, Song Gao

Learning Objectives: To support patients during the high-risk transition of care between the ICU and hospital ward, hospitals have implemented critical care transition programs. Published pre-and-post studies suggest these programs are helpful, but given methodological limitations, further evaluation is warranted. Methods: We employed an interrupted time series analysis to evaluate readmission to ICU (72hrs) and mortality (14 days) among 32,234 consecutive adult patients discharged alive from 8 medical-surgical ICUs (8 hospitals) in 2 cities (control group) and 10 cities (study group). There were 8 study hospitals and 6 control hospitals in the 1 city group, but not the 5 hospitals in the other city (control group). The program comprised an ICU provider team (physician, nurse, respiratory therapist) that evaluated each patient a minimum of once every 12hr after ICU discharge for a minimum of 2 visits. Temporal changes were examined using multivariable, segmented linear regression models. Results: Immediately following implementation of the program, there was a non-significant decrease in the absolute proportion of patients readmitted to ICU in the study group (-0.4%, 95% CI -1.7% to +1.0%) and a non-significant increase in the absolute proportion of patients readmitted to ICU in the control group (+1.0%, 95% CI -0.5 to +2.2%). Subsequently, over time, there were non-significant changes in the absolute proportion of patients readmitted to ICU in both the study (+0.1% per quarter; 95% CI, -0.1% to +0.2%) and control (-0.1% per quarter; 95% CI, -0.2% to +0.1%) groups. No significant changes in mortality were observed immediately after implementation of the program or in the long-term trends. Results were similar when sensitivity analyses were conducted according to reason for ICU admission, number of comorbidities, severity of illness, length of ICU stay and type of hospital. Conclusions: Implementation of a critical care transition program had no significant effect on patient readmission to ICU or mortality. Alternative strategies are needed to improve the quality of care for patients discharged from ICU.

DECREASE IN NONINVASIVE MASK-RELATED PRESSURE ULCERS AFTER EQUIPMENT STANDARDIZATION IN A PICU
Tara Benton, Kathy Baharzadeen, Katie Carlin, Rebecca Duggins, Kelsey Friessen, Kimberly Lucas, Ashley Schuyler, Emily Wilkinson

Learning Objectives: Noninvasive ventilation (NIV) is a critical resource for patients in respiratory distress. In our PICU, NIV masks were the most frequent cause of pressure ulcers (PU). Identified risk factors for PUs in this population included limited selection of masks, length of time on NIV, and variable pressure applied to the face dependent upon ventilator type. Dual and single limb circuit ventilators were both available for NIV in the PICU. Dual limb circuit ventilators were primarily utilized for NIV due to convenience. These ventilators had limited leak compensation resulting in discontinuation of positive pressure
IMPROVING PRIMARY TEAM PRESENCE AND PARTICIPATION DURING RAPID RESPONSE TEAM ACTIVATIONS
Prashanti Jagtap, Alexander Kogan, Faiza Hashmi, Alice Gallo De Moraes, Jennifer Elmer, Sean Caples, Richard Oeckler, Jeff Jensen

Learning Objectives: The role of the primary service during rapid response team (RRT) activations has not been well studied. Most publications have focused on team composition. At our institution, evaluation by RRT lead to more frequent goals of care discussion more appropriate triage, and allowed surgical services to provide unique knowledge important to their patients. We hypothesize that primary team presence provides the essential continuity, experience and familiarity necessary for effective decision-making during RRT activations. Methods: As part of a quality improvement initiative, we sought to increase the presence and enhance the participation of primary teams during RRT activations. Participation was objectively measured by assessment of the extent to which primary workup and treatment decisions were implemented prior to arrival of the RRT team. A total of 376 RRT activations (114 pre-intervention, 262 post intervention) were collected prospectively over a 6 month period by an electronic database (RedCap) survey. Stakeholders were identified and a multifaceted intervention program developed to provide both education and regular monthly feedback of presence at bedside, initiation of preliminary work up and treatment decisions. Results: Based upon our intervention, the presence of primary teams increased from 62% to 80% (p = 0.004). Those with a preliminary workup initiated prior to RRT arrival rose from 46% to 61% (p = 0.007) and treatment decision-making improved from 45% to 63% (p = 0.001). The median duration of RRT response decreased from 30 (IQR 20–38.75) min to 25 (IQR 17.75–39) min (p = 0.066). Conclusions: Active involvement by the primary team influences RRT activations. Multifaceted interventions involving constructive feedback in addition to education can improve primary team presence and participation during rapid response team activations, facilitate appropriate transfer of care, and reduce overall duration of RRT activation.

EXPERIENCE WITH PROPOFOL FOR PROCEDURAL SEDATION IN INFANTS UNDER 6 MONTHS OF AGE
Elan Jenkins, Pradip Kamat, Kiran Hebley, Daniel Hirsh, Michael Mallory, James Fortenberry, Courtney McCracken, Zhi Geng

Learning Objectives: There is increased risk associated with procedural sedation (PS) of infants < 6 mo of age. Although propofol is widely used for pediatric PS, its use in infants < 6 mo of age is not well documented. We hypothesized that propofol can be successfully used to sedate infants < 6 mo of age with minimal adverse events (AE). Methods: Retrospective chart review of 273 infants < 6 mo who received propofol for PS at Children’s Healthcare of Atlanta. Patient demographics, propofol dosing, sedation related AE and interventions were collected. Minor AE were defined as reversible sedation related events that are
expected during PS (for example insignificant change in heart rate or oxygen desaturation for <30 seconds). Serious AE were defined as laryngospasm, aspiration, need for admission, cardiac arrest, or death. Results: PS was successful in 271/273 (99.3%) of infants using propofol. 155/273 (57%) infants were female, and 214/273 (78%) were between 3–6 mo of age. Most patients were ASA class II 163/273 (60%); 54/273 (20%) had a history of prematurity and 57/273 (21%) had a recent upper respiratory tract infection. Median induction propofol dose was 2.7 mg/kg and total dose was 87 mg. There were a total of 55 sedation related minor AE in 41/273 (15%) infants of which airway obstruction (4.4%), apnea (4.8%), and hypoxia (2.9%) were most common. A total of 65 interventions were required in 50 patients (18%). The most common interventions were suctioning (2.9%), CPAP (7.3%), jaw thrust (4.8%), and change in propofol infusion rate (2.9%). Minor AE were similar in children < 90 days compared to those > 90 days (21% vs. 13%; p = NS). No significant predictors of sedation-related AE were detected. None of the 273 infants had a serious AE detected. Conclusions: Propofol can be used for procedural sedation of infants < 6 mo of age with a high success rate and no serious adverse events. Sedation related minor adverse events occur but are easily recognized and managed by well-trained sedation providers.

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REDUCTION IN POINT-OF-CARE BLOOD GLUCOSE MEASUREMENTS IN THE MEDICAL ICU
Anita Reddy, Seth Bauer, Anita White, Christina Canfield, Jorge Guzman

Learning Objectives: Blood glucose (BG) is typically evaluated in the ICU at least four times a day, often with a point-of-care (POC) device. These tests can be uncomfortable for the patient if a finger-stick method is utilized. In addition, these measurements pose an unnecessary cost to the institution with minimal impact on clinical care in certain patient populations. Methods: Two interventions were performed to reduce unnecessary POC BG measurements. First, the institutional insulin infusion protocol was adjusted to target higher BG values (140–180 mg/dl) and the frequency of BG measurements was decreased to every 3 hr from every 2 hr. Second, the frequency of BG measurement was differentiated for diabetic patients and non-diabetic patients, with less frequent POC BG measurements in non-diabetics if hyperglycemia was not detected on initial measurements. These interventions were implemented by changing existing order sets and extensive nursing education. A four month before-after retrospective cohort study was designed, with descriptive and inferential statistics utilized. Results: Changes in the insulin infusion protocol resulted in fewer incidents of hypoglycemia (blood glucose <70 mg/dl or below; 3.6% post-intervention versus 3.3% post-intervention; p = 0.018) and fewer patients started on an insulin infusion (1937 patients pre-intervention versus 1798 patients post-intervention). Additionally, the average number of POC BG measurements per patient encounter was reduced from 28.5 ± 6.2 pre-intervention to 19.9 ± 4.2 1 post-intervention (p = 0.018). This yielded a cost savings of $56.78 (95% CI $46.58-$66.98) per patient encounter (p = 0.025), and a projected total annual savings of approximately $200,000. Conclusions: Unnecessary practices are frequently engrained in the culture of care due to convenience. These data suggest that reducing blood sugar measurements, with an emphasis in reducing patient discomfort, may result in a significant cost savings without adverse effect to the patient.

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PREDICTORS OF RAPID UNPLANNED TRANSFER TO THE PICU FOLLOWING ADMISSION FROM THE ED
Kimberly McMahon, Erica Del Grippo, Andrew DePiero

Learning Objectives: Admitting a patient from the emergency department (ED) to a general unit who then quickly requires transfer to an ICU generates stress and safety concerns. Our study sought to identify predictors at the time of admission of patients likely to require rapid transfer. We evaluated vital signs, Pediatric Early Warning Scores (PEWS), ED length of stay, time from last ED vital to admission and degree of respiratory support at admission. Methods: We retrospectively reviewed patients requiring transfer to the ICU within 10 hr of admission from the ED at a pediatric tertiary care center from 3/09 to 10/13. These 73 case patients were then matched by age and diagnosis with 73 control patients who never required ICU admission. PEWS and vital signs were compared prior to ED departure, on admission to the floor and, for cases, at time of ICU transfer. ED length of stay, respiratory support and timing of last vitals were also recorded. Results: The ED PEWS for case patients were higher than those for controls (median 2 vs 0, p = 0.03). PEWS on admission remained higher for cases (median 3 vs 1). At ICU transfer, PEWS for cases increased to a median of 4. No significant differences in ED or admission vital signs were found between groups. ED length of stay was slightly shorter for cases than controls (p = 0.05), but time from last set of vitals to admission did not differ. Case patients were more likely to require high flow oxygen at admission. Conclusions: Patients requiring ICU transfer within hr of admission had higher PEWS than control patients at all time points, and PEWS increased from the ED to admission and time of ICU transfer, but remained only a median of 4. We did not identify any specific vital sign predictors, but case patients were more likely to require high flow oxygen at admission emphasizing that respiratory distress was the most likely reason for transfer. Shorter ED length of stay was noted for case patients demonstrating that perhaps longer observation would help determine disposition. Patient disposition remains a challenge with clinical judgement paramount.

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IMPROVING ORAL HEALTH: A STANDARDIZED ORAL CARE PROGRAM FOR POST-MECHANICALLY VENTILATED ADULTS
Michele Weber, Esther Chipp, Jennifer MacDermott, Jamie St. Clair, Cheryl Newton, Dorina Harper, Brenda Vermillion, Tania Von Visger

Learning Objectives: Oral care is standard practice to prevent hospital-associated infections while patients are intubated and in the ICU. Following extubation less attention is paid to oral care. Few studies have assessed the impact of oral care in recently extubated acutely ill patients. The purpose of our study was to increase the RN’s knowledge of the effect of a standardized oral care program on the oral health of post-mechanically ventilated adult patients. Our study objectives were: to identify the need for nursing assessment of the intubated patient’s oral cavity; to describe the elements of a structured oral care program for post-mechanically ventilated patients; and to discuss the connection between oral health and microbial contamination. Methods: A randomized controlled trial, where subjects were randomized to control (standard oral care) or an intervention protocol that included tooth brushing, tongue scraping, flossing, mouth rinse, and lip care. Major outcome measures were the revised THROAT (R-THROAT; oral cavity assessment) and overall prevalence of methicillin-sensitive Staphylococcus aureus and methicillin-resistant Staphylococcus aureus on oral cultures. Results: Seventy-four subjects were randomized. As measured by the R-THROAT, oral cavity health improved over time in both groups, but the intervention group demonstrated significantly more improvement than the control group (R-THROAT score improved by 1.97 intervention vs. 0.87 control; p = .04). The two categories of tongue and mouth comfort demonstrated the most significant improvement. There was no difference in MSSA/MRSA colonization between the groups at the conclusion of the study. Overall, subjects in the intervention group were more satisfied with their protocol than subjects in the standard care group. Conclusions: Results demonstrated improvement in oral health with the designed oral care protocol. Patients expressed a preference for the intervention protocol, which included a battery-operated toothbrush, higher quality toothpaste and mouth rinse, tongue scraper, floss, and lip balm.

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A MODEL TO PREDICT THE CLINICAL COURSE OF INTOXICATED ICU PATIENTS
Raya Brandenburg, Sylvia Brinkman, Nicolette De Keizer, Jan Meulenbelt, Newton, Dorina Harper, Brenda Vermillion, Tania Von Visger

Learning Objectives: The course of an intoxicated patient could be hard to predict and although severe complications rarely occur, they are an important reason to admitted these patients to the ICU for observation. This raises the question if it is indeed necessary to admit all these patients to the ICU. Therefore, the first aim of this study is to identify parameters that predict the need for ICU care for intoxicated ICU patients admitted from the emergency room. The second aim is to develop a model that predicts the need of ICU treatment. Methods: We analyzed intoxicated ICU patients originating from the emergency room, admitted between January 1st 2010 and January 1st 2015, extracted from a Dutch ICU

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INAPPROPRIATE CONTINUATION OF ACID SUPPRESSION THERAPY IN ICU PATIENTS
Kaatiin Pruskowski, Ricky Amaoeng, Brian Spoelhof

Learning Objectives: Over 95% of patients admitted to an ICU are started on acid suppression therapy for stress ulcer prophylaxis (SUP). The American Society of Health Systems Pharmacists (ASHP) defines several compelling indications for SUP. When ICU patients no longer have a compelling indication for SUP, acid suppression should be discontinued. However, studies have shown that up to 25% of patients started on acid suppression continue it, even after compelling indications are not present. Methods: This was a single-center retrospective preliminary baseline assessment of patients admitted to any adult ICU at Johns Hopkins Bayview Medical Center between April 1, 2014 and June 30, 2014. Using the electronic medical record, presence of a compelling indication for acid suppression therapy, acid suppression agent initiated, length of acid suppression therapy, date of end of a compelling indication, and date of acid suppression therapy discontinuation. It was also recorded if the patients returned to our institution for treatment of Clostridium difficile-associated (CDAD) within 30 days of discharge. Patients with active gastrointestinal bleeds and patients who were taking an acid suppression agent at admission were excluded. Descriptive statistics were used to analyze the data collected. Results: 249 patients were included in the study. Across all included ICU’s, acid suppression therapy was administered for a total of 1112 patient days. 738 of which were inappropriate. The rate of inappropriate continuation of SUP across all ICU’s was 65%. Three patients developed CDAD during their initial ICU admission. A total of 30 patients were re-admitted within 30 days, 2 with CDAD. Inappropriate SUP costs at our institution were about $1400 their initial ICU admission. A total of 30 patients were re-admitted within 30 days, 2 with CDAD. Inappropriate SUP costs at our institution were about $1400 per patient day. The impact of inappropriate SUP on mortality in children with critical illness. This study was aimed to evaluate the association of house staff training with mortality in children with critical illness. Methods: Patients <18 yr of age in the Virtual PICU Systems (VPS, LLC) Database (2009–2013) were included. The study population constituted the hospitals with residency and/or fellowship program. Control group constituted hospitals with no residency or fellowship program. The primary study outcome was mortality before ICU discharge. Multivariable logistic regression models were fitted to evaluate association of training programs with ICU mortality. Results: A total of 336,335 patients from 108 centers were included. Case-mix of patients among the hospitals with training programs was complex; patients cared for in the hospitals with training programs had greater severity of illness, had higher resource utilization, and had higher overall admission risk of death compared to patients cared for in the control hospitals. Despite caring for more complex and sicker patients, the hospitals with training programs were associated with lower odds of ICU mortality. Unadjusted ICU mortality was higher among patients cared for in the study groups compared to the patients in the control hospitals (residency and/or fellowship vs. control, OR: 1.28, 95% CI: 1.21–1.36, p<0.001). However, after adjusting for patient and center characteristics, ICU mortality was significantly lower among the patients in hospitals with any training program (residency and/or fellowship vs. control, OR: 0.74, 95% CI: 0.64–0.92, p=0.050). Conclusions: Our study has minimized the impact of institutional volume on outcome.

IMPACT OF INSTITUTIONAL VOLUME ON ECMO MORTALITY: A NATIONAL STUDY
Benton Hsu, Kaushal Chaudhary, Lesta Whalen, Jennifer Mosher, Thomas Brazelton

Learning Objectives: Conflicting studies exist regarding the benefit of institutional volume on outcomes for extracorporeal membrane oxygenation (ECMO) within the pediatric population. This study was conducted on a national pediatric inpatient database to determine the impact of institutional volume on mortality. Methods: Retrospective study of hospitalized children receiving ECMO using the Agency for Healthcare Research and Quality 2012 Kid Inpatient Database. ECMO use determined by presence of The International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) code of 39.65: ECMO excluding extracorporeal circulation auxiliary to open heart surgery and pulmonary bypass. Primary outcome measure was survival to discharge. Annual institutional volume of ECMO cases categorized as follows: 1–5, 6–10, 11–15, 16–20, 21–25, 26–30, >30 cases. Multivariable logistic regression accounted for confounding variables. Weighted analysis utilized Proc Surveylogistic in SAS version 9.4 (SAS Institute). Results: Study population included 1,470 un-weighted observations. Comparing those who survived versus those who died: Age (2.3 to 2.7 yr), Gender (44.3% to 44.1% female) and Length of Stay (94.2 to 32.3 days). Comparing against institutions with the lowest annual volume (1–5 annual cases) there were no statistical significant difference in adjusted odds ratio for survival: 6–10 cases, OR=1.16, p=0.65; 11–15 cases, OR=1.39, p=0.27; 16–20 cases, OR=1.06, p=0.84; 21–25 cases, OR=1.60, p=0.19; 26–30 cases, OR=0.88, p=0.71; >30 cases, OR=1.25, p=0.49. Conclusions: Our study found that increasing annual institutional volume did not confer a survival benefit for patients receiving ECMO. This supports findings from an earlier study using 2008 to 2013 pediatric data from International Registry of the Extracorporeal Life Support Organization (ELSO) database but conflicts with findings using 2004 to 2011 pediatric data from Pediatric Health Information System (PHIS) database. This trend suggests that current experiences in ECMO (2008 onward) have minimized the impact of institutional volume on outcome.

ASSOCIATION OF HOUSE STAFF TRAINING WITH MORTALITY IN CHILDREN WITH CRITICAL ILLNESS
Punkaj Gupta, Mallikarjuna Rao Rettiganti, Tom Rice, Barry Markovitz, Randall Wetzel

Learning Objectives: Little is known about the association of house staff training on mortality in children with critical illness. This study was aimed to evaluate the association of house staff training with mortality in children with critical illness. Methods: Patients <18 yr of age in the Virtual PICU Systems (VPS, LLC) Database (2009–2013) were included. The study population constituted the hospitals with residency and/or fellowship program. Control group constituted hospitals with no residency or fellowship program. The primary study outcome was mortality before ICU discharge. Multivariable logistic regression models were fitted to evaluate association of training programs with ICU mortality. Results: A total of 336,335 patients from 108 centers were included. Case-mix of patients among the hospitals with training programs was complex; patients cared for in the hospitals with training programs had greater severity of illness, had higher resource utilization, and had higher overall admission risk of death compared to patients cared for in the control hospitals. Despite caring for more complex and sicker patients, the hospitals with training programs were associated with lower odds of ICU mortality. Unadjusted ICU mortality was higher among patients cared for in the study groups compared to the patients in the control hospitals (residency and/or fellowship vs. control, OR: 1.28, 95% CI: 1.21–1.36, p<0.001). However, after adjusting for patient and center characteristics, ICU mortality was significantly lower among the patients in hospitals with any training program (residency and/or fellowship vs. control, OR: 0.74, 95% CI: 0.64–0.92, p<0.050). Conclusions: Our study has minimized the impact of institutional volume on outcome.

INCREASING EVENT REPORTING BY RESIDENTS IN A PICU
Elizabeth Mack

Learning Objectives: Event reporting is key to developing a culture of safety. The AHRQ culture of safety survey asks about frequency of events reported and how these reports are handled within an institution. Higher AHRQ culture of safety scores are associated with higher quality care delivery. The ACGME Clinical Learning Environment Review program also seeks to improve reporting by trainees. Barriers to reporting include time, fear of retaliation, lack of feedback, and lack of understanding about what to report. Methods: In January 2015, a hotline was added to the pre-existing reporting mechanisms and promoted specifically to residents & fellows though anyone could enter a report. The phone line
was added to the two pre-existing reporting mechanisms (online reporting, and abbreviated online reporting with less required fields) to specifically address the perception that reporting is time prohibitive. In addition, in February 2015 quality and safety leaders facilitated discussions with the residency programs of those residents rotating through the PICU and these programs set specific, measurable, non-incentivized goals around their reporting on specific units. Results: Reporting has increased significantly by trainees in the PICU, from a mean of 0 reports per month for a 20 beds comprised of PICU and stepdown beds to a mean of 3.8 reports per month. Additionally, these reports are of significant quality and have prompted root cause analyses and other thorough investigations leading to significant changes not detected by reports from others, safety rounds, word of mouth, or other traditional detection methods. None have been anonymous and nearly all have been submitted through the phone line, indicating a heightened safety culture and need for convenience. Conclusions: This pilot indicates targeted discussions with trainees increases reporting. Next steps include assessing sustainability and creating feedback systems where events are discussed in a multidisciplinary “town hall” fashion at grand rounds and house staff meetings so solutions can be targeted using reported events.

806 HIGH FLOW NASAL CANNULA USE OUTSIDE OF THE ICU: FACTORS ASSOCIATED WITH SUCCESS AND FAILURE
Kristina Betters, Scott Gillespie, David Kotzhauer, Kiran Hebbar

Learning Objectives: High flow nasal cannula (HFNC) use as a mode of respiratory support continues to increase in pediatrics. Most data studying the effectiveness and safety of HFNC has occurred in neonatal intensive care. Few studies exist to prove or refute the safety of HFNC use in pediatrics outside of the ICU. This study aimed to characterize patient qualities that were associated with success or failure of HFNC outside of the ICU at a tertiary care center.

Methods: A retrospective chart review of patients placed on HFNC outside of the ICU from September 2011-July 2013 was completed. Demographic, clinical, and HFNC related variables were collected. Failure was defined as intubation or cardiopulmonary arrest outside of the ICU. Binary logistic regression was employed to determine significant hospital-adjusted, univariable risk factors associated with failed HFNC administration. Results: Two hundred thirty-one patients met inclusion criteria, with 192 were receiving treatment for a primary respiratory diagnosis (83%), 147 (64%) specifically bronchiolitis. Fourteen (6%) progressed to HFNC failure; 12 were transferred to the ICU and intubated, two had complicated congenital heart disease and suffered cardiopulmonary arrest on the floor, both resulting in death. Children who failed were more likely to have a cardiac history (p = 0.026), prior history of intubation (p = 0.040), and require higher fraction of inspired oxygen (FiO2) (median 25th-75th 60%-100% FiO2, p = .0001). Failure patients were less likely to have a diagnosis of bronchiolitis. Failure patients failed quickly, within a median of 5.5 hr. History of prematurity (gestational age less than 34 weeks), weight at admission, initial pH, initial CO2, and flow per kilogram did not correlate to odds of HFNC failure. Conclusions: Inability to wean FiO2, prior history of intubation, and cardiac co-morbidity are significant associated predictors of HFNC failure. Patients with an uncomplicated diagnosis of bronchiolitis may be treated with HFNC outside of the ICU with higher success rates.

807 BEST PRACTICE STRATEGIES TO DECREASE UNPLANNED EXTUBATIONS IN THE NEONATE
Shari Toomey

Learning Objectives: Unplanned extubations (UEX) are a serious and potentially life-threatening event for a neonate. UEX leads to emergent, less-controlled endotracheal re-intubations. Repeated intubations increase risk of ventilator associated pneumonia, tracheal injury, and may prolong length of stay. Factors that increase the risk of UEXs include; lack of adequate sedation; type of tube stabilization used, and lack of vigilance by staff. Methods: A prospective cohort study was designed to consider the impact of modifying these factors and implementing a sequence of best practice strategies. Three leading factors were defined: stabilization of endotracheal tube (ETT), sedation for intubated patients, and personnel at the bedside. Strategies were developed to address these factors: 1) Six month trial of three different stabilization techniques; 2) Sedation guideline implemented, for patients who self extubated and required re-intubation within 48hr (scheduled sedation, 1mcg/Kg Fentanyl Q4, 1 mg/kg Fentanyl q2hr PRN); 3) Intubated patients required two personnel at the bedside during care or procedures. Patients requiring intubation from February 2010 to present were included in this 5 year quality study. Results: Baseline data indicated an UEX rate of 4.5/100 ventilator days. Following the implementation of three standards of care practice changes we saw the following decrease in the UEX rate: 1) Standardized Taping to 2.4/100 ventilator days; 2) Standard sedation to 1.7/100 ventilator days; 3) Adequate personnel at the bedside to 0.4/100 ventilator days. Conclusions: UEXs continued to occur despite implementation of standardized taping. It was determined that lack of sedation and absence of adequate number of personnel at bedside during procedures and care time contributed to UEXs. After implementation of Sedation Guidelines and standardizing personnel at the bedside during procedures, we experienced additional decrease in UEXs rate. Care time, procedures, and sedation are coordinated by nursing and respiratory therapy.

808 VALIDATION OF THE SAFE DISCHARGE FROM ICU SCORE: A RISK ASSESSMENT TOOL OF UNPLANNED ICU READMISSION
Jose Azevedo, Widlani Montenegro, Monique Rocha, Thalita Veiga

Learning Objectives: Discharges of patients from ICUs often use subjective criteria and are frequently influenced by the demand for a bed. In contrast, unplanned readmission of patients to the ICU is associated with increased mortality. The aim of this study is to validate the SD-ICU score as a tool to predict unplanned readmissions to the ICU. Methods: This prospective observational cohort study included all adults patients discharged from a 45-bed medical-surgical ICU from April 2014 to March 2015. At the time of ICU discharge the SD-ICU score was calculated using the scores for age, therapeutic intervention scoring system 28 (TISS-28), Charlson comorbidity index (CCI) and the ICU length of stay (1). All patients with a SD-ICU score above 14.5 were classified with risk for readmission and had a risk alert recorded in the discharge report. Results: The data of 1,329 patients were included in the analysis. Ninety-five patients were readmitted to the ICU (7.1%). Readmitted patients were older, had higher APACHE IV score and spend more time in the ICU. TISS-28 and CCI were significantly higher in readmitted patients. The mean SD-ICU score was 15.4±8.9 in readmitted patients and 9.0±9.0 in no readmitted (p<0.0001). In this validation study a cut score of 14.5 yield a positive likelihood ratio of 1.56 and a negative likelihood ratio of 0.73, with specificity of 67.6% and sensitivity of 50.5%. Using the data of this validation study the cutoff point according to Youden criterion was 12.5 points. This cutoff has a sensitivity of 65.3%, a specificity of 61.4%, a positive like hood ratio of 1.69 and negative like hood ratio of 0.57. The area under ROC curve was 0.667 (CI 95%, 0.625-0.729; p < 0.0001). Calibration was good with a Hosmer-Lemeshow goodness-of-fit test chi-square of 9.84, p=0.08. Conclusions: This validation study confirmed that a risk score tool based on easily measured parameters at the bedside is able to predict the risk of ICU readmission with moderate accuracy. (1). Intensive Care Med 2014;40 (suppl 1) S16

809 PROMOTERS AND BARRIERS TO IMPLEMENTING TRACHEAL INTUBATION SAFETY BUNDLES: A MIXED-METHOD ANALYSIS
Katherine Davis, Hayley Buffman, Simon Li, Natalie Napolitano, Vinay Nadkarni, Akira Nishisaki

Learning Objectives: Tracheal intubation (TI) is often associated with complications. An airway safety quality improvement (QI) bundle was implemented across PICUs of the NEAR4KIDS network. We aimed to describe promoters and barriers of QI bundle implementation using a mixed-methods approach. Methods: We held 12 60-min focus groups with PICU RNs, RTs, and MDs; half facilitated in person, half via video. Questions included TI safety concerns, promoters, and barriers to bundle implementation. Transcribed recordings underwent thematic analysis. Themes were assessed for commonality and compared to site implementation success, defined as time from initiation to > 80% bundle use compliance for...
3 consecutive mo. We used Fisher’s exact test for categorical analysis comparing early adopters (first half of sites to reach successful implementation) to the other sites. Concurrently, we held separate structured interviews with site leaders to assess their implementation process and suggestions for improvement. Results: 71 participants; mean 6/site. 72% self-identified as highly involved in the QI bundle. Common promoter themes included: an interdisciplinary approach to education and bundle completion, influential site champions, and customization of the bundle to site-specific needs. Common barrier themes included: lack of time, competing paperwork/QI initiatives, and staff buy-in. Site leader interviews identified areas for improvement including: rollouts focused solely on MDs, lack of interdisciplinary education/data sharing, and the bundle being perceived as research vs QI. Median duration to achieve implementation success was 395 days (IQR: 153–773); early adopters were more likely to have an interdisciplinary airway QI team (63% vs 0%, p=0.075). Conclusions: Frontline clinicians identified common promoters and barriers for TI safety bundle implementation. Structured interviews with site leaders identified specific strategies for future success. Median duration to successful bundle implementation compliance was long. Sites with successful implementation were more likely to have an interdisciplinary QI team.

810 EVALUATION AND POTENTIAL IMPACT OF CRITICAL CARE PHARMACISTS’ INTERVENTIONS IN SINGAPORE Caroline Tee, Melissa Ngi, Simeon Tang, Siang Fei Yeoh, Janice Li Learning Objectives: Critical care pharmacists have been recognized to be an integral part of the multidisciplinary Intensive-Care Unit (ICU) team. However, studies evaluating the impact of having dedicated ICU pharmacists are largely limited to North America. We aim to characterize the critical care pharmacists’ contributions in a university teaching hospital in Singapore. Methods: This is a retrospective evaluation of the critical care pharmacists’ interventions in a single university teaching hospital (1228-bed) over 6 mo from January to June 2015. The adult ICUs (54-beds) included were the medical, surgical and cardio-thoracic ICUs. Potential impact of the interventions were analysed based on the primary outcomes of cost avoidance, prevention of adverse effects and optimization of therapy. These interventions were further classified according to FASTHUG categories and drug-related problems (DRPs). Results: Of the 1378 patients admitted to the 3 ICUs during the 6-month study period, 45% of them had pharmacist interventions. A total of 1705 interventions were made, with an average of 12.9 interventions per work day and 2.8 interventions per patient. Majority of the interventions were targeted at the prevention of adverse effects (55.1%), followed by the optimization of therapy (37.8%) and cost avoidance (7%). The most common interventions were related to infectious diseases (34.1%), glycemic control (8.8%) and the cardiovascular system (8.7%). The top 3 interventions based on DRPs were dosage regimen (51.7%), recommendation of alternative therapies (14.2%) and drug use without indication (10.9%). Conclusions: To our knowledge this is the first published data characterizing critical care pharmacists’ interventions in Singapore. Substantial interventions were made across various clinical areas, the majority of which is to prevent adverse effects. This can serve as background knowledge on identifying the current gaps in ICU management and implementing appropriate guidelines. Future studies are needed to evaluate how these interventions impact ICU length of stay, mortality and drug costs.

811 VALIDATION OF A PEDIATRIC EARLY WARNING SCORE (PEWS) IN PEDIATRIC ONCOLOGY PATIENTS Aaya Agulnik, Peter Forbes, Nicole Stenquist, Carlos Rodriguez-Galindo, Monica Kleinman Learning Objectives: Hospitalized pediatric oncology and stem cell transplant (SCT) patients are a high risk population with a high mortality rate. Many hospitals use Pediatric Early Warning Scores (PEWS) to facilitate early identification of clinical deterioration; however, these scores have never been validated in these patients. We hypothesized that our institution’s PEWS would correlate with the need for unplanned transfer to the Pediatric Intensive Care Unit (PICU) in this population. Methods: We performed a retrospective matched case-control study, comparing documented PEWS 24 hr prior to unplanned PICU transfer in hospitalized pediatric oncology and SCT patients between September, 2011 and December, 2013. Controls were patients who remained on the inpatient unit and were matched 2:1 using age and condition (oncology vs. SCT). PEWS were documented by nursing staff at least every 4 hr as part of routine care. The need for transfer was determined by a PICU physician called to evaluate the patient. Results: One hundred and ten cases and 220 controls were included in the analysis. Of the 110 PICU transfers, 17 patients died (15.4%). Using the highest score in the 24 hr prior to PICU transfer for cases and a matched period for controls, the PEWS was highly correlated with the need for PICU transfer overall (AUROC 0.96), and in the oncology and SCT groups individually (AUROC 0.95 and 0.96, respectively). The difference in PEWS between the cases and controls was noted as early as 24 hr prior to PICU admission. Patients with higher PEWS prior to PICU transfer had increased PICU mortality (p=0.028) and length of stay (p<0.0001). Conclusions: We demonstrate that our institution’s PEWS is highly correlated with the need for unplanned PICU transfer in hospitalized pediatric oncology and SCT patients. Furthermore, we found an association between higher scores and PICU mortality. This is the first validation of PEWS specific to the pediatric oncology and SCT populations. This study supports the use of PEWS as a method of early identification of clinical deterioration in this high risk population.

812 IMPACT OF DAILY GOALS SHEET AND SIMULATION-BASED TRAINING ON CLABSI: A 5-YEAR ANALYSIS Anish DeSai, Peter Spiegl, Jared Kutrin, Guy Aristide, Roman Spivak, Eileen Abuzzo, Melissa Fazzari, Joseph Mathew Learning Objectives: Central line associated bloodstream infection (CLABSI) is a common complication of central venous catheter (CVC) insertion, leading to an estimated 41,000 infections in U.S. hospitals each year. We studied the impact of two interventions done at Winthrop-University Hospital (WUH)—implementation of a Daily Goals Sheet (DGS) in the Medical Intensive Care Unit (ICU) and a pre-rotation simulation-based CVC training program for all internal medicine residents—to reduce CLABSI. Methods: A DGS was incorporated into ICU rounds to address need for CVC and other patient care issues. A 4-hour simulation-based CVC program was developed comprising of small group discussions and hands-on training. January 2010 to June 2012 was classified as the pre-intervention period. The transition period, where the DGS was implemented and the simulation course developed was from July 2012 to June 2013. The post-intervention period was from July 2013 to May 2015. Monthly CLABSI rates at WUH from 2010 to 2015 were collected and retrospectively analyzed and compared to National Health Safety Network (NHSN) and New York State (NYS) published rates. A Poisson regression model of event rate with patient line days was used for statistical analysis. Results: The CLABSI rates for WUH were 2.5, 1.1 and 0.9 per 1000 catheter days during pre-intervention, transition, and post-intervention periods respectively. When compared to the pre-intervention period, the post-intervention period at WUH demonstrated a reduction in CLABSI but this did not reach statistical significance (p = 0.08). Overall, CLABSI rates are falling linearly over time (p = 0.001). There was no observed interaction between time and CLABSI rate examinal of WUH, NHSN and NYS), indicating that the decline over time is similar across all computed rates. Conclusions: Our 5-year analysis demonstrates a statistically significant decrease in CLABSI rates for WUH, NHSN and NYS. Our two interventions decreased CLABSI rates at WUH but the results did not reach statistical significance. The rate of decrease of CLABSI at WUH was not faster when compared to NHSN and NYS rates.

813 HEAD ELEVATED PATIENT POSITIONING DECREASES AIRWAY-RELATED COMPLICATIONS OF EMERGENT INTUBATION Sarah Khorsand, Aaron Joffe, Nira Khandelwal Learning Objectives: In data from elective surgical patients, positioning patients in a head-elevated position for pre-oxygenation and tracheal intubation can improve patient safety. However, data specific to the emergent non-operating room setting is lacking. The primary aim of our study was to evaluate the association between intubating position and the occurrence of emergency tracheal intubation related complications. Methods: This retrospective study was approved by the University of Washington HSD (Seattle, WA). Eligible patients included all adults undergoing emergent tracheal intubation outside of the operating room.
by the Anesthesiology-based airway service at two university-affiliated teaching hospitals. All intubations were performed via direct laryngoscopy for an indication other than full cardiopulmonary arrest. Patient characteristics and details of the intubation procedure were derived from the medical record. The primary endpoint was defined as the occurrence of a difficult intubation (defined as following: greater than three attempts, greater than 10 min, or need for surgical airway) and/or any of the following within 15 min of intubation: hypoxemia, aspiration, or esophageal intubation. Multivariable logistic regression was used to estimate the odds of the primary endpoint in the supine versus head elevated positions with adjustment for a priori defined potential confounders (body mass index and a difficult intubation prediction score). Results: Five hundred and twenty eight patients were analyzed. Glottic views were significantly improved by head-elevated positioning. By multivariable logistic regression, the odds of reaching the composite endpoint when patients were positioned in a head-elevated versus supine position were significantly reduced; OR=0.47, 95% CI: 0.26, 0.83; p=0.01. Conclusions: Placing patients in a head-elevated position during emergency tracheal intubation improved intubating conditions and was associated with reduced airway-related complications.

814 EVALUATION OF A SIMULATION-BASED COMMUNICATION COURSE FOR PEDIATRIC CRITICAL CARE MEDICINE FELLOWS Erin Johnson, Ericka Fink, R Watson, Robert Arnold, Ann Thompson, Melinda Hamilton Learning Objectives: Effective communication among providers, families, and patients is essential in critical care but is often inadequate in the pediatric ICU. To address the lack of communication education PCCM fellows receive, the Children’s Hospital of Pittsburgh PICU developed the simulation-based Pediatric Critical Care Communication Course (PC3). Hypothesis: PCCM trainees have limited prior training in communication and will have increased confidence in their communication skills after participating in the PC3 course. Methods: PC3 is a 3-day course taken once during fellowship featuring simulation with actors portraying family members. Prior to and after the course fellows complete an anonymous survey asking about 1) prior instruction in communication, 2) preparedness for difficult conversations, 3) attitudes about end-of-life care, and 4) course satisfaction. We analyzed pre and post data using student’s t-test. Results: Most of the 38 fellows who participated over 4 yr had no prior training in conducting a care conference (70%), providing bad news (57%), or discussing end of life options (75%). After the course, fellows reported increased confidence in giving bad news, conducting a family conference, eliciting a family’s emotional reaction to their child’s illness and their concerns at the end of a child’s life, discussing a child’s code status, and discussing religious issues (p<0.05). Fellows also felt less reticent to have difficult conversations with the families of dying patients and felt more strongly that physicians have a responsibility to prepare patients and their families for a child’s death (p<0.05). The vast majority (90%) of fellows reported the course be required in PCCM fellowship. Conclusions: The PC3 course increased fellow confidence in having difficult conversations common in the PICU and made them more willing to have those discussions. Fellows highly recommend it as part of PCCM education. Further work should focus on the course’s impact on family satisfaction with fellow communication.

815 A QUALITY ASSURANCE INVESTIGATION OF CLABSIS: ARE THERE EXCEPTIONS TO NEVER? Samantha Strickler, John Oropello, Anthony Manasia, Adel Basissy-Marcus, Roopa Kohli-Seth Learning Objectives: When the Center for Medicare and Medicaid Services published its first list of diagnoses for nonpayment in 2008, central line associated blood stream infections (CLABSIs) were deemed reasonably preventable. They have since acquired a designation of “never events,” prompting a quality assurance (QA) movement driven by the concept of “zero CLABSIs.” We propose that there is a cumulative effect of patient and hospital risk factors that influence CLABSIs. Methods: A retrospective QA investigation was conducted reviewing CLABSIs identified at a 1171 bed tertiary-care hospital from January 1 to December 31 2014. Published risk factors examined included site location, hospital location, parental nutrition (PN), immunosuppression, transplant history, and alteplase use. Additional factors analyzed included hyperglycemia, acute kidney injury (AKI), chronic kidney disease (CKD), and hospital-acquired infections (HAI). Results: Thirty-four CLABSIs were identified in 35 adult patients (age range 18–92; median 57). Temporary triple lumen and hemodialysis catheters accounted for 12 (55%), peripherally inserted central catheters for 5 (14%), and permanent catheters for 17 CLABSIs (50%); two occurred in femoral access. The mean duration from insertion was 38.7 days (median 15; IQR 9–26). Among patient factors, immunosuppression and hyperglycemia, 19 each, were the most common (55%), followed by PN and CKD, 17 each (50.0%), AKI (n=16, 47.1%), and HAI’s (n=13, 38.2%). Among the 10 factors mentioned above, multiple occurred in conjunction. Three or more were present in 22 CLABSIs (64.7%). Conclusions: These findings reflect the complexity of CLABSIs with multiple patient and hospital factors influencing incidence. Hyperglycemia, CKD, AKI, and HAI’s appear to be associated with incidence of CLABSIs, but require further investigation. These findings also suggest that there is a high-risk patient population that is CLABSI susceptible, raising the question - are there exceptions to never?

816 CRITICAL CARE ROUNDS: STANDARDIZING KEY ELEMENTS TO ENSURE SUCCESS Amy O’Brien, Kristin O’Reilly, Nicholas Demosthenes, Veronica Kelly, Lynn Mackinson, Juliann Corey, Jennifer Stevens, Michael Cocchi Learning Objectives: Interdisciplinary rounds are important for information and care plan synthesis, development, and communication for critically ill patients. Intensive care unit rounds consist of multiple complex interactions during which inconsistent communication of information and variable inclusion of key stakeholders can lead to patient harm. The aim of this project was to create standard outputs of rounds across all ICUs at an academic medical center. Methods: We completed a staff satisfaction survey (236/900 respondents) and in-person observations (120 patient presentations) to understand the current state of rounds in the ICU. We held a multidisciplinary retreat with lean methodology to conduct a gap analysis between current state and ideal state. The group designed 4 high impact, low difficulty interventions to employ as a ‘toolkit’ to improve the state of rounds: establish/communicate order of rounds visually; implement a ‘hard stop’ for nursing input; and summarize the plan for the day before moving on to the next patient. We then conducted post-observations (286 patient presentations) and a follow up staff satisfaction survey (203/900 respondents, 5-point Likert scale) to measure the change. Student’s t-tests were used to compare pre and post intervention. Results: Following the redesign of rounds, nurses demonstrated greater inclusion and involvement. Nurses were present for the entirety of rounds 85% of the time, up from 66% (p<0.05) and provided input 80% of the time, increased from 40% (p<0.05). When the care plan was summarized for each patient post intervention, a clarification or miscommunication was identified 50% of the time and a significantly different number of providers felt the plan was communicated to the entire team (mean score 3 versus 3.2 before and after, p<0.001). There was no significant change in how often staff reported including families on rounds or communicated the plan to them. Conclusions: A focused intervention that targets key aspects of ICU rounds can increase nursing engagement and contribution and improve communication amongst clinical team members.

817 ASSESSING VENTILATION AT PACU DISCHARGE, AFTER OPIOIDS Williams George, Peggy Duke, Ed George Learning Objectives: Opioid-based pain management balances analgesic efficacy with adequate ventilation. Recognition of early signs of respiratory depression in non-intubated patients has been challenging. Current practice relies on assessment of respiratory rate (RR) without measuring respiratory volumes. We assessed the effectiveness of RR monitoring to reflect respiratory depression prior to discharge from the PACU with a non-invasive respiratory volume monitor (RVM) that quantitatively measures minute ventilation (MV), tidal volume (TV) and RR. Methods: In an observational study on 204 patients (mean age: 65.8,
19–89 yr; mean BMI: 29.8, 19–49 kg/m2) in the PACU after joint replacement, we collected continuous RR, TV & MV data from a bio-impedance RVM (Exspirion, Respiratory Motion, Waltham, MA). We analyzed 30-second data segments within 30 min of PACU discharge. Predicted MV (MVPRED) was calculated for each patient based on Body Surface Area (BSA). LowMV was defined as MV<40% MVPRED and LowRR as RR<6 breaths/min. Sensitivity and specificity analysis correlated LowRR with LowMV. Results: Within ½ hour of discharge, 11,686 paired RR & MV measurements were collected. LowMV occurred 17.3% of the time and 67% of all LowMV episodes were concentrated in 39 patients (19.4% of the cohort). Importantly, LowRR coincided with only 15.7% of all LowMV episodes; a LowRR alarm set to trigger below 6 breaths/min would miss 84.3% of LowMV episodes. 71.5% of all LowRR events coincided with LowMV, yielding a 15.7% sensitivity & 98.7% specificity. Conclusions: LowRR alone does not accurately reflect LowMV and is insufficient for assessing respiratory status. In many patients LowMV is primarily related to a decrease in TV and not RR. RVM provides non-invasive, real-time measurements, which can better assess the adequacy of ventilation when considering discharge or transfer to a lower-acuity setting, preventing prolonged PACU or ICU stays, reducing extra healthcare costs, and reducing life-threatening respiratory complications.

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INCIDENCE OF ATYPICAL ANTIPLATFORMOTIC PRESCRIPTION AT TIME OF ICU AND HOSPITAL DISCHARGE
Matthew Korobey, Jacklyn O’Brien, Farid Sadaka, Upaga Kompalli

Learning Objectives: Atypical antipsychotics (AP) usage for delirium management has become common. Despite increased AP use, there has been little discussion regarding therapy tapering or discontinuation as delirium resolves. Emphasis on rapid patient throughput in the ICU fosters quick transfer to a lower level of care. This combination may lead to extended exposure to atypical AP during admission. Additionally, patients may be discharged on these medications and lose the opportunity to taper or discontinuse due to follow-up, potentially increasing the risk of toxicity. An investigation of the number of patients not on atypical AP at admission who are discharged from the ICU and hospital on these medications is warranted. Methods: The electronic medical record was queried for quetiapine (QT) orders starting in the ICU. Records were reviewed for pre-admission AP medication prescriptions. Patients on AP medications at admission were excluded. Data collected included demographic information, initial dose of QT, documentation of delirium, and continued prescription of QT at ICU and hospital discharge, as well as ICU and hospital length of stay (LOS). Results: A total of 157 charts were reviewed; 73% of patients had documented delirium/ agitation. Of these, 133 survived the ICU and were transferred to a lower level of care with 104 (78%) moved with a prescription for QT (median dose 25mg/day). A total of 130 patients survived hospitalization, with 54 (41.5%) patients being discharged with a prescription for QT (median dose 25mg/day). There was no associated difference in ICU LOS between patients transferred on QT and those without such prescription (9.7 vs 10.1 days). Per Mann-Whitney U test, a trend towards statistical significance was noted in hospital LOS between patients discharged on QT and those without such prescription (17.4 vs 14.2 days; p=0.054). Conclusions: Delirium is common in the ICU and atypical AP medications are a mainstay of delirium management. Lack of accurate medication reconciliation at transfer and discharge may lead to unintentional continuation of these medications beyond the duration of clinical appropriateness.

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A NOVEL DECISION SUPPORT SYSTEM FOR OPTIMIZATION OF GLYCEMIC CONTROL IN THE CRITICAL CARE SETTING
Karina Castellon Larios, Scott Pappada, Alberto Uribe, Thomas Papadimos

Learning Objectives: Numerous studies have shown that avoidance of hyperglycemia and hypoglycemia throughout a patient’s length of stay in the ICU serves to reduce morbidity and mortality. Optimization of glycemic control in this setting is extremely difficult, requires significant time, resources, and increases workload amongst healthcare providers (HCPs). This project summarizes the development of a decision support system (GlyCU) designed with advanced predictive models capable of predicting a complete trajectory of glucose values 75 min ahead of time. Methods: Fifty nine patients admitted to the ICUs at The Ohio State University Wexner Medical Center with initial blood glucose value >150 mg/dl were enrolled in this investigation. Each patient was connected to a continuous glucose monitoring (CGM) device (Medtronic CGMS Pro) for the initial 72 hr of their ICU stay. Electronic medical records (EMR) and CGM data for the patients were used to develop neural network-based predictive models designed to forecast a complete trajectory of glucose values across a 75 minute prediction horizon. Data from 10 random patients was omitted from model training sets and used to evaluate predictive model performance (simulated real-world use). Model performance was evaluated via Clarke Error Grid Analysis (CEGA), and via calculating the mean absolute difference percent (MAD%) between predicted glucose values and reference point of care (POC) blood glucose values taken at the bedside. Results: The MAD% of predictions generated by GlyCU’s predictive models with respect POC blood glucose values ranged from 10.9–15.6% across the model prediction horizon. CEGA revealed that 98.7% of predictions fell within regions A & B of the error grid and would not lead to adverse therapy recommendations. Conclusions: GlyCU and its advanced predictive models will serve to provide HCPs in the critical care setting a useful decision aide, support optimization of glycemic control, and enhancement of patient safety and care. Future efforts will surround optimization of these models and overall GlyCU system functionality.

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FLAWS IN CLINICAL ALARM SAFETY STUDIES: THE VALUE OF MIXED METHODS AND OBJECTIVE ALARM DATA
Aziieh Sowan, Charles Reed, Albert Tarisita, Tiffany Gomez

Learning Objectives: Alarm Systems Safety is a recent National Patient Safety Goal. The majority of alarm studies focused on the effect of adjusting alarm algorithms on alarm rate and used observation techniques or surveillance cameras to collect alarm data. Besides alarm rate, examining the effect of adjusting alarm algorithms on nurse attitude toward alarms and alarm fatigue is essential to evaluate improvements in alarm systems safety. Additionally, the validity and cost of observation techniques and annotation of recorded data can be problematic. Furthermore, monitor configuration, a major determinant of alarm rate, has rarely been addressed in alarm studies (e.g., latching versus non-latching alarms, auto measurement mode, and priority chain of alarm display). A multidisciplinary team, using mixed methods of (1) a change of 17 alarm algorithms of cardiac monitors and (2) in-service nursing program on cardiac monitor use, examined the effect of these two initiatives on (1) reducing alarm rate by using objective alarm dataset and (2) nurse attitude toward alarms and alarm fatigue. Methods: In a transplant/ cardiac ICU (N=39 nurses), we retrieved the cardiac monitors’ logged alarm data for 10-weeks before and 10-weeks after the interventions. Nurses’ attitudes and practices were measured using an adapted Health Technology Foundation National Alarm Survey (2011). Results: Target alarms were reduced from 87.88 alarm/pt day to 59.21 alarm/pt day (P<0.001). The pre and post survey showed unfavorable attitude toward clinical alarms and a very high level of alarm fatigue (P<0.05). Narrative data attributed alarm fatigue to poor usability of cardiac monitors and unit-related factors, e.g., absence of policies on alarm management, unit layout, and the need for further training. Monitor configuration was a key for the number of alarms. Conclusions: The use of mixed method approach and objective alarm data support the complexity of alarm management in ICUs, the fact that changing alarm algorithms may not necessarily improve alarm fatigue and safety, and the need for usability testing and special in-service on complex devices.

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AUTOMATED ELECTRONIC SURVEILLANCE OF ELECTRONIC MEDICAL RECORDS FOR SHOCK IN PEDIATRIC INPATIENTS
Adalberto Torres, Laura Goyack, Joe Negrón, Jim Miller, Gang Ye, Stephen Lawless

Learning Objectives: The Clinical Logistics Center (CLC) at Nemours Children’s Hospital (NCH), a remote monitoring unit of every inpatient at NCH, utilizes a user-defined decision support programming, automated electronic surveillance software system (Epic Monitor, Madison, WI) to look real time into the electronic medical records (EMR; Epic Hyperspace, Madison, WI), of current inpatients for indicators of infection or worsening clinical condition. A new decision support program application was created to instantly alert providers
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PREDICTING RISK PROGRESSION TRAJECTORY FOR CARDIORESPIRATORY INSTABILITY IN MONITORED PATIENTS
Lujie Chen, Artur Dubrawski, Marilyn Hravnak, Gilles Clermont, Michael Pinsky

Learning Objectives: Evolution of risk of cardiorespiratory instability (CRI) is a heterogeneous and dynamic process. In our prior work, we characterized it and discovered a finite number of distinct risk trajectory types. In this study we seek to predict these types in advance of the onset of overt CRI. Methods: From a 24-bed step-down unit, continuous vital sign (VS) data were collected over 3mo for heart rate (HR), respiratory rate (RR) and oxygen saturation (SpO2) at 1/20Hz, and intermittently recorded systolic (SysBP) and diastolic (DiaBP) blood pressure. CRI alerts were identified through an expert panel, followed by constructing a data set with 158 patients with CRI and 79 without. Trajectory analysis yielded 5 statistically distinct CRI risk evolution groups (persistently high [HIGH], persistently low [LOW], early-onset [EARLY], late onset [LATE], transient risk [TR]). For each patient, we extracted numeric features from 1hr of VS time series and trained Random Forest models to predict their CRI risk group at 1, 2,… up to 30min before overt CRI onset. Results: The 10-fold cross-validated Area Under Receiver Operating Curve (AUC) showed varied temporal predictive trends. For the HIGH group, AUC is constantly high at 87% (SD 1%), for the LOW group it starts at 76% at 30min and steadily increases to 88% at 1min before CRI. For the EARLY group, the AUC starts at 65%, and steadily increases to 85% at 10min before CRI. For the remaining LATE and TR groups, it starts low at 65% and rises slightly to 70% by 15min before CRI. Conclusions: Predictive modeling identifies patients in the HIGH and LOW CRI risk trajectory groups even at 30min lead time with high confidence. While discrimination for other groups varied with lead time, they all showed improved predictive value as they approached onset of CRI. This insight can be used in building robust predictive algorithms that consider heterogeneity and dynamic properties of CRI risk evolution reflected in the patient monitoring data. FUNDING:NIH R01NR013912, NSF 1320347.

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THE EFFECT OF AN ICU PATIENT SAFETY PROGRAM ON STAFF ENGAGEMENT AND PERCEPTIONS OF SAFETY
Denise Barchas, Kendall Gross, Charlotte Garwood, Hildy Schell-Chaple, Jennifer Schwartz, Angela Lipshutz, Michael Gropper, UCSF Critical Care Innovations Group

Learning Objectives: The Comprehensive Unit-Based Safety Program (CUSP) engages frontline clinicians and staff in patient safety and quality improvement (QI). CUSP is associated with improved job satisfaction, working conditions, and safety climate in the ICU. We aim to describe our institution’s experience implementing CUSP, and its effect on clinician/staff engagement and perceptions of safety. Methods: We implemented CUSP in a 32-bed medical-surgical ICU in November 2014. Prior to implementation, all staff were invited to attend safety training sessions. Our CUSP program includes monthly transdisciplinary meetings and workgroups to address defects and collaborate on safety projects. ICU clinicians and staff were invited to submit defects during training, at monthly meetings, and at pre-specified locations in the ICU. We administered the Quality Improvement in the Organization survey to clinicians and staff 4 mo before and after CUSP implementation. This survey assesses attitudes about QI via 34 questions on a 5-point Likert scale. We dichotomized and compared responses using the chi-squared test. Results: CUSP training was attended by 208 (65%) clinicians and staff over 31 training sessions. Seven CUSP team meetings were attended by 172 clinicians and staff over 8 mo. Participants identified 148 potential defects. Surveys were completed by 334 staff (pre=186, post =148, overall response rate 34%). Clinicians and staff felt more empowered to identify and act on QI issues after CUSP (pre-CUSP 39% vs. post-CUSP 48%, p=0.02). Clinicians and staff also felt increasingly educated and trained to identify and act on QI efforts (47%, vs. 62%, p=0.005), but the overall philosophy of continuous QI in the ICU did not show significant improvement (35% vs. 43%, p=0.15). Conclusions: Implementation of an ICU CUSP program is feasible and resulted in increased clinician/staff engagement in safety efforts and improved attitudes about QI.

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COMPLICATIONS OF TRANSSESOPHAGEAL ECHOCARDIOGRAPHY IN LIVER TRANSPLANTATION SURGERY: OUR EXPERIENCE
Ashish Khanna, Abraham Sonny, Amanda Naylor, Bianca Nguyen, Matthew Hutcherson, Jacek Cywinski, Samuel Irefin, Joti Mucci

Learning Objectives: Orthotopic liver transplantation (OLT) is associated with significant hemodynamic changes during the intra-operative period. Transesophageal echocardiography (TEE) during surgery can provide critical information on myocardial function and volume status in these patients. However, dilated esophageal varices present in patients with end-stage liver disease (ESLD) could increase the risk of bleeding, and more so, in association with the coagulopathy of inpatients who have signs consistent with shock and/or sepsis. Hypothesis: Patients with sepsis will have higher shock tool scores. Methods: This was a prospective observational pilot study using a convenience sample of every inpatient at NCH over the course of five weeks. The program was based upon the shock tool being used in the AAP Septic Shock Collaborative being adopted to electronically detect shock automatically in the EMR. For 12 hr per day, one of four data collectors recorded when a patient was listed in Epic Monitor with a potential for sepsis (a shock tool score ≥ 25). The patients’ EMRs were then retrospectively reviewed for documentation of sepsis or suspected sepsis in the daily progress notes or problem list. A least square difference test was performed to assess for correlation between score and sepsis and score and location. Results: There were 70 hospital admissions with median scores of 30, range of 25 – 75. There were 47/70 (6%) cases of sepsis and 5/7 (7%) cases of suspected sepsis. Shock tool scores were ≥ 45 in 4 patients with documented sepsis. Location of patients when first achieving scores ≥ 25 was the general wards (40/70, 57%), ICUs (23/70, 33%), ED (6/70, 9%), and transport (17/70). The sepsis/suspected sepsis patients had a higher score than the non-sepsis patients (12.5, 95% CI 6.5 – 18.5; p <0.001) and patients in non-general ward locations had a higher score than patients in general ward locations (10.9, 95% CI 4.9 – 17; p<0.001). Conclusions: This electronic shock tool has the potential to identify inpatients with shock and/or sepsis as signs manifest.
associated with the transplant procedure. Our study was aimed as a comprehen-
sive descriptive analysis of all complications associated with an intra-operative TEE during OLT at a high volume transplant center. Methods: All patients from March 2005- September 2014 who underwent TEE placement during OLT at the Cleveland Clinic, were included in this retrospective analysis. Major upper GI bleeding for the purposes of this analysis was any bleeding that occurred within the first 48 postoperative hr that needed one /more units of blood transfusion for resuscitation and was described as likely attributable to the TEE probe by the attending intensivist in the EMR. Descriptive statistics were performed using SPSS (SPSS Inc. IBM). Associations were not calculated due to the small inci-
dence of complications. Results: Of the 1,278 patients who underwent OLT at our institution form 03/2005 to 09/2014, 386 patients had an intraoperative TEE during OLT. Esophageal and gastric varices, were present in 238 (62%) and 19 (5%) patients respectively. 44 (11%) of the patients had a pre-transplant handring procedure for the varices in the 6 mo prior to surgery (Median duration 153 days pre-surgery). Odynophagia and dysphagia were seen in 5 (0.8%) and 27 (7.0%) of our patients respectively. Minor oropharyngeal bleeding was seen in 15 (3.4%) patients. Only 1 (0.25%) patient had a major upper GI bleed and a possible esophageal perforation secondary to the TEE procedure. Conclusions: Our single center experience clearly shows that an intraoperative TEE is a safe and feasible procedure during orthotopic liver transplant surgery.

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EFFECT OF A “RE-INVIGORATED” RRT ON IN-HOSPITAL CARDIOPULMONARY ARREST RATES AND MORTALITY
Ryan Magnuson, David Lent, Anthony Pietropaoli, Mark Ott, E. Kate Valcin, Samad Rasul, Michael Apostolakos
Learning Objectives: Rapid response teams (RRTs) were created to promote early recognition of clinically deteriorating patients leading to prompt assessment and early intervention by a multi-disciplinary healthcare team. The ideal activation timing is within 4-6 hr of initial signs of deterioration. The effectiveness of RRTs in reducing cardiopulmonary arrests and in-hospital mortality remain unclear. To evaluate the effectiveness of a “reinvigorated” RRT to reduce hospital-wide cardiopulmonary arrests and hospital mortality in an 830 bed tertiary academic medical center. Methods: The RRT re-invigoration occurred from May through July 2011 and included formation or a resuscitation committee, addition of dedicated RRT providers and nurses, standardization of triggers/responses, and faculty/staff education. RRT data, cardiolpulmonary arrests, and hospital mortality were retrospectively reviewed for the prior year prior to and three years after intervention. Results: RRT activation rates increased tenfold following re-invigoration (3.87 per-intervention vs 30.98 post-intervention per 1000 patient discharges, p<0.001). There were no significant dif-
f erences in cardiopulmonary arrest rates pre- and post-intervention (6.18 vs 6.13 per 1000 discharges, p=0.946). However, the ratio of codes occurring outside the ICU divided by those occurring inside the ICU significantly decreased from 0.50 to 0.42 (p<0.05). There was a trend toward a higher hospital mortality rate in the year after vs before the intervention (3.98 vs. 3.60 per 1000 discharges, p=0.052). Conclusions: The “reinvigorated” RRT failed to show a reduction in hospital-wide code rates or mortality despite a marked increase in RRT activation. How-
ever, this intervention was associated with a higher proportion of codes occurring in the ICU as opposed to the general ward. This finding supports the notion that RRTs promote recognition of clinically unstable patients and promote their trans-
fer to a higher level of care. This may improve patient, family, and staff satisfaction despite lack of improvement in other clinical outcomes.

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OUTCOMES OF EMERGENCY DEPARTMENT LENGTH OF STAY IN MECHANICALLY VENTILATED PATIENTS
Nicholas Pozzesere, Brett Lindgren, Nicolas Castellano
Learning Objectives: Previous large-scale studies have shown that delayed trans-
fer time of critically ill patients from the emergency department results in increased ICU length of stay (LOS) and mortality rates. This study aims to determine if delayed transfer of > 6 hr results in increased mortality rates, ICU LOS, or hospital LOS within a single community hospital. Methods: Ret-
rospective chart review of patients placed on mechanical ventilation admitted to a community teaching hospital, Mercy Philadelphia Hospital, between May 2012 and August 2014. Patients with chronic tracheostomy and/or immediately postoperative were excluded from this study. Patients were divided into two groups: ED length of LOS ≥ 6 hr vs LOS < 6 hr. Patient demographics, LOS, and mortality rates were analyzed using chi-square and unpaired t-tests. Results: 210 patients were included in this study: 165 in Group I (LOS < 6hr) and 45 in group II (LOS > 6 hr). Mean age was similar (64 ± 18 vs. 66 ± 14 yr, groups I and II respectively, p = NS). Group I and II had similar severity of illness (APACHE II (30.82 ± 8.41 vs 30.27 ± 7.25, p = NS) and SOFA (8.82 ± 3.50 vs 8.09 ± 3.06, p = NS)). ICU LOS and Hospital LOS were similar between group I and group II (5.78 ± 8.84 vs 5.31 ± 3.83 and 8.4 ± 10.63 vs 8.9 ± 8.63, p = NS). Average ED LOS for survivors vs in hospital deaths was (278.46 ± 267.87 min for survi-
ors vs. 313.04 ± 291.27 min, p < NS) Survival to hospital discharge was higher in Group I compared to Group II (80 % vs 71.11 %, p = 0.20), however, did not reach statistical significance due to sample size. Conclusions: In this community hospital setting the group with Emergency Department LOS less than 6 hr had a trend towards more favorable outcomes and greater survival benefit. Larger stud-
ies with greater sample sizes would be needed to detect a significant difference in clinical outcomes.

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SEPSIS AND SHOCK RESPONSE TEAM: A RECIPE FOR HIGH-
QUALITY SURVIVING SEPSIS GUIDELINES IMPLEMENTATION
Pablo Moreno-Francisco, Ami Geel, Michael Maniacci, Ehsan Shirazi, Angela Starbuck, Kristine Thompson, Sandra Booth, Fesic Eimir
Learning Objectives: The incidence of septic shock has continued to rise over the last several decades with 215,000 deaths reported nationally. The Surviving sepsis campaign outlines treatment guidelines (SSCG) for physicians designed to decrease mortality through consistent application of a 7-element bundle. Guide-
line adherence continues to vary among hospitals. Methods: A quasi-experimen-
tal time-series evaluating compliance with the bundle elements prior to, during and after interventions intended to improve the process. Interventions included the development and implementation of a computerized sepsis sniffer algorithm, creation of a multidisciplinary Sepsis and Shock Response Team (SSRT), and standardized resuscitation with decision support tools imbedded in the EMR to improve compliance with SSCG bundle elements. Enhanced teamwork between the departments of Emergency Medicine, Critical Care and Hospital medicine was key to the success of the project. This was achieved through the use of Aware-
ness-Desire-Knowledge-Ability-Reinforcement principles. Results: A baseline retrospective review of 25 patients who presented to the emergency department (ED) with sepsis, severe sepsis or septic shock revealed a 0% all-or-none compli-
cance with elements of the SSC bundle. Prospective data after our interventions showed an improvement to 35% at 3mo (n=34) and 51% at 10 mo (n=55). From a total of 116 patients who had SSRT activation between September 2013 and September 2014, 18 patients died, which translates into 15.52% mortality. According to the University Healthcare Consortium (UHC) Clinical Database, mortality data for our institution before and after study period improved, with the overall observed/expected sepsis mortality index from 1.38 pre-SSRT to 0.68 post-SSRT implementation Conclusions: Through QI methodology and the Failure-Mode-Effect-Analysis tool, we were able to develop high-impact inter-
ventions to improve reliability and resilience to SSCG bundle adherence with an improvement from 0% to 51%. In our institution this translated to a decrease in overall observed/expected sepsis mortality index.
establishing inter-rater reliability. 12 Ideal Team Tasks were identified by a hospital quality improvement committee and event observations included tracking of compliance with these tasks (e.g., whether or not role clarity was established). Team performance was measured during each event using the Team Emergency Assessment Measure tool (2010) with an additional overall global rating ranging from 0-worst to 10-best. Results: 51 RRT events were observed and the overall rating was fair (average=6.58). The number of Ideal Team Tasks completed (average=6.58) was significantly positively correlated with global rating (r=0.03). Nurses activated the team in 45% of events, but the licensed independent practitioner presented the patient case in all events. The ICU fellow introduced themselves in 45.2% of cases and the team in only 9.68% of cases. A complete situation, background, assessment, and recommendation were presented by the primary team in 16% of events. The ICU fellow stated a robust plan in 63.2% of events, but asked the primary team if they had questions in only 22.6% of events. When parents were present, the ICU fellow explained the plan to them in 71.4% of cases. However, when parents were not present, the ICU fellow assigned someone to update the family in only 22.2% of cases. Conclusions: Our results demonstrate support for the use of the 12 Ideal Team Tasks in team training given the relationship between task completion and global rating. Improved performance through a training program based on these tasks and Crew Resource Management principles is currently being sought.

830 PERIOPERATIVE ANTIBIOTICS: STILL ROOM FOR IMPROVEMENT Nicholas Watson, Jatturong Wichianson, Peter Milonas, Ashley French Learning Objectives: The Surgical Care Improvement Project (SCIP) contains elements aimed at preventing surgical site infections with compliance linked to reimbursement. However, clinical practice guidelines for antimicrobial prophylaxis in surgery include many procedures that are not part of SCIP, and therefore may not be subjected to the same pressures for compliance. The purpose of this quality study was to evaluate the use of perioperative antibiotics in non-SCIP procedures to identify areas for improvement. Methods: We retrospectively reviewed the medical records for 2539 consecutive patients undergoing operations performed at a tertiary hospital over 63 days in 2014. Various perioperative data were collected, including billing codes and antibiotic details (selection, timing, dosing). Raw numbers, percentages, and nominal data are reported. Results: Of the 2539 operations analyzed, 1750 (68%) were non-SCIP. Of these, two categories were identified: antibiotics indicated AI (n=1448) and antibiotics NOT indicated ANI (n=248). These were analyzed according to the American Society of Health-System Pharmacists guidelines. Al group had an antibiotic administration error in 533 cases (37%). 354 of erroneous cases (24%) received no antibiotic, overwhelmingly due to patient factors as the indication for perioperative antibiotics (as opposed to the procedure alone being the indication). 179 of erroneous cases (12%) received an incorrectly administered antibiotic, primarily due to errors in dosing and selection. The ANI group had antibiotics inappropriately administered in 86 cases (35%), commonly in extracorporeal shock wave lithotripsy and surgical laparoscopy with removal of adnexal structures. Further analysis identified ceftazolin as the most commonly used antibiotic when there was no indication and levofloxacin as the most commonly incorrectly dosed. Conclusions: We have shown trends in antibiotic administration for non-SCIP surgeries. The retrospective nature of the data is hypothesis-generating rather than conclusive, but indicates areas where efforts at improvement would be best focused.

831 FAILURE TO RESCUE AFTER RAPID RESPONSE TEAM ACTIVATIONS IN SURGICAL PATIENTS Ara Ko, Lia Aquino, Edward Seferian, Gail Grant, Rodrigo Alban Learning Objectives: Failure-to-rescue (FTR) events are defined as complications leading to mortality in surgical patients and are tracked as patient safety indicators. Hospitals that utilize Rapid Response Teams (RRT) have shown decreased rates of respiratory and cardiac arrest outside ICUs but data is insufficient to show mortality reduction, particularly in post-operative patients. We analyzed clinical characteristics of surgical patients with RRT activations and subsequent FTRs, to identify potential opportunities for mortality prevention.

Methods: Morailtials on patients with RRT activations within 30-days of surgery were analyzed from August 2012 to December 2014 at a large academic medical center. Data collected included demographics, type of surgery, physiologic variables, and reasons for RRT and FTR events. All cause mortality, ICU length of stay (LOS) and total hospital costs were determined. Results: 223 patients had RRT activations within 30-days of a surgical procedure. Of these, 47 had FTR events leading to mortality (21.2%). 21 were excluded due to incomplete data. The 26 patients included for analysis had procedures involving general surgery (53.8%), neurorurgery (19.2%), thoracic (11.5%), or orthopedics (7.7%). The most common reasons for RRT activations were respiratory events (34.6%), altered mental status (26.9%) and hypotension (23.1%). FTR related mortality events were associated with sepsis (61.5%), acute renal failure (50%), pneumonia (46.2%), neurologic complications (38.5%), deep vein thrombosis/pulmonary embolism (23.1%), shock/cardiac arrest (19.2%), and GI bleed (19.2%). Average ICU LOS was 16 days with an average total cost per patient of $176,021. Conclusions: FTR events leading to mortality are relatively common in surgical patients who undergo RRT activations. The majority of activations are related to respiratory events and altered mental status. Further analysis comparing survivors and non-survivors after RRT activations is recommended to better understand risk factors for deterioration and FTR.

832 IMPROVING THE PICU DISCHARGE PROCESS Mihaela Damian, Lauren Destino, Pat Hock, Luzelle Matias, Paul Sheark Learning Objectives: Every year, approximately 30% of admissions to Lucile Packard Children’s Hospital Stanford are discharged (de) to home directly from the PICU. In a PICU setting, the mindset, training, and resources for an ideal de may not be present, resulting in confusion, delays, and provider dissatisfaction. Our goal was to improve provider satisfaction with the discharge process by implementing several discharge related best practices. Methods: A thinking from Lean methodology was used to frame the problem. Miscommunication, ineffective coordination and inefficient flow were identified as major contributors to dissatisfaction among all providers. A key driver diagram was formulated identifying the importance of early identification of patient de readiness, coordination of services, communication of the de plan to all staff and families and adherence to de standard work. We implemented several interventions including 1) increasing the accuracy of discharge predictions, 2) discussing discharge goals for all patients on daily rounds and night rounds, 3) developing daily case manager rounds where discharge was a focus topic, and 4) an RN checklist with items focused on discharge readiness and planning. DC accuracy, provider and patient satisfaction were followed continuously over time. Results: From Oct. 2014 to Apr. 2015 dc accuracy increased from 21% to 43%, Provider satisfaction increased from 2.8 to 3.8 (1- very satisfied to 5- very satisfied). Importantly there were no very dissatisfied or dissatisfied providers by Apr. 2015 (25% pre, 16% during and 0% post). In addition, readmission rate and hospital stay decreased (6.3 pre vs 2.1 post readmissions/100 dets, 3.95 pre vs 3.5 hospital days post). Families were similarly satisfied with the overall de process (4.53 pre vs 4.42 post), however they reported increased awareness of de goals (4.26 pre vs 4.67 post). Conclusions: Predicting and planning for PICU discharge is possible while leading to safer discharges with improved provider satisfaction while decreasing readmission rate.

833 WHICH RAPID RESPONSE TRIGGERS PREDICT ICU ADMISSION? AN OBSERVATIONAL COHORT STUDY Markos Kashiorius, Sammy Pedram, Shannon Lubin, James Tormey, Curtis Seusler Learning Objectives: Hospital-based rapid response systems aim to provide timely evaluation, treatment and rapid escalation of care, when necessary. Delays in appropriate ICU admissions have a detrimental impact on mortality, whereas overloading the ICUs with unnecessary admissions may result in unpredictable costs without clear outcome benefits. There is a lack of evidence on which rapid response activation triggers have pragmatic impact on escalation of care. The objective of this study was to identify which rapid response activation triggers effectively predict ICU admission. Methods: This is an observational cohort study, which followed all rapid response team (RRT) activation calls between
January and November 2014, in an academic tertiary care center. The RRT activation symptoms, sign and markers were collected in real time. The triage decision for RRT evaluation was recorded. Multinomial logistic regression was employed to identify the adjusted odds ratio for ICU admission per each activation trigger. **Results:** During the study period, we performed 1,229 calls for 944 unique patients. The following activation triggers were found to be positive or negative predictors of ICU admission. Surgical vs. medical service (Odds Ratio [OR] 1.66, Standard Error [SE] 0.33, P < 0.01), chest pain (OR 0.42, SE 0.12, P < 0.01), respiratory distress (OR 2.67, SE 0.94, P < 0.01), tachypnea (OR 1.95, SE 0.6, P < 0.001), dyspnea (OR 2.12, SE 0.44, P < 0.001), decreased oxygen saturation (OR 2.0, SE 0.35, P < 0.001), change in mental status (OR 1.84, SE 0.37, P < 0.01), airway bleeding (OR 5.51, SE 4.54, P = 0.03) uncontrolled bleeding (OR 4.24, SE 2.01, P < 0.01) problems with IV access (OR 1.96, SE 0.39, P < 0.001). **Conclusions:** Our study suggests that some clinical triggers are more powerful than others in predicting ICU admission. Further understanding on which rapid response triggers are associated with ICU admission, may help in the design of improved prediction algorithms and further facilitate prompt triage and inpatient rescue efforts.

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**DISCREPANCIES IN MEASURING BLADDER VOLUMES WITH BEDSIDE ULTRASOUND AND BLADDER SCANNING IN THE ICU**

Marilyn Schallion, Donna Prentice, Carrie Sonna, Enyo Ablordepepy, Bradford Bemiss, Jesse Mecham, Brian Wessman, Warren Isakov

**Learning Objectives:** ICU patients are at risk for catheter associated urinary tract infection. Earlier removal of catheters may be possible if accurate measurement of bladder volume post removal can occur. The purpose of this study was to compare measured bladder volumes with a 3D ultrasound (US), bladder scanner (BS), and urine volume (UVol) in ICU patients with low urine output receiving dialysis or patients with suspected urinary catheter obstruction. **Methods:** A physician trained in US and an advanced practice RN trained in BS measured the BS measured bladder volume; each blinded to the other person's measurement. Device used first (US or BS) alternated each day. Results of each measurement were documented and the ICU team determined need for intermittent catheterization or treatment for suspected obstruction. **Results:** Thirteen patients with 52 paired measurements were obtained, reported in ml. US measurements were mean volume of 71 ± 125.6 (range 1.7 – 660) compared to 114.3 ± 150.1 (0 – 529) with BS. Mean difference between US and BS was -43.7 (range of -510 to 598). The correlation between measurements was r = 0.214 (p = 0.128). On 8 occasions, a catheterization or voiding occurred for UVol measurement. The difference in US-UVol was mean -43.7 (range of -510 to 598). The correlation between measurements was r = 0.214 (p = 0.128). On 8 occasions, a catheterization or voiding occurred for UVol measurement. The difference in US-UVol was mean -43.7 (range of -510 to 598). The correlation between measurements was r = 0.214 (p = 0.128). On 8 occasions, a catheterization or voiding occurred for UVol measurement. The difference in US-UVol was mean -43.7 (range of -510 to 598). The correlation between measurements was r = 0.214 (p = 0.128). On 8 occasions, a catheterization or voiding occurred for UVol measurement. The difference in US-UVol was mean -43.7 (range of -510 to 598). 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were compared. **Results:** Post-pathway patients (n=498) had lower MPEDS score than pre-pathway patients (n=921) (2 vs. 3, p <0.01). Post-pathway patients used more HFNC compared to pre-pathway patients (17.3% vs. 2.1%, p <0.01) but rates of noninvasive positive pressure ventilation (4.2% vs. 2.4%, p =0.06) and invasive ventilation were similar (1.2% vs. 0.8%, p=0.40). Hospital Length of Stay (LOS) and ICU LOS were similar in pre- and post-pathway groups (1.8 vs. 1.7 days, p=0.10; 2.4 vs. 2.4 days, p=0.95). Post-pathway patients had a higher rate of transfer to the ICU than pre-pathway patients (9.8% vs. 3.2%, p=0.001). Average post-pathway hospitalization costs were higher than pre-pathway hospitalization costs (estimated cost difference $1243, 95%CI 318–2163). Respiratory care (estimated cost difference $249, 95%CI 149–356) and room and board costs ($1233, 95%CI 546–1844) were significantly higher in the post-pathway cohort. For patients started on HFNC in the post-pathway cohort, those directly admitted to the ICU had shorter LOS compared to those admitted to the ward and transferred to the ICU (4 vs. 7 days, p=0.01). **Conclusions:** Implementation of the HFNC pathway for bronchiolitis did not change hospital or ICU LOS but resulted in higher costs. This may be due to increased use of HFNC on the wards in lower acuity patients and the increased percentage of patients transferred to the ICU. Among patients initially started on HFNC who required the ICU, those directly admitted to the ICU had shorter LOS. Future work will investigate drivers of differences in cost.

**838 INTROPERATIVE LUNG-PROTECTIVE VENTILATION: ANESTHESIA PROVIDER ATTITUDES AND PRACTICE**

**Cassandra Barry, Judith Strong, Gretchen Schultz, Sean Josephs**

**Learning Objectives:** Intraoperative lung-protective ventilation (ILPV) with lower tidal volumes reduces pulmonary complications. As part of a quality improvement project aimed at improving anesthesia provider adherence to ILPV, a survey was administered to improve understanding of how change interventions, including implementation of a departmental ILPV policy, affected provider attitudes and practice. **Methods:** Interventions occurred October 2014 through February 2015. In May 2015 an electronic survey was distributed with 5-point Likert scale items phrased to assess provider attitudes “currently” and “prior to” implementation of the ILPV policy. Topics assessed included whether providers had knowledge of literature supporting ILPV and whether personal ventilator practice was consistent with ILPV. Responses were analyzed accordingly using the Wilcoxon signed rank test and the Mann-Whitney test. **Results:** The survey return rate was 48% (95 of 197 recipients). Respondents were 44% (42/95) physicians and 55% (52/95) non-physicians. **Conclusion:** Medians Likert scores were higher for having knowledge of literature supporting ILPV (5 vs 4; P<0.001) and for having practice consistent with ILPV (5 vs 4; P<0.001) in paired analysis comparing items phrased as “currently” vs “prior to” the ILPV policy. Unpaired analysis showed median Likert scale scores for physicians vs non-physicians were higher for having knowledge of literature supporting ILPV for items phrased as “prior to” the policy (5 vs 4; P<0.001) but not on those phrased as “currently” (5 vs 5; P=0.08). Likert scores for physicians vs non-physicians also had a significantly higher rank for having practice consistent with ILPV for items phrased as “prior to” the policy (P<0.003) but not on those phrased as “currently” (P=0.07). **Conclusions:** Per survey responses, change interventions that included Implementation of an ILPV policy increased provider knowledge of literature supporting ILPV and practice consistent with ILPV. Physicians reported knowledge of and practice consistent with ILPV more than non-physician providers prior to but not after implementation of an ILPV policy.

**839 IMPLEMENTATION OF AN OPIOID AND BENZODIAZEPINE WITHDRAWAL PREVENTION PROTOCOL IN A PICU**

**Lazaro Sanchez-Pinto, Lara Nelson, Phuong Lieu, Joyce Koh, John Rodgers, Jennifer Huson, Krichelle Larson, Rambod Amirnovin**

**Learning Objectives:** Long-term opioid and benzodiazepine infusions are often required in the care of critically ill children, but their use is associated with complications including delirium, dependence, and withdrawal syndrome. These complications lead to significant morbidity including extended drug tapers and prolonged hospital stay. Our aim was to implement an opioid and benzodiazepine withdrawal prevention protocol (WPP) to reduce the length of drug exposure and length of stay of children at high risk for withdrawal. **Methods:** The WPP was implemented in the pediatric ICU of a large children’s hospital, and included a protocol guiding drug conversion and weaning, and education for the clinical staff. Patients on ≥ 7 days of continuous opioids were included in the study. Opioid-related measures were used as surrogates of the WPP process effectiveness. Outcome metrics were length of scheduled opioids, length of opioid taper, hospital length of stay, and withdrawal symptoms measured with the Withdrawal Assessment Tool-1. The pre- and post-intervention periods were 1/2013 to 4/2014 and 5/2014 to 3/2015. Continuous variables were analyzed using the Mann-Whitney U test and categorical variables using the Yates-corrected Chi-squared test. **Results:** 107 critically ill children met the inclusion criteria (68 pre- and 39 post-intervention). The age, gender and severity of illness scores on admission did not differ between the two groups. Patients in the post-intervention group had significantly shorter median lengths of scheduled opioids (17 vs. 22.5 days, p=0.01) and opioid taper (7 vs. 11 days, p<0.02) than those in the pre-intervention group. There was also a trend toward shorter hospital length of stay (29 vs. 35 days, p=0.06). There was no difference in the withdrawal symptoms between the two groups. **Conclusions:** We successfully implemented a withdrawal prevention protocol in the pediatric ICU of a large children’s hospital. The protocol led to a significant reduction in the length of opioid exposure and a trend towards decreased hospital length of stay in patients at high risk of withdrawal.

**840 DISCHARGE PRESCRIBING OF ENTERAL OPiates AFTER USE AS A WEANING STRATEGY FROM INTRAVENOUS OPIATeS**

**Bridgette Kram, Kylie Weigl, Dan Gilstrap**

**Learning Objectives:** To strategically wean mechanically ventilated (MV) patients from continuously infused opiates, enteral opiates may be used to reduce duration of IV therapy. The purpose of this study is to evaluate the proportion of patients receiving a discharge prescription for methadone or oxycodone following initiation as a weaning strategy in the ICU. **Methods:** This retrospective, observational study included MV adults admitted to an ICU between July 1, 2013 and August 1, 2014. Patients were excluded if they were not prescribed an enteral opiate as weaning strategy from a continuous opiate infusion, received less than two doses of study drug or had a long-acting opiate documented as a home medication. The primary endpoint was the proportion of patients who received a hospital discharge prescription for a scheduled enteral opiate. Secondary endpoints included the proportion of patients with a scheduled enteral opiate upon ICU transfer, duration of IV therapy after initiation of enteral therapy, ICU and hospital length of stay. **Results:** During the study period, 52 patients received an enteral opiate as a weaning strategy; Methadone was administered to 14 patients (26.9%) and scheduled oxycodone to 38 patients (71.3%). Thirty of the 49 ICU survivors (61.2%) had the medication continued on ICU transfer. Of the 46 patients who survived to hospital discharge, 14 patients (30.4%) received a discharge prescription for a scheduled enteral opiate. Patients with a discharge prescription were more likely to have received a tracheotomy (85.7% vs 50%, p=0.027) and have a longer duration of opiate infusion (13.3 vs 6.8 days, p=0.03), though duration of IV therapy after enteral opiate initiation, duration of MV and length of stay were not different between groups. Breakthrough opiate use and median pain score prior to discharge were similar. **Conclusions:** Scheduled enteral opiates used to transition from IV opiate infusions are often continued on ICU transfer and hospital discharge. Process improvement initiatives should be directed toward weaning these medications to avoid prolong and possibly unnecessary use.
was essential with a rapid cycle improvement over 4 mo to facilitate changes in the electronic documentation. Within 3 mo after initiation, a template was created for a monthly report of compliance to the team. Data was shared with the team and on a central monitor. On-going education and modifications occurred. Targets and plans were discussed during interdisciplinary bedside rounds with the team, patients and families. Results: PAD assessments were monitored from May 2013 until June 2015. Report development and pilot testing were conducted over 13 weeks after a baseline period. Post implementation data from June 2015 was compared to baseline data. During the pre-implementation period, the patient days for pain assessment frequency (≥6 assessments/day) were at 11%. A target for pain level was established at ≤6 and was at 50%. Patient days with RASS assessment (≥6 assessments/day) was reported at 14% initially. Patient days with RASS at target (+1 to -1) was 41%. The frequency of at least 2 CAM-ICU screens (≥2 assessments/day) was at 28%. Post implementation pain assessment increased to 79%. Patient days with a median level of pain≤4 increased to 91%. RASS assessment frequency post implementation improved to 77%. Attainment of target RASS increased to 69%. Post implementation data for CAM-ICU screens improved to 80%. Conclusions: Implementation success is dependent upon engagement of an interdisciplinary team, administrative support, and sharing progress which promotes a change in culture. This team approach led to significant improvement in assessing PAD.

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DEVELOPMENT OF SELF-SERVICE EHR DATA REPORTING TO DRIVE QUALITY IMPROVEMENT IN THE SICU
Naralie Powenzaale, Brian Williams, Tammy Chung, Clay Townsend, Wasif Huda, Jon McNamur, Christian Minshall

Learning Objectives: Massive amounts of patient care data is continuously collected and stored in electronic health record (EHR) repositories but is not easily deployed for analysis of patient care quality. We sought to develop a tool to extract, aggregate, and report EHR data in order to target quality improvement efforts to the specific needs of our Surgical Intensive Care Unit (SICU) patients and clinicians. Efficiency and usefulness of this reporting tool was evaluated through analysis of the effectiveness of an intervention aimed at improving ICU delirium assessment in non-verbal patients by SICU nurses. Methods: A semantic layer that allows for a SICU-focused representation of relational patient data were constructed and made accessible through a suite of reporting tools. A report including EHR data elements related to the Confusion Assessment Method for the ICU (CAM-ICU) and ICU delirium was generated for two mo pre- and two mo post-intervention and filtered for non-verbal patients able to follow commands. A chi-square test was run to compare frequency of inappropriate “Unable to Assess” (UTA) documentation pre- and post-intervention. Results: Semantic layer construction was carried out over a nine-month period by two data solutions team members and a quality improvement nurse, with the majority of time dedicated to isolating SICU patients and accurate in/out times. CAM-ICU query development time was two hr. The self-service EHR reports required run-times of eleven min each and generated 502 pre- and 351 post-intervention documentations. Report structuring and variable development to increase data usability required eight hr. Data analysis revealed that the intervention was effective, with inappropriate UTA CAM-ICU documentation in the target population declining from 90% to 40% (p = 0.01). Conclusions: Development of self-service EHR data reporting, though initially resource-intensive, offers the possibility of efficient, meaningful data analysis that can be leveraged in a wide variety of quality improvement areas.

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TIME OUT FOR SIGN OUT: IMPROVED TRANSFER OF CARE FROM THE OPERATING ROOM TO THE ICU
Amit Prasad, Theodore Cios, Carol Dziedzina, Whitney Staub-Juergens, Srikantha Rao, Kai Singbartl

Learning Objectives: Healthcare professionals strive to provide safe care, yet an estimated 98,000 Americans die each year due to errors. Error rates as high as 37% in ICUs occur during exchanges between nurses and physicians. A quality improvement initiative was initiated to improve the hand-off process from the OR team to the ICU team following cardiac operating room (OR) cases. Methods: The OR and ICU teams identified key components of a hand-off process. As a result “Time Out for Sign Out” was created. Phase 1—planning: the OR nurse calls the ICU when the patient is off bypass and when sternal wires are being inserted. Phase 2—gathering: the OR nurse calls the ICU nurse when the patient is being transferred to the ICU bed to prepare for arrival. Phase 3-handoff: is our structured sign-out process from the OR team to the ICU team and the transferring of care. The process was trialed for 3 mo. A pre and post survey was collected using a Likert scale of 1–7 to assess the perception of the new hand-off process. The questions assessed quality of information, comfort and environment, efficiency, and the overall relevance. Results: In all 4 areas, significant improvements were seen with the new, standardized process. The new sign-out process rate increased from 4.2 ± 1.6 to 5.7 ± 0.9 (p = 0.004) for information, from 3.8 ± 1.8 to 5.9 ± 0.7 (p = 0.001) for comfort, from 3.8 ± 1.8 to 5.6 ± 1.1 (p = 0.001) for efficiency, and from 3.9 ± 1.9 to 6.0 ± 0.9 (p = 0.0001) for relevance. Linear regression analysis demonstrated nurses with less than 4 yr of experience felt that the non-standardized process needed improvement compared to nurses with 5 yr (1–2 year, p = 0.003; 2–3 yr p = 0.029; 3–4 yr p = 0.015). Conclusions: A standardized sign-out process significantly improved satisfaction with the transfer of information given from the OR team to the ICU team. Initial apprehension by experienced anesthesia providers was observed, but younger ICU staff prefer a standardized sign-out. This new structured process holds promise for a better handoff of patient care with improved communication between OR and ICU providers.

844
IMPROVING IDENTIFICATION AND DIAGNOSIS OF MALNUTRITION IN HOSPITALIZED PATIENTS
Lentna Finch, Jessen Fischer, Monica Gallant, Tarah Goad, Gaurav Sachdev, Toan Huynh

Learning Objectives: Up to 50% of hospitalized patients are malnourished upon admission. Poor nutritional status may prolong hospital length of stay (LOS) and increase readmission rates. Malnutrition is often underdiagnosed and many clinicians are unaware of the evidence-based definition of malnutrition. Appropriate diagnosis of malnutrition leads to more accurate adjustment of severity of illness, which can impact the expected length of stay and thus financial reimbursement. Further, nutritional intervention leads to improved overall outcomes. Herein, we developed an initiative aimed at improving malnutrition diagnosis. Methods: A multi-professional team consisting of dieticians and physicians tracked all cases of malnutrition in hospitalized patients from November 2014 to April 2015. There were a total of 68 patients admitted during the study period. Our dietician team communicated the diagnosis of malnutrition to clinicians, and we measured the incidence of malnutrition documented in the discharge summary (surrogate measure of physician awareness). We aimed for a 95% goal in the diagnosis of malnutrition. Results: During the first month of the study, there was no diagnosis of malnutrition. Throughout the study period, there was a steady increase in the incidence of diagnosed malnutrition, to 30% in the second month, and reaching a peak of 50%. We did not achieve the preset 90% goal. Conclusions: Physicians are unaware of new malnutrition diagnosis criteria and education is needed. Current communication of diagnosis is inefficient. There is a gap between dieticians and physicians in regards to malnutrition diagnosis. As such, we aim to provide education to physicians, build “Malnutrition Notification Form” in electronic medical record to “automate” the communication to attending physicians, and continue to track diagnosing of malnutrition in hospitalized patients.

845
RANDOMIZED TRIAL OF VIDEO LARYNGOSCOPY FOR ENDOTRACHEAL INTUBATION OF CRITICALLY ILL ADULTS
David Janz, Matthew Semler, Robert Lentz, Daniel Matthews, Tufik Assad, Benjamin Ferrell, Michael Noto, Todd Rice

Learning Objectives: Life-threatening complications are common during endotracheal intubation of critically ill adults. By improving glotic view, video laryngoscopy may increase intubation rates on first laryngoscopy attempt and decrease complications. However, past studies comparing video and direct laryngoscopy have yielded conflicting results. In a randomized trial of critically ill adults, we tested the hypothesis that video laryngoscopy would increase the rate of intubation on first attempt, adjusted for the operator’s previous experience with the intubating device, compared with direct laryngoscopy. Methods: We conducted
a randomized, open-label, parallel-group, pragmatic trial of video compared with direct laryngoscopy for 150 adults undergoing endotracheal intubation by Pulmonary and Critical Care Medicine fellows in a tertiary-care center medical ICU. The primary outcome was endotracheal intubation on first attempt, adjusted for the operator’s previous experience with the assigned laryngoscopy device. Secondary outcomes included time to intubation, glottic view, lowest procedural arterial oxygen saturation, and procedural complications. Results: Patients randomized to video (n = 74) and direct (n = 76) laryngoscopy were similar at baseline. Despite better glottic visualization with video laryngoscopy, there was no difference in intubation on the first attempt (video 68.9% vs direct 65.8%, P = 0.68) in unadjusted analyses or after adjustment for the operators’ previous experience with the assigned device (OR of video laryngoscopy on intubation on first attempt 2.02, 95% CI 0.82 – 5.02, P = 0.12). Secondary outcomes of time to intubation, procedural arterial oxygen saturation, complications, and in-hospital mortality were not different between video and direct laryngoscopy. Conclusions: Video laryngoscopy improves glottic visualization but does not increase any measure of procedural success or decrease complications.

846 ALL BLEEDING STOPS - OBSTETRIC PATIENTS REQUIRING INTENSIVE CARE: A 3-YEAR RETROSPECTIVE REVIEW
Jacqueline McLachy, Ilya Shnaydman, Rafael Barrera, Adiel Fleischer

Learning Objectives: Obstetrical patients make up 2% of ICU admissions in the United States. They are admitted for hypotension, hemorrhage, respiratory failure, sepsis and hemodynamic compromise. These patients represent a unique cohort that require specialized training and management. Methods: A three year retrospective chart review was performed of all peripartum patients admitted to a surgical ICU at a tertiary care center. Specific inquiries included demographics, pregnancy status, mode of delivery, mortality, APACHE II score, ventilatory support, blood transfusions, and indication for admission. Results: 25 women required admission to the surgical ICU, representing 0.12% of deliveries. 91% were postpartum, 9% were postabortal and no antepartum, 90% were delivered via cesarean. Average age was 34.7 yr and most were multiparous. The most common reason for admission was obstetric hemorrhage (57%), followed by hypertensive disorders (17%), sepsis (17%) and respiratory failure (9%). Hemorrhage was delineated into causes (placental, postpartum, coagulopathies) and interventions (transfusion, b lynch sutures, balloon tamponade, artery embolization and hysterectomy). Mechanical ventilation and transfusion were required to support 78% and 74% of patients. There were 3 maternal deaths (1.3%) for a maternal mortality rate of 15 per 100,000 live births compared to the average of 9 for developed nations. The observed mortality rate was significantly lower than that calculated by APACHE II score. Conclusions: Critically ill obstetric patients represent a cohort that requires a specialized multidisciplinary treatment strategy. Hemorrhage is the leading cause of maternal morbidity and mortality worldwide. Interventions should develop standardized protocols to assess blood loss in real time and implement early interventions; an example developed at North Shore-Long Island Jewish Health System is provided. Intensivists should have basic knowledge on the management of hemorrhage and pregnancy related hypertension, as these represent the majority of ICU obstetric admissions and can decrease maternal mortality.

847 PROSPECTIVE EVALUATION OF AN AUTOMATED SEVERITY SCORE’S ABILITY TO DIFFERENTIATE ICU PATIENTS
Ekan Hassan, Xinggang Liu, Omar Badawi

Learning Objectives: We previously verified an Automated Severity score (AS) based on a modified SOFA score, to highlight patients (pts) undergoing acute physiologic change. An AS used with computerized clinical decision support (CDS) should effectively differentiate between low (L), moderate (M) and high (H) severity pts at risk. Study goals were to prospectively evaluate the: 1) distribution of AS and; 2) correlation of the AS score with ICU mortality and length of stay (LOS) based on severity level of continuously monitored tele-ICU pts.

Methods: AS consisted of cardiovascular (BP or active treatment), respiratory (ventilated or non-ventilated - RR, O2 administration, and/or PEEP), renal (creatinine clearance), neurologic (GCS), infectious diseases (temperature or white blood cell counts), and hemotologic (hemoglobin – actual value or specifically trend ing decreases). The AS was scored as H, M, or L severity based on predefined rules and thresholds. AS was calculated with all new parameters. All adult non-trauma ICU admissions at 4 divergent U.S. tele-ICU programs monitoring 935 beds continuously were included. Data collection was 10–60 days per site from 8/2013 to 9/2014. ICU LOS and mortality were compared to the AS. Statistical analysis was done via Kruskal-Wallis rank test or chi square. Results: 6,054 pt stays with 16,698,968 AS scores were included: mean age (SD) = 62.9 (17.1) yr; 54.6% male. Number (% )of scores were: H -1,465,272 (8.8%); M - 10,301,082 (61.7%); L - 4,932,614 (29.5%). A difference occurred between survivors (S) and non-survivors (NS) at all 3 score levels (P<0.05). NS had a higher number of H (AS: 24.6% NS vs 7.9% S P<0.001); and M scores (AS: 70.6% NS vs 61.6% S P<0.05). L AS scores occurred greater in S vs NS (30.8% vs 4.8% respectively P<0.001). The average ICU LOS (total hr) increased with increasing AS: L-23.3 (10.78) hr; M-71.4 (33.4) hr; H-94.5 (25.0) hr (P<0.05). Conclusions: The AS effectively differentiates between the 3 severity levels of pt and has good delineation in identifying LOS and mortality in a reproducible manner based on a large cohort of pts.

848 NETWORK ANALYSIS OF THE MEDICATION PROCESS IN A TERTIARY CARE NICU SITUATED IN AN ADULT HOSPITAL
Alon Geva, David Wang, Xiaoning Lu, Charles Safran, Gregory Dumas, DeWayne Parsley, James Gray

Learning Objectives: Unit-based pharmacists may improve medication safety and expedite prospective order review (POR), but their impact on neonatal patients in a general adult hospital has not been described. Social network analysis provides tools for assessment of team structure of providers involved in the medication process. We hypothesized that NICU-based pharmacists would be central actors in the medication process, reduce risk of errors related to verification of high-alert adult medications, and shorten time from order entry to prospective order review. Methods: We identified all newborn medication orders at a tertiary care hospital with a neonatal intensive care unit (NICU) over a 1-year period. We also identified orders for adults that were reviewed by the same pharmacist who reviewed a newborn order. We constructed network representations of ordering clinicians, nurses, and pharmacists caring for patients based on their interactions with an individual order. Multivariable logistic regression was used to examine the relationship between ordering clinician and pharmacist’s network centrality and time from order entry to POR. Results: In these networks with a strong core-periphery structure (Gini coefficient 0.76), pharmacists represented 8 of 12 most central nodes. The likelihood that high-alert medication orders for both an adult and NICU patient were reviewed by a single pharmacist within 30 min of one another was lower when a NICU-based pharmacist was available. Long latency between order entry and POR was less likely when the ordering provider or pharmacist was central in the patient’s care team (odds ratio 0.89 (95% confidence interval (CI) 0.82 – 0.96) and 0.87 (95% CI 0.81 – 0.93), respectively). Conclusions: NICU-based pharmacists play a central role in the care provided to critically ill newborns and allow for timelier and potentially safer POR. Use of network analytics for the study of complex systems may be of benefit in quality improvement efforts and research regarding the optimal assignment of resources to enhance medication safety.

849 MOBILITY PRACTICES IN THE PICU
Jillian Bybee, Lauren Sorce, Jody Ciolino, Meredith Bone

Learning Objectives: Critically ill children are at risk for developing a decline in physical function during their PICU admissions. This morbidity may be exacerbated by immobility during the PICU stay. Mobilization during ICU admission has been linked to improved outcomes in critically ill adults. Rehabilitation protocols are not standard in pediatric critical care, and there is a paucity of literature describing common PICU mobility practices. We aimed to describe the current practices of mobilization of critically ill children who receive invasive mechanical ventilation. Methods: Single center, prospective, descriptive cohort study of mobilization of critically ill children who receive invasive mechanical ventilation during their PICU stay. Common PICU mobility practices. We aimed to describe the current practices of mobilization of critically ill children who receive invasive mechanical ventilation. Methods: Single center, prospective, descriptive cohort study of mobilization of critically ill children who receive invasive mechanical ventilation. Results: 23 women
ventilated for longer than 48 hr were eligible. The primary outcome was time to out of bed. Functional status at baseline and at PICU discharge was assessed using Pediatric Overall Performance Category (POPC) score. Baseline activity level was compared to patients’ highest level of daily activity while in the PICU. Results: Nineteen of 23 eligible patients were enrolled. Survival rate to PICU discharge was 95%. Median length of PICU stay was 22 days (IQR 10–45). Sixteen patients (84%) were mobilized out of bed. Median time to out of bed was 14 days (IQR 9–31). Two patients (11%) remained in bed without any mobility therapies. Only 1 of the 8 patients (12.5%) who were ambulatory at baseline walked while in the PICU. Nine of 18 survivors (50%) had a worse POPC score compared to baseline. Nine PICU survivors (50%) did not return to their baseline level of activity prior to ICU discharge. Conclusions: PICU patients who received mechanical ventilation spent much of their time in bed without mobilization, and half did not return to their baseline level of activity before discharge. Time to initiation and frequency of mobilization therapies could be targets for interventions aimed at improving outcomes of PICU survivors.

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HIGH VERSUS STANDARD DOSE DEXMEDETOMIDINE FOR SEDATION IN CRITICALLY ILL PATIENTS: THE HI-DEX STUDY
Kellie Rodriguez, Georgia Keriaze, Rebecca Anderson, Bruce Meyers

Learning Objectives: Recent studies have demonstrated the safety and efficacy of dexmedetomidine infusions at doses up to 1.5 mcg/kg/hr. Data evaluating doses greater than 1.5 mcg/kg/hr is limited; however, doses up to 2.5 mcg/kg/hr have been utilized. It is uncertain whether higher doses provide additional benefit but may result in more adverse events. The purpose of this study was to compare the safety and efficacy of dexmedetomidine in patients receiving high (doses greater than 1.5 mcg/kg/hr) versus standard dose (0.2 to 1.5 mcg/kg/hr) dexmedetomidine. Methods: A retrospective cohort study was conducted in critically ill, mechanically ventilated patients receiving dexmedetomidine for at least 24 hr. Standard dose dexmedetomidine (SD-DEX) was defined as less than or equal to 1.5 mcg/kg/hr and high dose dexmedetomidine (HD-DEX) was defined as greater than 1.5 mcg/kg/hr. Patients were assigned to the SD-DEX group if the maximum dose of dexmedetomidine received was between 0.2 and 1.5 mcg/kg/hr. Conversely, patients were assigned to the HD-DEX group if the maximum dose of dexmedetomidine received was greater than 1.5 mcg/kg/hr. The primary outcome was a composite of the incidence of heart rate less than 55 beats/min and/or hypotension (mean arterial pressure less than 60 mmHg). The secondary outcome was the proportion of time within target Richmond Agitation Sedation Scale (RASS) score (-2 to 1). A chi-square analysis was used for all nominal and number of notes written on that day. As the number of notes increased, the significant correlation between the quality of the notes and the severity of illness and number of notes written on that day. As the number of notes increased, the quality of the notes deteriorated if they were written by residents or fellows, but not if they were written by nurse practitioners or attending physicians. Limitations are discussed. Conclusions: Despite the complexities of the ICU and the limitations of a retrospective EHR, clinicians can capture information about the patient, synthesize it and generate good quality notes. The quality declines with an increase in the number of patients or severity of illness.

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RETROSPECTIVE DESCRIPTIVE STUDY OF AN ICU AT A UGANDAN REGIONAL REFERRAL HOSPITAL
Adam Was, Vanessa Bradford Kerry, Paul Firth, Emmanuel Munyarugero, Mark Preston, Stephen Trendo

Learning Objectives: There is a significant and increasing need for critical care in Sub-Saharan African hospitals. However, there are little primary data available on the delivery or results of critical care in these settings. We examined patient management and outcomes in the ICU at a Ugandan regional referral hospital. Methods: We reviewed the ICU patient logbooks at Mbarara Regional Referral Hospital in Uganda, from January 2008 to December 2011. We analyzed associations between age, gender, disease classification and length of stay, with ventilator use and mortality. Pearson chi-squared, Wilcoxon Rank-Sum tests, or logistical regressions were used. Ethics approval was obtained from the Mbarara University of Science and Technology and the Massachusetts General Hospital. Results: 431 patients were admitted to the MRRH ICU between January 2008 and December 2011. 239 (55%) patients were female, median age was 23 (IQR 9–34) yr, and 142 (33%) were children. The median length of stay (LOS) was 2 (1–4) days. Diagnosis classifications were surgical 49% (213), medical/pediatric 27% (118), obstetrical/gynecological 22% (96). The overall mortality rate was 38% (162 / 431), 214 (50%) patients were mechanically ventilated. Ventilated patients were older [median age 26 (17–35) vs. 21 (3–32) yr, p<0.0002], more likely to have medical diagnoses (p=0.0308) and stay longer than 7 days (p<0.0001). Adjusting for covariance of age, gender, diagnosis and LOS, ventilated patients had higher mortality (aOR = 6.15, 95% CI 3.83–9.87, p<0.0001), while those with LOS < 7 days had lower mortality (aOR = 0.57, 95% CI (0.19–0.70), p = 0.0021). Conclusions: The ICU at MRRH in Uganda predominantly functions as an acute care unit for young, critically ill patients with surgical disease. Mechanical ventilation is a frequent intervention. Future research should analyze the nature and impact of the ICU in low-income settings, to guide the expansion and improvement of critical care and patient outcomes in global health.

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ASSESSING THE QUALITY OF COMPUTERIZED CLINICAL DOCUMENTATION IN THE PICU
Khama Daphary

Learning Objectives: Clinical documentation is an essential aspect of the patient-clinician encounter and serves many purposes. Ensuring good quality documentation is crucial to good patient care. The ICU is a complex, dynamic environment and large amounts of data are generated daily for each patient. Good documentation becomes challenging in this situation. The quality of documentation in the ICU has not been studied. The objective of this study was to evaluate the quality of computerized clinical documentation in the pediatric ICU. Methods: A retrospective chart review was performed and 100 history and physical notes and progress notes were rated using the PDQ-I-9 tool. Data regarding the author of the notes, time of starting and completing the note in relation to the time of service, length of hospital and ICU stay prior to the day of service, number of notes written in the ICU that day, the day of the week that the service was provided, and severity of illness of the patient were collected. Results: The overall quality of the notes was good with a mean total PDQ-I-9 score of 39 (maximum score possible is 45). Almost all notes were rated highly (score of 4 or 5 out of a maximum of 5) on succinct (99%) and most were rated highly on comprehensibility (93%), up-to-date (92%), accurate (92%), internally consistent (92%), synthesized (81%) and organized (80%). About two-thirds of the notes were highly useful and 37% on thorough. There was a statistically significant correlation between the quality of the notes and the severity of illness and number of notes written on that day. As the number of notes increased, the quality of the notes deteriorated if they were written by residents or fellows, but not if they were written by nurse practitioners or attending physicians. Limitations are discussed. Conclusions: Despite the complexities of the ICU and the limitations of a commercial EHR, clinicians can capture information about the patient, synthesize it and generate good quality notes. The quality declines with an increase in the number of patients or severity of illness.

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INTERHOSPITAL TRANSPORT OF PATIENTS WITH HEMORRHAGIC STROKE: A 12-MONTH EXPERIENCE
Arun Ranganath, John Dziodzio, Barbara McCrum, Lauren Connolly, Christopher Pare, Matthew Sholl, Robert Ecker, David Seder

Learning Objectives: Neurological decline (ND) may occur during interhospital (IH) transport of patients with acute hemorrhagic stroke (HS). We evaluated prehospital and IH care of patients transferred with non-traumatic subarachnoid hemorrhage(SAH) or spontaneous intracerebral hemorrhage(ICH) over 1 year to determine adherence to local standards of care. Methods: We performed a retrospective, IRB-approved review of EMS and hospital records of patients from Jan 1, 2013 to Dec 31, 2013. Patient characteristics, blood pressure(BP) measurements during transfer, coagulopathy and its reversal, ND, and outcomes were recorded. Results: 45 patients with ICH:median ICH score 1(IQR 1, 2) and 20 patients with SAH(median IH Grade 1(IQR 1, 2.25)) underwent IH transfer to our
facility during the study period. Mean age was 63.5 ± 16.8, and 36/55 (4.4%) were female. Comorbidities included hypertension (55.4%), diabetes (23.1%), atrial fibrillation (12.3%), and DVT/PE (10.8%). Median transport time was 77 min (IQR 58.8, 94.5), and distance 52.7 ± 32.7 miles. The IH mean number of BP measurements was 5.6, and 43% had SBP <140. BP was recorded every 10 min (our standard) in 20/64 (45%) patients. 29.2% were receiving aspirin at the time of presentation, 15% warfarin, and 6.2% clopidogrel. Of patients receiving warfarin, 60% received vit-K, 50% FFP, and 10% prothrombin complex concentrates prior to transfer. 16.9% of patients were intubated prior to transfer. The median GCS on tertiary center arrival was 15 (IQR 10, 15) and 4 (6.2%) suffered ND during transport, defined as a drop in GCS of 2 or more. Delayed (>3 month) modified Rankin scale (mRS) outcomes were 21% mRS0, 23% mRS1, 13% mRS2, 0 mRS3, 8% mRS4, 3% mRS5, and 33% mRS6. Conclusions: Among patients transferred to tertiary center arrival was 15(IQR 10, 15) and 4(6.2%) suffered ND during transfer. 16.9% of patients were intubated prior to transfer. The median GCS on.

The effect of a comprehensive unit-based safety program on systems thinking in adult ICU providers

Angela Lipshutz, Kathleen Liu, Denise Barchenas, Jenica Cimino, Chetna Pathak, Hildy Schell-Chaple, Michael Gropper, UCSF Critical Care Innovations Group

Learning Objectives: Systems thinking is an analytical approach that focuses on systems’ parts and how they interrelate. It is a key component of quality improvement (QI). The Comprehensive Unit-Based Safety Program (CUSP) aims to improve quality by educating staff on the science of safety and empowering them to engage in QI. We hypothesized that implementation of CUSP would improve systems thinking in ICU providers.

Methods: We administered the Systems Thinking Scale (STS) to all ICU providers and staff in 2 medical-surgical ICUs. The STS is a validated 20-question tool that uses a 5-point Likert scale (0 = never to 4 = always). The survey was administered 4 mo before and after CUSP implementation. We calculated the means for each item and a composite systems thinking score (range 0–80). Responses before and after CUSP implementation were compared using the Student’s t-test and Mann-Whitney U test.

Results: 734 providers responded to the survey (response rate 34%–38%) prior to CUSP implementation and 148 after. 56% of the respondents were nurses, 25% physicians, 19% other providers/staff. The composite systems thinking score was 60.57 before and 61.60 after CUSP implementation (p<0.33). Providers were more likely after CUSP administration to “think of a problem at hand as a series of connected issues,” (meansSD pre-CUSP 2.89 ± 0.69 vs. post-CUSP 3.06 ± 0.68, p=0.05) and “propose solutions that affect the work environment, not specific individuals” (2.76 ± 0.77 vs. 2.91 ± 0.80, p=0.05). Providers were least likely to “seek everyone’s view of the situation” or “try strategies that do not rely on people’s memory,” and were more likely to do so after CUSP (2.73 ± 0.76 vs. 2.71 ± 0.75, p=0.97; 2.65 ± 0.88 vs. 2.58 ± 0.86, p=0.70, respectively).

Conclusions: After CUSP implementation, providers were more likely to evaluate problems as a series of connected issues and to focus solutions on the environment, but overall systems thinking did not improve. Appreciation of key tenets of the science of safety, such as eliciting others’ opinions and using higher-level solutions that do not rely on memory, did not improve.

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Impact of implementing a critical care specific pressure ulcer prevention bundle: a pilot study

Christina Britt, Laura Arwood, Laura Wilkinson, Dallen Penoyer, Mary Sole

Learning Objectives: Critically ill patients are at risk to develop hospital-acquired pressure ulcers (HAPUs) and prevention is challenging. HAPU costs can exceed $43,000 and are not reimbursable. Bundles of care have improved outcomes in other conditions; yet no standardized critical care bundles exist for HAPU prevention. Hypothesis: A critical care specific Pressure Ulcer Prevention (PUP) Bundle will reduce HAPUs.

Methods: We used a retrospective, pre-post, non-equivalent

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CICU sedation pathway decreases polypharmacy use in mechanically ventilated patients

Lisa Kehr, Pamela King, Amy Lisanti, Evan Ramsey, Roxanne Kirsch, Robert Mansfield, Maryam Naim

Learning Objectives: Over- and under- sedation can have deleterious effects on patient recovery following a critical illness or surgery requiring ICU care. Sedation pathways have been shown to optimize sedation and prevent over- or under- sedation. Methods: The aim of this quality improvement initiative was to decrease variation in sedation practices and use of polypharmacy in patients requiring mechanical ventilation in the CICU. We included patients whose anticipated mechanical ventilation time was > 12hr. Patients on neuromuscular blockade were excluded. Four pathways were implemented based on patient age (neonate, infant/child, adult) and condition (need for ECMO support). Drug titration and PRN usage was driven by validated pediatric pain and sedation scales. Results: A total of 198 patients were placed on the sedation pathway from February 2014 to July 2015. The pre-implementation phase (January 2013 until January 2014) was compared with the early and late sedation pathway implementation phases; (February to June 2014 and July 2014 to July 2015), respectively. The total amount of drug exposure was calculated by the amount of opioid and benzodiazepine continuous infusions and PRN medications. The median opioid dose decreased from the pre-implementation phase (0.6) to the early phase (0.62) and the late phase (0.98 mg/kg/patient intubation). The median benzodiazepine dose decreased from the pre-implementation phase (1.76) to the early phase (1.33) and then increased in the late phase (2.22 mg/kg/patient intubation). Combined barbiturate and ketamine use “polypharmacy” dropped from the pre-implementation phase (33%) to the early phase (23.5%) and late phase (15.9%). Conclusions: Our single center study at a tertiary care CICU showed reduction in polypharmacy sedation medications use by designated sedation pathways. Sedation pathways can play an important role in achieving appropriate levels of sedation resulting in improved patient care and safety.

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Transitions of care from the operating room to the PICU: A targeted safety initiative

Anthony Sochet, Ashley Siems, Nithal Godiwala, Lauren Hebert, Christiane Corriveau

Learning Objectives: Exceptional postsurgical handover is paramount in generating shared mental models and collaborative team planning to eliminate errors and ensure safety. Patients undergoing anesthesia and surgery are at particular risk following the interchage of clinical providers. As our institution, approximately 20% of all ICU admissions, nearly 500 per year, are transfers from the operating room (OR). The lack of formative, interdisciplinary handover provides important opportunities for quality improvement. We seek to define ideal handover, appraise our current practice and institute the principles of quality improvement to optimize care. Methods: The mechanisms and qualities of ideal postoperative handover were produced with key stakeholders and included: comprehensive individual sign-out, structured communication norms and independence between staff. A REDCAP database was fashioned for prospective evaluation of current practice. Outcomes measured included attendance, completeness of handover, duration of handover and prompts for involvement between team members. This study was Institutional Review Board approved. Results: Our data revealed consistent ICU fellow and anesthetist presence (100% and 85% respectively). ICU resident and surgical team attendance was low at 57%. Our pilot data reflected missing stakeholders during all handovers. The bedside nursing staff announced readiness to participate in only 66% of cases and were prompted to ask questions in 66% of those encounters. Regarding shared mental models, the ICU fellow summarized handovers completely 29%, partially 57%, and not at all 14% of the time. Mean duration of handover was 10.5 min. Written transition plans were present after 9.1% of handovers. Conclusions: Our data identified numerous opportunities for improvement among a vulnerable patient population during transition from the OR to the PICU. As a microsystem of an organization striving for high reliability, these data will empower structured handover motifs to promote a culture of safety via transformational leadership, interdependence and performance review.
control group design to study the impact of the PUP Bundle on HAPUs in the ICU. We compared HAPU data from 2014 (control) with data from April–June 2015 (intervention). The control group received our hospital HAPU prevention protocol. The intervention group received the PUP Bundle consisting of 5 evidence-based actions: turning, reduced bedding layers, heel boots, chlorhexidine bathing, and barrier cream/soft silicone barrier sacral dressing. We collected data related to demographics, comorbidities, and treatments, and analyzed data with Fisher's Exact test and logistic regression. Results: Data were available for 737 patients. Mean age was 60.5 y; length of stay (LOS) 3.9 days; and Braden score 16.2. No statistical differences were found in patient characteristics between control (n=604) and intervention (n=133) groups. The control group had 14 (2.3%) HAPUs compared to none in the intervention group, but the reduction was not significant (p=0.6). Patients who developed HAPUs had 2.5 times longer LOS (p=0.001) and lower Braden scores (p=0.001). No other demographic or treatment factors were predictors. For those with Braden scores of 14 or less, the odds ratio for developing a HAPU was 4.4 (CI 1.5–12.8). Conclusions: While no statistical significance was found for HAPU development between groups, implementing a critical care specific PUP Bundle had clinically significant results in this pilot study. Implementing the PUP Bundle in the critically ill with Braden scores of 14 or less may be an important intervention for HAPU prevention.

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STRUCTURE AND FUNCTION OF TEAMS IN THE PICU: A SOCIAL NETWORK ANALYSIS
Jonathan Wong, Mark Duffett
Learning Objectives: Healthcare team dynamics help to shape the delivery and quality of care. In focusing on the relationships among team members, social network analysis (SNA) is an approach to better understanding team structure and function. Our objective was to describe team structure and function within a PICU using SNA. Methods: In this self-administered online survey, we asked all PICU staff to identify up to 5 of their most influential colleagues in 3 contexts: information seeking (colleagues that advise on patient care challenges), social influence (colleagues that influence their clinical practice), and social support (colleagues that help with work-related personal problems). We used anonymized data to generate a network diagram for each context. Results: 98 (86.7%) of 113 staff from 12 professions participated. Amongst the 3 networks, there were no weakly connected groups. Few individuals reported no links to a colleague: none for information seeking, 2 (2.2%) for social influence, and 7 (7.8%) for social support. The number of links among colleagues was greatest for the information seeking network (density=0.068), followed by social influence (density=0.041) and social support (density=0.031). 5 individuals (2 intensivists, 2 RNs and 1 RT), 3 of whom had formal leadership roles, were amongst the 10 most influential team members in all 3 networks. Using regression, a formal leadership role was associated with higher influence in all 3 networks. The role of profession, part time status, and yr of experience varied in influence amongst the networks. Conclusions: In this healthcare team, there was a core group of individuals who were among the most relied upon in different contexts and few individuals who were weakly connected. These relationship patterns can be used to inform the implementation of practice changes and for focusing interventions to enhance team functioning.

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EFFECT OF LOW AMPLITUDE QRS COMPLEXES ON FALSE ASYSTOLE ALARMS
Michele Pelter, Richard Fidler, Xiao Hu
Learning Objectives: While electrocardiographic (ECG) monitoring is valuable for continuous surveillance of ICU patients, false alarms are common. The resultant sensory overload (alarm fatigue) to clinicians has been linked to untoward patient outcomes. The American National Standard for cardiac monitors, states ECG devices should not detect a QRS if the waveform is less than 1.5 millimeters in size to avoid mislabeling P-waves or baseline noise as QRS complexes during complete heart block or asystole. However, manufactures of ECG devices use more conservative QRS thresholds (i.e., > 5 millimeter in more than one lead), which can result in false positive asystole alarms in patients who have low amplitude QRS complexes. In this study, we further examine low QRS amplitude as a source of false positive ECG alarms. Methods: Retrospective data from the UCSF Alarm Study were used (n = 416). We examined all standard 12-lead ECG’s in ICU patients with annotated false asystole alarms. Low QRS amplitude was defined as unidirectional (only positive or only negative) QRS complex < 5 mm in one or more of the following leads: I, II, III, and V1. These lead were selected because the bedside monitoring algorithm identifies a QRS complexes with an amplitude > 5 mm in two of these leads. Results: One-hundred thirteen (25%) had 792 asystole alarms; 531 (67%) were false. One or more 12-lead ECG’s were available in 100 (89%). Mean age was 62±18, and 58% were male. Using the first available 12-lead ECG, low amplitude QRS was present in 34 (30%). When all available 12-lead ECG’s were examined, an additional 20 (17%) had low amplitude QRS. Conclusions: Low amplitude QRS, as assessed from hospital 12-lead ECG’s, is frequent among a group of ICU patients and can be dynamic during hospitalization. Identification of patients with low amplitude QRS from 12-lead ECG’s could be used to identify patients who might be susceptible to false positive asystole alarms. Manufactures of ECG devices should explore algorithms that can more readily identify QRS complexes of low amplitude in all available ECG leads.

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A NOVEL APPROACH TO PATIENT HARMS: PRESERVING PATIENT RESPECT AND DIGNITY
Laure Sokol-Hessner, Patricia Focolari, Melinda Van Niel, Ken Sands
Learning Objectives: Extensive research has investigated both known serious adverse events (e.g., death, wrong side surgery, falls) to patients and innovative strategies for preventing these events. After collaborations with families and patients, we recognized that grievous harms to the respect and dignity of patients and their families were not included in the assessment of a reportable adverse event. Further, we hypothesized that patients and clinicians would have different assessments of the severity of these newly-documented harms. Methods: We performed a retrospective review of all available harms reported to our patient representatives and extracted a series of harms to respect and dignity. We developed and iteratively improved a tool for evaluating the severity of each of these harms. We then validated this tool among different populations of clinicians and patients. Results: We have reviewed 255 cases reported by both patients (90% of reports) and staff (10% of reports) in the first 9 mo and have found that 19% of cases involve severe, preventable harm to dignity. Examples of these cases include the failure to provide respectful care to the deceased or family members after death (6% of severe cases); environmental issues such as lack of cleanliness, or violations of personal privacy (20% of severe cases); insensitive care that minimizes patient concerns (14% of severe cases); uncoordinated care planning that leads to unreasonably long waits or cancellations (33% of severe cases); and even failure to protect irreplaceable possessions (4% of severe cases). Many of these harms are amenable to performance improvement initiatives. Conclusions: Harms to patient and family respect and dignity can be identified, measured, and targeted for improvement. Further, patients and clinicians may be discordant in the evaluation of the severity of each category of harm. Future work will seek to develop valid and reliable methods for measuring harms to respect and dignity of hospitalized patients.

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INTEGRATING LEAN SIX SIGMA IN THE DAILY OPERATIONS OF AN ICU TO ACHIEVE SAFE, QUALITY PATIENT CARE
Joanne McGovern, Sharon Barniak, Sarah Beadling, Donna Bowes, Jennifer Leahy, Annie Hodge, Richard Wright, Jason Brash
Learning Objectives: Developing and maintaining a culture of safety and quality in delivering patient care is critical in the ICU, especially in oncology. Incorporating the Lean Six Sigma program into daily operations of the ICU promotes continuous improvement in the delivery of safe, quality patient care. Methods: This program engaged the ICU team through visual management of quality, safety, and budget indicators such as: medication scanning, falls, sharps exposure, infection prevention including blood stream, cather, hospital and ventilator acquired pneumonias, venous embolism prevention, and staffing compliance. The initiative focused on stakeholder development to increase...
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ECONOMIC IMPACT OF CLINICAL PHARMACY SERVICES AT AN ACADEMIC TEACHING HOSPITAL
Devin Holden, Ben Lomaestro, Martha Naber, Edward Timm

Learning Objectives: Clinical pharmacists are recognized as essential members of the medical team. While multidisciplinary team members are aware of the clinical contribution of a pharmacist, the economic benefits of are often overlooked. The aim of this analysis was to evaluate and document the economic impact of three clinical pharmacy specialists, two full-time ICU specialists and ID specialist at an academic teaching hospital. Methods: Clinical pharmacists documented their interventions into two basic categories: pharmacy initiated medication management strategies (MMS) and direct therapy related interventions during patient care rounds. Specific MMS were documented and evaluated by direct comparison of pre and post implementation costs. Cost avoidance from implemented MMS were carried forward only for the period of time that it was clinically appropriate and averaged in the final estimate of annualized cost savings for the time period analyzed. Clinical pharmacist’s direct patient care interventions including antibiotic stewardship were documented and categorized and the associated impact on cost was calculated based upon the nature of the intervention, e.g., therapy modification, antibiotic review, dosage form modification, medication reconciliation, and individualized dosage adjustment. Cost savings were totaled annually based on existing cost data from the published literature on the economic benefits of these interventions. The period of analysis included 2002 until 2014. Results: A total of nine MMS were identified with an average cost avoidance of $902,375 per year. These initiatives included switching to a less expensive therapeutic equivalent agent (e.g. abciximab to eptifibatide) or more appropriate use of an existing agent (e.g. factor VIIa, droterocolin alpha). Clinical pharmacist direct patient care interventions averaged 1,137 annually a cost savings of $164,885. Antibiotic stewardship interventions lead to an average cost savings of $723,620 annually. Conclusions: Total cost avoidance averaged an estimated $1,342 (100%) each month. Conclusions: Team alignment utilizing Lean daily management centered on production, patient flow, and staff development enables real-time problem solving of daily issues regarding safety, quality, productivity, and stakeholder development. Furthermore, it has enhanced daily communication and engagement in this oncology critical care unit.

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RESPIRATORY CARE UNIT (RCU) QUALITY IMPROVEMENT INITIATIVE ROUNDING AND COMMUNICATION BUNDLE
Abhay Vakil, Devang Sanghavi, Bashar Alkinj, Jasleen Pannu, Vicki Loeslie, Bernard Selim, Jeffrey Rabatin, Rahul Kashyap

Learning Objectives: We conducted a quality improvement (QI) project to develop a rounding and communication bundle in RCU with a primary aim of improving patient as well as staff satisfaction and a secondary aim of decreasing RCU length of stay (LOS). Methods: This QI project was conducted at a 9-bed RCU at Mayo Clinic, Rochester. Patients and their family members admitted to RCU from July to October, 2014 were surveyed regarding their satisfaction about communication practices used by staff members in RCU as well as their perception regarding barriers to effective communication. RCU staff members also underwent a similar survey. Based on results obtained (see result section), a rounding and communication bundle focusing on the following was implemented from November, 2014 to March, 2015: a) Staff education to avoid using complex medical terminologies b) Bi-weekly scheduled care conferences with multidisciplinary involvement c) Starting multidisciplinary rounds at a fixed time daily with family involvement Post-intervention survey regarding patient and staff satisfaction was conducted after a 15-day washout period. Number of care conferences, time for starting multidisciplinary rounds and RCU LOS were calculated and compared during pre-intervention and intervention phases. Results: During pre-intervention phase, only 36% patients with RCU LOS greater than 2 weeks had care conferences within first two weeks of their stay. Only 45% patients as well as staff members were satisfied with communication practices used in RCU. After implementation of rounding and communication bundle, number of care conferences increased to 90%, whereas patient and staff satisfaction increased to 80% and 78% respectively. 75% of the days, multidisciplinary rounds started within predetermined scheduled time frame and RCU LOS decreased from 7 to 5 days (p = 0.04, adjusted for APACHE III, SOFA scores and Katz index of independence on admission to RCU). Conclusions: Implementation of a rounding and communication bundle in specialized units like RCU is a simple yet effective way to improve patient and staff satisfaction.

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REDUCTION IN S. AUREUS NASAL SCREENING IN MICU REDUCES LAB COSTS WITHOUT INCREASE IN LAB ID EVENTS
Anita Reddy, Seth Bauer, Thomas Fraser, Steven Gordon, Jorge Guzman

Learning Objectives: Optimal strategies to prevent hospital-acquired S. aureus (SA) infections have been debated in the literature. Institutional protocols vary, from screening nasal swabs (with subsequent targeted decolonization with mupirocin), to isolation, to universal decontamination. Recent studies have suggested that universal decolonization may be more effective than targeted decolonization, but there is hesitation to adopt this approach. In our center, patients were screened with nasal swabs for SA by PCR testing on admission and on a weekly basis in the medical intensive care unit (MICU). In the MICU, the SA carriage rate is 19%, 7% being MRSA, with a conversion rate of 0.9%. Patients positive for SA are decolonized with mupirocin. This approach yielded a high laboratory cost for screening with little perceived benefit due to a low in-hospital MRSA acquisition rate. Methods: In an attempt to lower cost, the process for SA screening was changed to only include swabs on MICU admission and cease subsequent weekly screening swabs on the same patient. This change was implemented by changing the MICU admission order set and via nursing education. A 3-month before-after retrospective cohort study was designed (March through June 2015), with descriptive and inferential statistics utilized. The study aimed to compare screening cost and MRSA infection Lab ID events before and after the process change. Results: The number of SA screening tests per encounter were significantly reduced from 1.73±0.10 (mean±SD) tests per patient in the pre intervention period compared to 1.23±0.15 in the post intervention period (p=0.008). The total cost of SA screening also significantly decreased by $489 per month ($13,216±$1246 per month to $8322±$1036 per month; p=0.096). In addition, there was no increase in the number of MRSA lab identifici- cation events in the two periods (1 event in the pre-intervention period versus zero events in the post-intervention period). Conclusions: Eliminating weekly MRSA screening swabs resulted in decreased lab costs and did not result in an increase in MRSA Lab ID events.

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INCIDENCE AND PREDICTORS OF C. DIFFICILE INFECTIONS IN ADULT SURGICAL POPULATION IN THE USA
Veeralalhandhar Allareddy, Natalia Martinez-Schlurmann, Sankeerth Rampa, Nalliah Romesh, Veerasathpurush Allareddy, Alexandre Rusta

Learning Objectives: Clostridium difficile is an important health care associated infection. We sought to examine the incidence and patient related
On-going analysis is needed to evaluate our approach to the care of children associated with lower peri-operative mortality compared to the pre-LICU era.

colization of supportive measures for critically ill children with ESLD were pre-LICU (n=59; p<0.05).

The number of deaths post-LICU (n=1) was significantly lower compared to pre-LICU (n=59; p<0.05).

Conclusions: Formation of a LICU and proto-colization of supportive measures for critically ill children with ESLD were associated with lower peri-operative mortality compared to the pre-LICU era. On-going analysis is needed to evaluate our approach to the care of children with ESLD.

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DEDICATED LIVER INTENSIVE CARE TEAM IMPROVES PERI-OPERATIVE OUTCOMES IN CHILDREN WITH LIVER FAILURE

Fong Lam, Kathleen Thompson, Amy Arrington, Trung Nguyen, John Goss, Ryan Himes, Aye Anikan, Moresbwar Desai

Learning Objectives: The care of children with end stage liver disease (ESLD) is complex, requiring a multidisciplinary approach and rapid application of extracorporeal therapies. We present a single institutional experience from 2004–15 before and after the development of a dedicated Liver Intensive Care Unit Team (LICU) with a mission to provide consistent peri-operative care for critically ill children with ESLD. This team, composed of pediatric intensivists, performs daily rounds and coordinates care with members from transplant surgery, hepatology, and other medical subspecialties. Methods: A retrospective chart review of all liver transplants from 1/2004-1/2014 (pre-LICU) and 2/2014–7/2015 (post-LICU) from a US children’s hospital. Results: From 1/2004-1/2014, the numbers of children with ESLD listed and transplanted were 328 and 268, respectively. The number of deaths on the waitlist was 31/328(9%). Diagnoses available from pre-transplant autopsies (14/31) revealed cerebral herniation n=8(60%), alveolar hemorrhage n=11(80%) and extensive coagulopathy n=14(100%). The number of post-transplant deaths was 28(10%). Causes of post-transplant deaths were hepatic failure n=11(80%) and extensive coagulopathy n=14(100%). The number of post-transplant deaths was 28(10%). Causes of post-transplant deaths were hepatic failure n=11(80%) and extensive coagulopathy n=14(100%). The number of post-transplant deaths was 28(10%). Causes of post-transplant deaths were hepatic failure n=11(80%) and extensive coagulopathy n=14(100%).

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AGREEMENT BETWEEN PATIENTS AND NURSES ABOUT ADMITTING ILLNESSES AND TREATMENTS IN THE ICU

Cherna Pathaki, Wendy Anderson, Kathleen Turner, Jenica Cimino, Kathleen Liu, Hilda Schell-Chaple, Michael Gropper, UCSF Critical Care Innovations Group

Learning Objectives: Family members of ICU patients report significantly different understanding of the patients’ diagnoses and treatments than the patients’ physicians. Agreement between ICU patients and nurses about patients’ diagnoses and treatments has not been described before. Methods: We surveyed patients with decision-making capacity and their bedside nurses in two medical-surgical ICUs of an academic medical center on day 3 of the patient’s ICU stay. Participants were asked 1) whether each of five organ systems (heart, kidneys, gastrointestinal (GI), lungs, brain) was a reason for the patient’s ICU admission; and 2) whether each of twelve common ICU treatments (mechanical ventilation, non-invasive ventilation, oxygen, vasopressors, sedation, dialysis, nasogastric drainage, chest tube, transfusion, surgical wound care, antibiotics, nutrition by feeding tube) had been provided to the patient since ICU admission. For each patient, we calculated the percentage of organs associated with admitting illness and treatments about which the nurse and patient agreed. Results: Of 28 eligible patient-nurse pairs, 61% (n=17) completed the survey. Only five (29%) patient-nurse pairs agreed completely about organs involved in the ICU admitting illness. Only one pair (6%) agreed completely about treatments the patient had received. Mean patient-nurse agreement was 78% (range, 0%-100%) for organs involved and 69% (range, 33%-100%) for treatments received. Of the five organ systems, the lowest patient-nurse agreement was whether GI organs were involved (65% of patient-nurse pairs). Highest agreement was whether the brain was involved (94%). For treatments, agreement was lowest about transfusions (47%), vasopressors (53%) and wound care (53%). Agreement was highest for dialysis (100%) and oxygen (88%) therapies. Conclusions: ICU patients with decision-making capacity and opportunity to interact frequently with their clinical team had a different understanding of aspects of their illness and treatments received than their bedside nurses. This misalignment might complicate medical decision-making and warrants further study.

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IMPACT OF AUDIOVISUAL COMMUNICATION BY A REMOTE ALARM MONITORING UNIT ON INPATIENT CARE

Dandan Ma, Jim Miller, Gang Ye, Laura Goyack, Trevor Marton, Adalberto Torres

Learning Objectives: Bedside cameras and speakers in all the patient rooms at Nemours Children’s Hospital (NCH) and Alfred I. duPont Hospital for Children (AIDHC) make it possible for the paramedics of the Clinical Logistics Center (CLC) to communicate real-time in response to alarms. Hypothesis: Low pulse oximeter saturation alarms resulted in more clinical interventions than other physiologic alarms. Methods: This was a prospective observational study using a convenience sample of every inpatient at NCH and AIDHC being continuously monitored non-invasively during the study. Over the course of five weeks for 12 hr a day, every potentially clinically significant alarm was recorded in the CLC by one of three data collectors. Other data collected included noting when audiovisual (AV) communication between the CLC paramedic and a patient room occurred, type of alarm that triggered the AV communication and the action performed by the paramedic in response to the information gathered. Any relevant clinical interventions performed by the patient care team within 2 hr of the alarm were retrospectively collected from the electronic medical records. A chi square or Fisher exact test were performed to test for significant correlations between types of alarms, actions taken by paramedics, and interventions performed by clinical staff. Results: There were a total of 1137 alarms noted during the study. 244/1137 (21%) were false alarms. 113/893 (15%) of true alarms triggered AV communication between the medic and patient rooms, 27/113 (24%) audio only and 86/113 (76%) AV. Low oxygen saturation was the most common alarm (76/113, 67%). Of 44/893 (5%) actions taken by the medics, 8/44 (18%) resulted in a clinical intervention (p<0.001). There were an additional 7 clinical interventions that occurred in response to alarms but not as a result of the paramedics’ actions. 13/16 (81%) of all interventions were in response to low saturation alarms (p<0.001). Conclusions: Clinical interventions were triggered mostly by low oxygen saturation alarms. AV communication led to half of the interventions.
A PEDIATRIC RAPID RESPONSE SYSTEM IN A COMPREHENSIVE CANCER CENTER 1 YEAR AFTER OPENING A PICU

Dorotha Dashiel, Vicky Ng, James Killinger

Learning Objectives: The goal of a rapid response system (RRS) is to provide early assessment, treatment and critical care expertise outside of the ICU. There is limited research on pediatric RRS within a comprehensive cancer center (CCC). Our rapid response system consists of 2 types of calls: rapid response (RR), response within 5 min; and consult (CS), response within 30 min. The team consists of a Nurse Practitioner (NP) and respiratory therapist, supported by a Pediatric Intensive Care Unit (PICU) physician. The objectives are to 1) describe the calls evaluated by the NP led RRS within a CCC; 2) review impact of the RRS on the rate of out-of-ICU acute respiratory or cardiac arrests 1 year after opening a PICU. Methods: This retrospective chart review analyzed RR and CS from 6/16/2014 to 6/15/2015. The number of calls, age of patient, primary diagnosis, presence of bone marrow/stem cell transplant (HSCT) patients, indications, and disposition were recorded. Results: 43 RR calls and 212 CS calls occurred during the study period. RR were highest for children 13 yr or > (n= 18, 41.9%), whereas the incidence of CS was greatest for children < or = to 3 mo (n= 87, 41%). HSCT patients accounted for 25.6% (n- 11, p<0.0005) of RR and 40.6% (n= 86, p< 0.0001) of CS (accounting for 14% of the admissions over the same time period). Indications for RR included hypotension (n= 15, 49.5%) and respiratory distress (n= 10, 23.3%). Respiratory distress (n= 57, 26.9%) was the most common indication for CS. PICU admissions occurred for 65% (n= 28) of RR, and 51% (n= 109) of CS. During the study period, there were 1.9 out-of-ICU arrests per 1000 admissions. In the 2 yr prior to the study period the rate of out-of-ICU arrests were 7.9 and 4.5, respectively. Conclusions: A Pediatric Nurse Practitioner led Rapid Response System within a Comprehensive Cancer Center may be effective in decreasing out-of-ICU acute respiratory or cardiac arrests. Patients who had a history of, or were being prepared for, HSCT represented a significant proportion of the rapid response system calls during the study period.

INCIDENCE OF ASYNCHRONIES DURING INVASIVE MECHANICAL VENTILATION OBSERVED OVER 2 MINUTES

Siddharth Dugar, Max Cassell, Eduardo Mires-Caldeveda, Robert Chaburn

Learning Objectives: Patient-ventilator asynchrony (PVA) is a mismatch between the patient effort and the ventilator. The incidence of asynchrony has been reported using advanced monitoring, computerized monitoring and prolonged (>30 min) recording periods to determine its incidence. This is not practical at the bedside. The purpose of this study is to conduct a pilot investigation to evaluate the baseline incidence of various forms of PVA during invasive mechanical ventilation using a 2 minute recording of ventilator waveforms to determine the incidence of asynchrony. Methods: Study subjects were patients on invasive mechanical ventilation admitted to the Medical Intensive Care Unit. A 2 minute video recording of the ventilator pressure and flow waveforms graphic was collected. The videos were reviewed by critical care fellow and content experts (staff physician and respiratory therapist). Asynchronies were classified as ineffective trigger effort, premature cycling, delayed cycling, double trigger, flow asynchrony and auto-trigger by consensus. Results: We recorded data for 60 patients. Modes represented in the sample included Volume A/C (45%), Pressure A/C (24%), Pressure Regulated Volume Control (18%) and Pressure Support (13%). Some form of PVA was observed in 52% of patients. These included: ineffective trigger effort (32%), premature cycling (22%), double trigger (20%), delayed cycling (15%) and flow asynchrony (7%). 25% of patient on pressure support showed PVA, the only one being ineffective trigger effort. Conclusions: In our 2 minute observation of patient-ventilator interaction, 52% of patients exhibited some form of asynchrony compared to 77%-86% described in previous studies using longer observation periods and advanced technology. The most common PVA observed was ineffective triggering effort which was in accordance with previous studies. The incidence of double trigger was 20%, similar to described previously by Thille et al. A 2 minute bedside observation of flow and pressure ventilator waveform graphics may be a more practical non-invasive approach in detecting PVA.

PERCEPTIONS OF RAPID RESPONSE SYSTEM ROLES AMONG HIGH FREQUENCY UTILIZERS

Christopher Hogan, Darci Bowles, Moshe Feldman, Shannon Lubin, Markos Kashiouris

Learning Objectives: Rapid Response Systems (RRS) are commonplace in many hospitals, but have not consistently demonstrated improved patient outcomes. Although there is research regarding global patient outcome measures, there is limited work regarding how the RRS is perceived and utilized by non-ICU healthcare providers who activate and interact with these teams. Methods: We conducted structured interviews with groups of medical and surgery floor physicians and nurses (2 night and 2 days shifts) working within units that had high utilization of RRS. Interviews were transcribed without identifying information. A critical care/RRS physician and nurse independently coded the interviews using thematic content analysis approach. Consensus was reached for any themes or codes where there was disagreement between the raters. Results: We extracted 271 data elements from 4 transcripts gathered from ~50 participants, identifying 23 unique codes centering on 5 core themes: RRS roles and triggers, communication, psychosocial issues and organizational culture. RRS roles (23% of comments) included: RRS as a safety net, resiliency, structural barriers, psychological and logistical support. Communication (21% of comments) included sub-themes of record review, communication barriers, communication tools and brevity. Triggers (42% of comments) included intuitive assessment, lack of knowledge or equipment, unresponsive medical staff, insufficient resources and logistical barriers. About 50% of trigger comments were related to patient clinical condition. Psychosocial factors (13% of comments) included self-worth, team identity, support and trust from RRS. 2% of comments related to organizational culture. Conclusions: RRS were identified by non-ICU providers as an integral part of patient care in unstable patients. We found a wide variability in RRS roles and activation triggers, some that may not have been initially anticipated and may not be taken into account when RRS utility is being assessed. Future research should focus on exploring RRS roles and communication, specifically the development of interventions to improve communication.
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A RETROSPECTIVE ASSESSMENT OF SURGICAL CRITICAL CARE UNPLANNED READMISSION DURING HOSPITALIZATION
Jessica Peters, Atiko Kodaira, Pedro Mendez-Tellez

Learning Objectives: There is minimal evidence exploring the patient characteristics associated with unplanned readmission unique to the surgical population. The purpose of this study was to perform retrospective identification of patient characteristics associated with unplanned readmission to the surgical critical care unit during hospitalization to identify patients at risk and develop interventions to support patients during transitions.

Methods: This retrospective study included 3800 patients admitted to 2 surgical ICUs in an urban academic medical center from January 1, 2013 to December 31, 2013. Those patients experiencing two or more admissions to a surgical critical care were included in the analysis. A total of 146 patients were included for review, 56 patients were disqualified secondary to patient experienced planned readmission or transfer to equivalent level of care. Data was evaluated and reported in terms of patient characteristics including hospital length of stay, critical care unit initial and readmission lengths of stay, comorbidities present upon hospital admission and critical care discharge without unique patient identifiers.

Results: The surgical patient unplanned readmission rate was 3%. 50% of the readmitted surgical patients had initial critical care LOS that was >48hr and 49% of patients were readmitted within 48 hr or less of discharge. 19% of patients experienced total hospital LOS that was greater than 50 days with an average hospital LOS of 33 days. The main diagnosis documented for unplanned readmission (33% of patients) was secondary to concerns over respiratory distress/failure/ increased O2 requirements and 32% of patients readmitted had a combined ICU LOS of >15 days.

Conclusions: Patients readmitted to Surgical ICUs have prolonged ICU and hospital stays and potential for poor outcomes. Implementation of measures and care coordination to support patients during and following transition from the surgical critical care unit would facilitate improved patient outcomes, particularly patients high risk for respiratory complications.

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EFFECTS OF ELECTROLYTE REPLACEMENT PROTOCOL IMPLEMENTATION IN A MILITARY MEDICAL ICU
Daniel Pearson, Edward McCann, Michael Morris

Learning Objectives: Electrolyte replacement protocols (ERP) have been widely implemented in the hospital setting but there is limited published evidence regarding the effects of their implementation, particularly in a medical intensive care unit (MICU). In a large academic military hospital, we sought to develop a safe and effective ERP for implementation in our MICU.

Methods: As part of a performance improvement project in the MICU, we designed an ERP to guide the replacement of potassium, calcium, magnesium, and phosphorus based on specific low values. We conducted satisfaction surveys of both nurses and physicians prior to and following ERP implementation. A report of electrolyte replacement was generated from pre-implementation (April 2015) and post-implementation (May 2015).

Results: Data from 432 electrolyte replacement events pre protocol implementation were compared to 183 replacement events post protocol implementation. Median time from abnormal lab result to time of documented dose administration for potassium decreased from 184 min to 96 min (p=0.01); for phosphorus decreased from 205 min to 109 min (p=0.02); for calcium there was no change 100 min to 69 min (p=0.03); and for magnesium no change 159 min to 129 min (p=0.18). Overall, there was a significant reduction in time to electrolyte repletion from 158 min to 91 min (p=0.01) for all electrolytes regardless of whether patient received ERP. Nursing satisfaction for autonomy, timeliness, effectiveness and need to seek additional orders were all significantly improved (p<0.01), and physicians saved 4.5 minutes/patient/day (p=0.04). There were no episodes of “over-replacement” as a result of the ERP and no adverse events were observed.

Conclusions: Implementation of an ERP significantly reduced the time from an abnormal lab result to the time of replacement dose administration while increasing nursing satisfaction with electrolyte replacement. The ERP significantly reduced physician time spent managing electrolytes. There were no adverse effects of ERP implementation.

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NURSES PERCEPTION OF ADVANCED PRACTICE PROVIDERS IN THE ICU
James Lunn, Cathy Roy, Peter Sandor

Learning Objectives: Academic medical center are utilizing Advanced Practice Providers (APP) to fill the ‘resident hour restriction’ void. The role of APPs has been well established in the critical care when comparing APPs to residents in regards to procedural skills, ventilator management, morbidity and mortality. However, the role of APPs in team dynamics on the critical care team has not been quantitatively evaluated. Poor communication leads to poor team work, poor patient outcomes and sentinel events. Our goal was to evaluate nursing perception of APPs as it relates to these topics. The MSICU at St Francis Hospital is a 22 bed closed unit. Nurses are randomly exposed to 2 critical care teams: one service is 24 hour resident coverage and the other is 24 hour APP and limited resident coverage.

Methods: We conducted a cross-sectional survey of all full time nurses over a 2 week period. All surveys were completed anonymously and returned to a secure envelope. All responses were rated on a scale with 1= strongly disagree to 5= strongly agree. Critical care APPs were blinded to the survey.

Results: Of the 56 nurses 44 (79%) completed the survey. The APP critical care team is comprised of 11 full-time and 1 part-time APP with an average of 11 (2–27) yr of critical care experience. Participants rated: APP have improved results with procedures 4.70 (3–5), APP improve communication with families 4.57 (3–5), APP improve communication between nurses/physicians 4.54 (3–5). APP are easier to reach 4.63 (3–5), APP improve efficiency 4.61 (3–5), APP improve my knowledge by answering medical questions 4.52 (3–5), APP are more responsive 4.48 (3–5), APP improve my ability to care for my patients 4.46 (3–5). APP improve my involvement in medical decisions 4.28 (1–5).

Conclusions: In this study, compared to a non-APP resident team, nurses perceive APPs to provide improved, efficient communication with patients, nurses and physicians. APPs are also more responsive to nurses and improve the nurses’ ability to care for patients. This could lead to improved quality of care, less errors and better patient outcomes.

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IMPACT OF EXPANDING EMERGENCY MEDICINE PHARMACY SERVICES IN A COMMUNITY HOSPITAL
Darlene Chaykosley

Learning Objectives: A growing area of clinical pharmacy practice is emergency medicine (EM) pharmacy. Pharmacists can provide a variety of services to emergency department patients and providers such as education, drug information, medication reconciliation, participation in medical emergencies, therapeutic drug monitoring, and ensuring medication safety. In 2011, an EM pharmacy service line was implemented at our institution with pharmacist coverage expanding to nearly 24/7 in 2015. Methods: This was a single center, survey based study conducted at a community hospital. All emergency department practitioners and nursing staff (N=67) were asked to complete a pre- and post-implementation survey that included subjective questions relating to their satisfaction before and after expansion of EM pharmacy services. Clinical intervention data were also collected from pre-established pharmacy reports.

Results: Forty-nine emergency department providers (73%) voluntarily completed the pre-implementation survey; however, only 24% completed both the pre- and post-implementation surveys. After implementation of expanded EM pharmacy services, more responders were completely satisfied with the hr of coverage (42% vs. 29%) and time to order verification (75% vs. 50%) compared to pre-implementation. There were also post-implementation improvements in provider satisfaction of the benefits (100% vs. 90%), quality of care (92% vs. 80%), and team role (92% vs. 80%) that EM pharmacists provided. When compared to the pre-implementation survey, sepsis alert, stroke alert, and rapid sequence intubation were clinical situations that EM pharmacists provided. When compared to the pre-implementation survey, sepsis alert, stroke alert, and rapid sequence intubation were clinical situations that EM pharmacists provided. When compared to the pre-implementation survey, sepsis alert, stroke alert, and rapid sequence intubation were clinical situations that EM pharmacists provided. When compared to the pre-implementation survey, sepsis alert, stroke alert, and rapid sequence intubation were clinical situations that EM pharmacists provided.
FEASIBILITY OF CONTINUOUS CAPNOGRAPHY MONITORING OF CONTINUOUS NON-INTUBATED PATIENTS AT RISK OF DECOMPENSATION

Ehizode Udevbulu, Adel Basilly-Marcus, Edward Mossop, Raja Singh, John Oropello, Anthony Manata, Roopa Kohli-Seth

Learning Objectives: Capnography (End Tidal CO2 monitoring) has been utilized in intubated patients as a monitoring tool during anesthesia, procedural sedation, during cardiac arrest resuscitation and to confirm endotracheal intubation as well as adequacy of ventilation in the ICU. Capnography has not been evaluated as a continuous monitoring tool in non-intubated patients. The purpose of this study is to evaluate the feasibility of continuous ETCO2 monitoring in detecting deteriorating patients in a non-monitored settings such a regular ward room or isolation room without traditional monitoring tools. Methods: Patients who met criteria for “At Risk for respiratory decompensation” were placed on ETCO2 continuous monitoring along with pulse oximetry monitoring. Device was setup so it was remotely linked to patient’s primary nurse if alarm was triggered. Primary nurse would receive a voice message via a wireless communication device indicating the type of alarm that has been triggered. An escalation to a secondary nurse was built if primary nurse is unable to respond. Results: Over 9 months period, 222 patients were monitored. There have been no event that led to cardiac arrest or respiratory failure requiring intubation. Using nasal cannula detector to sample ETCO2 was capturing adequately expired CO2, including mouth breathers and accurate graphs were recorded. One significant limitation of this monitoring tool is alarm fatigue. Excessive false alarms were recorded ranging from 1 – 116 false alarms per patient in 24 hr. Multiple steps have been taken to minimize false alarms. Since alarm modification, SPO2 alarms has significantly reduced to an average 1.8 alarms per patient. ETCO2 alarms remained significantly elevated at 21.8 alarms per patient. Patients were monitored on average 2.7 days. Conclusions: Continuous ETCO2 monitoring is feasible in non-intubated patients. A significant false alarm remains a challenge. Modification of the alarm settings and routing of the messages have decreased false alarms and improved the specificity of the abnormal ETCO2 which may improve early detection of decompensating patients.

ICU UTILIZATION AND OUTCOME OF OBSTETRIC POPULATION IN TERTIARY CARE CENTER: A 13-YEAR EXPERIENCE

Richard Iuorio, Adel Basilly-Marcus, Catharine Allen, Michelle Wong, John Oropello, Anthony Manata, Roopa Kohli-Seth

Learning Objectives: The obstetric population is a unique group of patients that have low incidence of critical care intervention and ICU management. There are limited reports of the ICU support for these patients in the US, primarily based on a single data set ranged from 7 to 16 yr ago, based on ICD-9 CM codes with limited case analysis. Methods: With IRB approval, all surgical intensive care unit (SICU) admissions from 1/2002 to 12/31/2014 at an academic tertiary care center were identified based on admission service and diagnosis. Data was collected by retrospective chart review and included ICU diagnoses, APACHE II scores, interventions received in the ICU, ICU length of stay (LOS), and clinical outcome. Standard statistical tests were applied. Results: During the study period, 113 patients required SICU admission, representing 1.4 % of overall SICU admissions. Mean age was 33 (range 15–44, SD 6.5), mean APACHE II score was 8.1 (range 1–20, SD 3.7), mean ICU LOS 2.6 days (<1 day – 31 days, SD 4.4). Reason for ICU admission includes hemorrhage in 72 patients (64 %), hypertensive related illness in 19 patients (17%), hypoxic respiratory failure in 11 (10 %) and sepsis 6 patients (5 %). Patients received 89 arterial lines (81%), 48 central venous catheter (44%), 92 received mechanical ventilation (81.4 %), mean PRBCs transfused was 12 Units (range 0–76 units, SD 13). There were 2 mortalities (1.8%), one from refractory septic shock, and one from decompensated heart failure from severe mitral stenosis. The frequency of admissions and mean APACHE II scores have been steadily increasing, without a change in the ICU LOS. Conclusions: Obstetric population represents a small percentage of ICU admissions but requires significant critical care interventions. Unlike prior report, leading cause of ICU admission is predominately bleeding related complications. APACHE II score under represent the severity of illness of this population. Overall mortality rate is very small and likely due to early and aggressive interventions. Early critical care involvement and early ICU admission is warranted in this high risk population.

EFFECTS OF EDUCATION AND VENTILATOR CARDS ON PROPER INITIAL TIDAL VOLUME SETTINGS

Nicholas Ponzessere, Brett Lindgren, Junad Chowdhury, Aasim Mohammed, Ana Maheshwari, Yuh Raj Selhia, Nicolas Castellano, Rotem Friede

Learning Objectives: Previous large-scale trials have recommended for initial tidal volumes in mechanically ventilated patients to be 6–8 ml/kg based on ideal body weight (IBW). Compliance with these recommendations is roughly 30% nationally. We studied the effects of bedside ventilator cards in addition to resident education on proper initial tidal volume settings. Methods: A retrospective review was done on all mechanically ventilated patients at Mercy Philadelphia Hospital between October 1, 2014 and February 28, 2015. After education, charts were prospectively reviewed between March 1, 2015 and May 31, 2015. Chronic tracheostomy and patients extubated immediately post operatively were excluded. Patients were divided into pre-intervention and post-intervention groups. Rates of proper initial tidal volume settings, patient demographics, and mortality rates were analyzed using chi-square and unpaired t-tests. Results: 192 patients were included in this study: 127 in group I (pre-intervention) and 65 in group II (post-intervention). Mean age was similar (group I 63 ± 17 vs group II 59 ± 15, p= NS). Group I and II had a majority of patients that were female (54.53% vs 50.77%, p= NS) and predominantly African American (91.34% vs 93.85%, p= NS). Group I had a much higher rate of tidal volumes outside of 6–8 ml/kg IBW compared to Group II (31.50% vs 12.31%, p= 0.004). Compliance was significantly improved when subdividing patients by BMI. In group I vs group II patients with BMI ≥ 30 (32.5 % vs 17.7 %, p= 0.008) with greater benefits in obesity class II and above (BMI ≥ 35) (35.20% vs 0%, p= 0.006). There was a slight survival benefit in this subclass group I vs group II (82.55% vs 94.44%, p= 0.26), but did not meet statistical significance. There was no statistical significance between groups in initial plateau pressures, mortality rates, ventilator days, or ICU length of stay. Conclusions: Education, along with bedside ventilator cards showed a significant difference in correct initial tidal volume settings in this community hospital setting. Larger studies are needed to show a significant difference in clinical outcomes.

EVALUATION OF AN AUTOMATED ELECTRONIC SURVEILLANCE SOFTWARE PROGRAM OF AN ELECTRONIC MEDICAL RECORD

Laura Goyack, Dandan Ma, Jim Miller, Gang Ye, Trevor Matrox, Adalberto Torres

Learning Objectives: The Clinical Logistics Center (CLC) at Nemours Children’s Hospital (NCH), a remote monitoring unit of every inpatient at NCH, utilizes an automated electronic surveillance software program (Epic Monitor, Madison, WI) to automatically peruse the electronic medical records (EMR; Epic Hyperspace, Madison, WI) of current inpatients for indicators of infection (central line associate bloodstream infection [CLABSI], catheter associated urinary tract infection [CAUTI], neonatal sepsis) or worsening clinical condition (increasing Pediatric Early Warning Score [PEWS]). Hypothesis: The automated electronic surveillance software program utilized by the CLC paramedics occasionally triggers a timely change in patient care. Methods: This was a prospective observational study using a convenience sample of every inpatient at NCH over the course of five weeks. For 12 hr per day, one of three data collectors in the CLC recorded when a patient was listed in the automated electronic surveillance software for a potential infection of interest or worsening condition. Results: The paramedics within the CLC notify the clinical staff when a potential infection or elevated PEWS is noted. Relevant clinical interventions performed by the patient care team within two hr of the notification by the paramedics were retrospectively collected from the EMR. A Fisher exact test was performed to see if there was any correlation between the kind of alert triggered and clinical intervention. Results: There were a total of 85 alerts collected during the study.
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OVERCOMING NOSOCOMIAL INFECTION BURDEN IN A DEVELOPING COUNTRY THROUGH ELECTRONIC ICU
Shamit Gupta, Anjali Kaushal, Sandeep Dewan, Naveen Chandra, Amit Varma

Learning Objectives: eICU (electronic intensive care unit) is mainly used as a tool to overcome the shortage of trained intensivists in a country like India. We believe that eICU can be used to improve standard of basic nosocomial prevention protocols in tier 2 hospitals. Methods: This retrospective observational study was conducted at a tertiary care tier 2 city with 36 ICU beds to evaluate the impact of eICU having complete access to patients’ real-time vitals, hemodynamic parameters, microbiology data and lab values; audiovisuals and smart alerts were appropriately engineered in reducing nosocomial infection in the form of CLABSI (central line associated bloodstream infection). Records were evaluated pre and post eICU intervention for the period of 6 mo that is between July 1 to December 31 2014 and January 1 to June 30 2015 respectively. CDC guideline was taken as a benchmark for determining CLABSI. Method adopted for Implementation of Bundle, virtual training sessions and strict observation by eICU were noted and adhered to.

Results: Total of 1138 and 1251 patients were admitted with ICU days being 3085 and 3106 pre and post eICU intervention respectively. Baseline demographics and patient profile were comparable with APACHE II being 16.4 ± 2.5 and 16.7 ± 2.1 respectively. Total incidence of CLABSI was 22 vs 9 for a total central line days of 1759 vs 1791 pre and post eICU respectively with per 1000 line days incidence at 12.5 vs 5.0 respectively (decrease of 60%), process sigma was at 3.74 and 4.07 respectively with difference between two coming at 9% which is significant. Conclusions: While there is no doubt that eICU can contribute to meaningful care at the bedside in resource starved areas, it has been meaningful to utilize the training tools and protocols to improve quality. Reduced CLABSI leads to better patient survival, improved outcome and reduced cost.

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EARLY TELE-INTENSIVIST INVOLVEMENT IMPROVES LENGTH OF STAY IN CLINICALLY DETERIORATING INPATIENTS
Colleen Karverski, Michael Green, Scott Lindblom, Michael Reif, Jaspal Singh, Nehal Thakkar

Learning Objectives: Due to a variety of factors in population growth, medical complexity, and provider scarcity, there has been tremendous interest and expansion in teleICU programs to provide front-line critical care. Moreover, there is mounting evidence that teleICU programs may reduce ICU and hospital length of stay (LOS). Few studies have investigated specific key drivers behind the favorable impact of teleICU programs. Here we present the role of a teleICU intensivist approach to clinical alarm management. “We hypothesized that lowering the default alarm limit was lowered to 90%, the unit experienced a 13% reduction in SpO2 alarms and a 15% reduction in total alarms, with SpO2 Lo alarms representing 45%. Many of these alarms were chattering, meaning they resolved themselves in under 10 seconds, rendering them useless. A multidisciplinary group composed of clinicians (RNs and MDs) and hospital administrators was established to tackle the high-alarming environment in a pediatric step-down unit (Progressive Care Unit, PCU). Working alongside a consulting group to perform data acquisition, a 70-day analysis was done on the number and type of physiological monitor alarms, as well as the time in alarm for the unit. Results: Based on these findings in an effort to develop implementable workflow solutions to optimize access to frontline critical care resources.

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IMPACT OF DURATION OF MECHANICAL VENTILATION ON OCCURRENCE OF C. DIFFICILE AND MRSA IN ADULTS WITH ARF
Veerajalandhar Allareddy, Natalia Martinez-Schlurmann, Sankehrth Rampa, Nalliah Romesh, Veerarathupush Allareddy, Alexandre Rotta

Learning Objectives: MRSA and C difficile infections (CDI) are major hospital acquired (HAI) infections. HAIs are important safety/quality indicators. Acute respiratory failure (ARF) necessitating invasive mechanical ventilation (IMV) is a common occurrence in the adult ICUs. The impact of duration of IMV on occurrence of CDI and MRSA is unknown. We sought to examine the impact of prolonged IMV (>96 hr) on occurrence of CDI and MRSA in adults hospitalized with ARF. We hypothesized that prolonged mechanical ventilation is associated with higher risk for CDI and MRSA infections. Methods: The Nationwide Inpatient Sample for the years 2006 to 2010 was used. All hospitalized patients older than 18 yr who experienced ARF and required IMV were selected. The independent variable of interest was duration of IMV. The outcomes were occurrence of CDI and MRSA infections. The association between outcomes and duration of IMV was examined by multivariable logistic regression models. The confounding effects of age, sex, race, insurance status, co-morbid burden, hospital region, and hospital teaching status were adjusted in the multivariable logistic regression models. Results: During the study period a total of 5,252,740 hospitalized adults had ARF and underwent IMV. The age groups included 19 to 45 yr (14.5%), 46 to 65 yr (36.1%), and >65 yr (49.4%). Males comprised 52.2% of hospitalizations. The overall incidence rate of CDI and MRSA infections was 4.1% and 2.4% respectively. 42.8% of all hospitalizations had IMV >96 hr. Following adjustment for patient and hospital level confounding factors, those who had IMV >96 hr were associated with higher odds for CDI (OR=2.78, 95% CI=2.68–2.88, p<0.001) and MRSA infections (OR=2.77, 2.66–2.89, p<0.001) when compared to those who had IMV <96 hr. Conclusions: CDI and MRSA infections occur in a considerable number of hospitalized adults with ARF needing IMV. The duration of IMV is an independent predictor of higher risk of occurrence of CDI and MRSA infections in this cohort. Strategies to minimize the duration of IMV are needed to decrease the risk of assessed HAIs.

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“MANAGING” ALARM MANAGEMENT THROUGH MULTIDISCIPLINARY COLLABORATION TO REDUCE SPO2 ALARM LIMITS
Kim Riha, Kevin Roy, Eric Williams, Fernando Stein

Learning Objectives: The high number of unactionable, nuisance monitor alerts in ICUs has become an overwhelming problem that is affecting patient safety as well as nurse productivity. The Joint Commission National Patient Safety Goals for 2014, NPSG.06.01.01, make hospitals responsible for developing a “systemic, coordinated approach to clinical alarm management.” We hypothesized that lowering the default SpO2 low limit would decrease the number of alarms and reduce alarm fatigue. Methods: A multidisciplinary group composed of clinicians (RNs and MDs) and hospital administrators was established to tackle the high-alarming environment in a pediatric step-down unit (Progressive Care Unit, PCU). Working alongside a consulting group to perform data acquisition, a 70-day analysis was done on the number and type of physiological monitor alarms, as well as the time in alarm for the unit. Results: Data recorded over 70 days indicated that the PCU experienced 423,293 total alarms, with SpO2 Lo alarms representing 45%. Many of these alarms were chattering, meaning they resolved themselves in under 10 seconds, rendering them unactionable. The current threshold for SpO2 Lo was set at 93%. Once the SpO2 Lo default limit was lowered to 90%, the unit experienced a 13% reduction in SpO2 alarms, with a 9% reduction in time spent in SpO2 alarms and a 15% reduction in SpO2 chattering alarms. This reduction in alarms has resulted in increased nurse and patient satisfaction, as well as a decrease in nurse time spent on SpO2 alarms.
patient satisfaction, as more nursing time is being spent caring for patients rather than attending to alarms. There were no reported adverse events related to lowering the alarm limits. Conclusions: This initiative revealed an outdated hospital guideline that was affecting patient safety and nurse productivity. It also proved the effectiveness of multidisciplinary collaboration in achieving such a goal, as multiple hospital departments participated. The input of both nurses and physicians gave an accurate depiction of the state of the unit, and drove the need for change, so that their time could be spent attending to patients rather than alarms.

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RISKS OF ADULT HEPARIN-PROTOCOLS IN CHILDREN ADMITTED WITH VENOUS THROMBOEMBOLISM
Sangita Baner, Nicole Carmichael, Ryan Majcina, Giovanna Capriolo

Learning Objectives: Hospital admissions for pediatric venous thromboembolic events (VTE) are becoming increasingly prevalent. The aim of this study was to: (1) evaluate if adult heparin treatment protocol is optimal for pediatric VTE and (2) identify risk factors in patients presenting with VTE. Methods: A retrospective chart review was conducted, after IRB approval, in pediatric patients admitted to the pediatric ICU (PICU) with a diagnosis of VTE. Activated partial thromboplastin time (aPTT) was used to assess whether or not patients achieved adequate anti-coagulation therapy. Data was presented as percentages, means and standard deviations. Results: Of 15 patients admitted to the PICU (60% female) with a diagnosis of VTE, 10 met inclusion criteria. Average age was 14.3 ± 4.5 yr. All patients had at least one identifiable risk factor, most common were age over 13 yr (n=11/10), oral contraceptive use (n=5/10), and family history of VTE (4/10). There was at least 1 risk factor present in each patient. The average number of risk factors for each patient was 3.4 ± 1.2 (range 1–5). A heparin drip as per adult protocol was started in 80% (8/10). Other patients were started on low molecular weight heparin or coumadin. Of the 8 patients receiving heparin, 6 reached therapeutic range within 48h. All patients had at least one event where aPTT values exceeded therapeutic level. The average number of times aPTT values exceeded therapeutic level in all patients was 2.8 ± 1.7 (range 1–5) which was related to one adverse event (massive hematoma, 12%). Four patients (n=4/8) had subtherapeutic aPTT values. The average number of times aPTT values were subtherapeutic was 0.5 ± 0.3 (range 0–1). Conclusions: This study suggests that using adult heparin protocols may cause potentially dangerous aPTT levels which could result in adverse events such as hemorrhage, and calls for a pediatric heparin protocol for the management of VTE in children. Additionally, physicians need to be cognizant that VTE can occur in children with risk factors and screen/monitor all children above 10 yr that are admitted to the hospital.

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TAKE OUT THE FOLEY! MINIMIZING INDWELLING URETHRAL CATHETERS AFTER ACUTE SPINAL CORD INJURY
Diana McPhee, Soula Priovolos, Meno Lueders, Samuel Kigongo-Mwesezi, Ronald Simon

Learning Objectives: The inability of patients with acute spinal cord injury (SCI) to sense the need to void leads to prolonged periods of indwelling urethral catheter (IUC) use during initial hospitalization. This leads to a high rate of urinary tract infection; the published incidence of UTIs in patients with IUCs is approximately 50% after 7 days. We present our protocol for minimizing the use of IUC in acute SCI. Methods: Patients admitted with a new SCI have an IUC placed. Sonographic screening for urinary retention is performed 6 and 24 hr after removing the IUC. Results: Of 13 male patients were admitted with acute SCI after removing the IUC. The median time of IUC in acute SCI was 5 days, and the intraquartile range was 2–13 days. Three patients (23%) developed UTIs, 2 with urethral catheters and 1 in the self-catheterization group. None required a IUC at discharge. Conclusions: An aggressive protocol of early removal of indwelling urinary catheters is possible in patients with acute spinal cord injury. This approach appears to reduce the incidence of UTIs in this high-risk population.

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EVALUATION OF COMMUNICATION TECHNOLOGY’S IMPACT ON INTERDISCIPLINARY COMMUNICATION
Erika Setliff, Judith Ascenzi, Mary Terhaar

Learning Objectives: New technologies are often introduced into clinical settings. Telecommunications devices were provided to all staff members on an expansive 40-bed Pediatric ICU at a large academic medical center to facilitate communication and deliver alerts. Anecdotal reports indicated frustration and interruptions. Thus, a comprehensive mixed-methods evaluation was performed to assess for the impact of these devices on multidisciplinary team communication. Methods: The mixed-methodology included analysis of 3 mo of call and message data, unit observations of communication during various events, and staff responses to the Clinical Information Systems Implementation Evaluation Scale (CISIES). These quantitative data were entered into and analyzed using IBM SPSS 22. Qualitative data were obtained from semi-structured multidisciplinary staff interviews and open-ended survey responses. Interviews were transcribed and analyzed using NVivo QSR 10. Results: Charge Nurses experienced the highest call and message volume. Fellows were interrupted during 25.6% of rounding events, and had their highest incoming call volume on nightshift. Although distribution of provider call volume throughout the day was highest during the afternoon and evening, qualitatively, providers of all types indicated experiencing many interruptions during rounding and sign-out times. Bedside RNs had more outgoing than incoming calls, but still described frequent interruptions from the devices. Qualitative themes described a current inability to triage urgency of communication, with lack of functional asynchronous messaging necessitating more synchronous interruptive calls to relay information. Conclusions: These findings reinforce the importance of evaluating technologies within their specific unit context. Use and culture vary among organizations and within individual units. Communication technology must be tailored to unit culture and communication patterns to optimize their functionality. Similar to other studies, we find high importance in the ability to triage urgency and set priority for synchronous and asynchronous communication.

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VARIATIONS ON A THEME: HOW CLINICIAN DESCRIPTIONS OF PATIENT CONDITION DIVERGE
Jeremy Pamplin, Sarah Murray, Maria Serio-Melvin, James Aden, Todd Huzar, Steven Wolf, Kevin Chung, Christopher Nemeth

Learning Objectives: Language that clinicians use in the ICU is assumed to convey similar meaning across specialties and clinical backgrounds. In our experience, we have found clinicians describe conditions in uniquely variable ways that may lead to misunderstanding. We sought to learn how clinicians describe patient condition and whether these terms help clinicians to successfully communicate their perception of patient condition. Methods: This was a prospective, mixed methods (survey, interview) study of clinicians in three academic, regional referral Burn ICUs. We asked clinicians during normal daily activities to identify “where” their patient was on a scale indicating severity of illness (SOI). The scale was divided into ten equal parts from “sickest patient: could die today” to “least sick ICU patient: could transfer to the ward today.” We also asked clinicians to circle 6 ± 2 descriptors, nurses and residents chose 4 ± 2 descriptors, and clinicians in other roles participated. Conclusions: These findings reinforce the importance of evaluating technologies within their specific unit context. Use and culture vary among organizations and within individual units. Communication technology must be tailored to unit culture and communication patterns to optimize their functionality. Similar to other studies, we find high importance in the ability to triage urgency and set priority for synchronous and asynchronous communication.

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There was considerable overlap of all other terms across multiple SOIs. **Conclusions:** With few exceptions, the language that ICU clinicians commonly use to describe patients poorly differentiates them according to SOI. Consequently, care teams risk misunderstanding what is meant when these terms are used and leading to possible medical errors.

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**JUST MOVE IT! IMPLEMENTING EARLY EXERCISE AND PROGRESSIVE MOBILITY IN A SURGICAL/TRAUMA ICU/PCU**

Ann Tescher, Mary Overorn, Kirsten Kaffine, Michele Asche, Collette Boyle, Melissa Barth, Mariela Rivera, Beth Ballinger

**Learning Objectives:** The Surgical/Trauma ICU/PCU (STICU) multidisciplinary team has worked to reduce sedation and delirium in all our patients by utilizing an evidence-based resource: ABCDE bundle (Awakening and Breathing Trial Coordination, Delirium Assessment and Management, Early Exercise/Progressive Mobility). This quality project focused on the “E” component of the bundle. Progressive mobilizing ICU patients, even in the early phases of illness, prevents ICU acquired weakness and decreases delirium, ventilator-associated pneumonia, and length of stay. Baseline audits revealed limited use of our standard adult ICU early mobility algorithm and delays in moving patients along the mobility continuum. **Methods:** Our team tailored our standard mobility algorithm to the STICU population. Safety screening criteria were used to determine patient readiness for mobility and the Richmond Agitation Sedation Score guided specific interventions. The patient’s actual mobility levels were tracked with the Johns Hopkins Highest Level of Mobility Impairment Study Group was given to staff nurses. We used a self-service reporting tool to extract ICU delirium-related EHR data for 2 mo pre- and 2 mo post-intervention to evaluate how well the nursing staff assessed all non-verbal patients and modified our standard ICU mobility algorithm to meet the unique needs of STICU patients. Incorporating early mobility takes teamwork, ongoing communication, persistence, and accountability to address mobility needs of every patient.

**Results:** 87 of 106 (82%) nurses received CAM-ICU assessments, as opposed to “Unable to Assess”, pre- and post-intervention. Analysis of post-intervention documentation instances for non-verbal patients following commands. Post-intervention, documentation of CAM-ICU assessment completion for the target patient population increased from 10% to 60% (p<0.01). Analysis of CAM-ICU “Negative” documentation instances revealed discordant documentation, such as Riker score not equal to 4 at the time of assessment. **Conclusions:** The CAM-ICU re-education was successful in increasing awareness among STICU nurses that intubated/non-verbal patients who are following commands can be assessed for ICU delirium. However, further analysis revealed continued knowledge gaps in correct use of the CAM-ICU. Future efforts will include targeting re-education to those knowledge gaps as well as interventions to optimize prevention and management of ICU delirium.

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**IMPROVING CAM-ICU ASSESSMENT OF NON-VERBAL PATIENTS IN THE SICU**

Natalie Provenzale, Tammy Chung, Furhazaa Ajani, Stacey Barker, Christian Minshall, Brian Williams

**Learning Objectives:** The quality improvement (QI) process in our Surgical Intensive Care Unit (SICU) identified deficiencies related to assessment, prevention, and management of ICU delirium. A multi-disciplinary task force was convened and identified that SICU nurses demonstrated a lack of understanding of ICU delirium assessment, particularly in intubated/non-verbal patients. We hypothesized that focused CAM-ICU re-education would improve nursing assessment of ICU delirium in this patient population. **Methods:** Our 39-bed SICU admits over 1000 patients per year; each patient is assessed using the CAM-ICU every 12 hr. CAM-ICU re-education using materials from the ICU Delirium and Cognitive Impairment Study Group was given to staff nurses. We used a self-service reporting tool to extract ICU delirium-related EHR data for 2 mo pre- and 2 mo post-intervention to evaluate how well the nursing staff assessed all non-verbal patients for ICU delirium. A chi-square test was run to compare frequency of documented assessments, as opposed to “Unable to Assess”, pre- and post-intervention. Analysis of documentation for post-intervention patients who had CAM-ICU “Negative” documented was also conducted. **Results:** 87 of 106 (82%) nurses received the CAM-ICU training. The on-demand EHR report generated 302 pre- and 351 post-intervention documentation instances for non-verbal patients following commands. Post-intervention, documentation of CAM-ICU assessment completion for the target patient population increased from 10% to 60% (p<0.01). Analysis of CAM-ICU “Negative” documentation instances revealed discordant documentation, such as Riker score not equal to 4 at the time of assessment. **Conclusions:** The CAM-ICU re-education was successful in increasing awareness among SICU nurses that intubated/non-verbal patients who are following commands can be assessed for ICU delirium. However, further analysis revealed continued knowledge gaps in correct use of the CAM-ICU. Future efforts will include targeting re-education to those knowledge gaps as well as interventions to optimize prevention and management of ICU delirium.

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**TRANSPORT RISK ASSESSMENT IN PEDIATRICS SCORE PREDICTS CLINICAL COURSE OF CRITICALLY ILL CHILDREN**

Rosa Haddock, Anabel Puig-Ramos, Milagros Martin de Pumarejo, Gilberto Puig

**Learning Objectives:** Studies in adults have shown that timely transportation of patients with critical conditions have a better outcome, but studies in children showing this relationship is scarce. This study evaluates the relationship of transport time to a PICU on patient’s clinical outcome and the relationship between the Transport Risk Assessment in Pediatrics (TRAP) Score the Pediatric Risk of Mortality (PRISM III) score and patients’ clinical outcome in PICU. **Methods:** Prospective observational cohort study including pediatric patients admitted to a tertiary PICU in Puerto Rico from August 2014 to July 2015. Vital signs and neurologic status (GCS) along with time of referral of patients transferred to the PICU was collected via phone call prior to transportation and used to calculate the TRAP score. Once at PICU, time of arrival was recorded and a PRISM III score was calculated. Outcomes were measured as length of stay at PICU and death. Descriptive statistics and logistic regression was used to analyze data. **Results:** A total of 79 patients met inclusion criteria, 38% females, 62% males with a mean age of 84.7 ± 7.6 mo. Mean LOS at PICU was 5.4 ± 0.6 days. The mean total time between referral and arrival time to PICU was 294 ± 25.8 min (4.9 hr). There was no association between time of transportation and mortality or LOS. There was a mean PRISM score of 5.3 ± 0.7 and a mean TRAP Score of 3.2 ± 0.3. Mortality rate was 5.1%. There was an association between mortality and PRISM score (OR 1.4 [95% CI 1.1 – 1.8], p = 0.02). An association with mortality and a high TRAP score was observed (OR 3.5 [95% CI 1.4 – 8.5], p = 0.007). A Mann-Whitney test showed that patients with a TRAP score greater than 5 were associated with a prolonged LOS at the PICU (p=0.002). **Conclusions:** TRAP score predicted morbidity and mortality among this sample of patients. Time of transportation did not predict outcome in this study. More studies are needed to further assess and improve the safety of pediatric patients at high risk of clinical deterioration.

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**STAFF AND FAMILY SATISFACTION WITH IMPLEMENTATION OF A SAFE PEDIATRIC SEDATION CHECKLIST**

Elizabeth Mack, Margaret Gray, Genevieve Ray, Abigail Case, Hrishikesh Chakraborty, Christine Turley

**Learning Objectives:** Checklists have been demonstrated to decrease surgical mortality worldwide. Pediatric sedation and the accompanying procedures put children at risk for complications involving anesthesia, procedures, communication, and other aspects of care. We piloted a safe sedation checklist in a pediatric sedation unit to assess feasibility, efficiency, efficacy, staff satisfaction, and family satisfaction. **Methods:** Prior to implementation of the checklist, we assessed time required for the time out and elements addressed in the time out for three mo. We allowed a 6 month washout period and then assessed compliance with checklist implementation of each of the variables selected, time required for checklist completion, and assessed for near misses or errors specifically prevented by the checklist. With IRB approval, during the post-implementation period we used a 10-item survey to assess the satisfaction of 17 staff members with the checklist, and an 11-item survey to assess the satisfaction of 100 family members with the checklist. **Results:** Completion of checklist required a mean of 32 seconds. Staff estimated, on average, that the checklist required a mean of 34 seconds, and 94% (16/17) staff felt that time spent doing the checklist was well-spent. 52% of staff and 47% of families reported the checklist prevented at least one error. 100% of staff and 94% of families said they would want the checklist used if they or their loved one were being sedated. There were many near misses or errors potentially prevented by the checklist. **Conclusions:** Families and staff felt the safe sedation checklist prevented errors, and
this was supported by several near misses prevented by the use of the checklist as witnessed by auditors. Engaging family in the checklist process contributed to their sense of ease. All staff surveyed and most families surveyed agreed they would want such a checklist used if they or their loved ones were being sedated. We plan to trial this in other settings where pediatric sedation is performed.

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EVALUATION OF AZITHROMYCIN ADMINISTRATION AND QTc-INTERVAL PROLONGATION IN THE CRITICALLY ILL

Anna Fiorvento, Linda Park, Ibah Al Shelli, Astraf Mostafa, Maria Pusnik

Learning Objectives: Critically ill patients are at a potential risk for delayed ventricular repolarization, identified on an electrocardiogram (ECG) by prolongation in the QT interval. QT-interval prolongation (QTcP) may lead to serious cardiac events, such as Torsades de Pointes (TdP). Azithromycin, a frequently prescribed macrolide antibiotic, is often administered to critically ill patients without routine ECG monitoring. The primary objective of this evaluation was to identify the incidence and degree of QTcP-prolongation (QTcP) in medical intensive care unit (MICU) patients receiving azithromycin. Methods: A retrospective observational study was done utilizing data derived from the electronic medical record of patients admitted to the MICU from 1/11/11 to 7/31/11. Patients who received azithromycin were included if they were >18 yr of age and had a baseline and repeat ECG after 24 hr of azithromycin administration. The presence of QTcP was defined as >500 ms, an increase of >60 ms from baseline, drug discontinuation occurred in 6% of patients. Conclusions: Azithromycin may be a significant cause of QTcP in patients admitted to the MICU. This data can be used to educate health care providers for more judicious QTc-interval monitoring at our institution.

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IMPLEMENTING PATIENT SAFETY GOAL BUNDLES IN NIGERIA: PRACTICE REVIEW IN A RESOURCE LIMITED SETTING

Abdulali Ibrahim, Halima Kabara, Adebayo Adeyinka, Louiseon Pierre

Learning Objectives: The World Health Organization defined patient safety bundles as a global problem applicable to all health settings. In resource limited environments the common ICU invasive procedures and their potential risks are compounded by high case load, reduced equipment and low human resource. The aim of this study is to explore the awareness on ventilator and central venous catheter bundle among ICU providers in Nigeria and discover gaps of implementation Methods: An anonymous survey was designed and distributed with SurveyMonkey® online software after IRB approval. E-mail database sources included contacts from healthcare organizations in Nigeria and email lists of ICU doctors and nurses in tertiary teaching hospitals. A descriptive analysis of responses from 44 respondents was performed categorizing qualitative, quantitative variables. Results: A total of 247 email invitation were sent. 52 (21.1%) bounced. 77 (40%) opened the survey and 48 (19%) clicked through, 5 opted out. 44 recipients responded to the invitation, 37 (84%) completed the survey, 6 (15.4%) partially responded. The breakdown of respondents by profession: resident in training 17%, medical doctor 23%, nurse 50%, others 10%. 65% had >10 yr experience, 28% had 4–9 yr. All geographical areas were represented with 50% from the North West. 88% of respondents worked in ICUs with <7 beds. 50% had a 1:1 nurse/patient ratio while 45% had 1:2 ratio. 68% had 1–2 intubated patients daily and 14.2% had 3–4. 35% were unfamiliar with the ventilator associated pneumonia (VAP) bundle, 16% read about it. The VAP implementation rate was 40%. 73% had <2 central venous catheters per day, and 27% 2–6. 60% were unfamiliar with the CLABSI bundle. Only 16.6% implemented this bundle. When explored separately, bundle parameters were practiced in a range of 23–98%. Conclusions: The results of this survey demonstrate a limited awareness of the patient safety goal bundles in Nigeria. More studies are warranted to evaluate implementation and outcomes in resource limited areas.

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IMPROVED SATISFACTION AND EFFECTIVENESS OF PICU ROUNDS BY REFINING AND STANDARDIZING THE PROCESS

Jayesh Thakker, Andrew Macfadyen, Marcie Peterson, AmyEllen Jorgenson, Rene Smith, Mel Hall

Learning Objectives: Daily rounds within the PICU often have several distractions and interruptions with the potential to compromise care and outcomes due to communication errors and delays. This also leads to staff and physician dissatisfaction. The goal of this project was to improve staff and physician satisfaction and effectiveness of PICU rounds. Methods: A workflow analysis of the rounding process was done. A survey was developed to evaluate satisfaction and effectiveness perceptions of the staff and physicians of the existing rounding process. Opportunities for improvement were identified and changes to the rounding process implemented. Post-implementation surveys were done at 1 mo and 6 mo to compare changes in staff and physician perceptions. Results: The existing bedside rounding process involved a large, multidisciplinary team. Bedside rounds were often noisy, interrupted and distracted, potentially leading to communication errors and inefficiencies. The patient's nurse was often distracted from rounds by various alarms and patient care needs. Survey data showed the lowest satisfaction score was 45% while the highest score was 79%. The rounding process was moved to a closed conference room within the PICU with audio-visual aids to allow projection of the electronic health records. The entire workflow for the rounds was standardized. Presentations by residents and other providers were improved and standardized to allow more efficient and effective discussion. The charge nurse directed the flow for rounds based on a pre-determined order of patients. The patient's nurse was always present during rounds while a relief nurse substituted at the bedside. Parents actively participated. Rounds are now in a quiet place without interruptions, distractions or HIPAA violation. The post-implementation satisfaction scores increased to a low of 92% and a high of 100% with greater learning opportunities and parental understanding. Conclusions: Refining and standardizing the PICU rounding process has led to improved staff satisfaction, education and effectiveness.
environment. Our PFAC has helped established meaningful change in both our ICU and hospital.

897 PERCEPTIONS OF RESIDENTS REGARDING CENTRAL LINE PLACEMENT BEFORE AND AFTER SIMULATION TRAINING

Joseph Mathew, Anish DeSai, Jamie Vedovitz-Freeman, Zachary Milligan, Roman Spivak, Guy Aristide, Melissa Fazzari, Jared Kuzirtz

Learning Objectives: Central venous catheter (CVC) placement is an essential procedure which permits patients to receive vasoactive agents and various infusions. CVC placement training is often performed by a trainee under supervision of an experienced provider. Few institutions have a formal training program to teach CVC placement. Methods: 18 PGY-3 internal medicine residents under-went a 4-hour simulation-based training program at Winthrop-University Hospital consisting of a pre-course video, small group discussions, demonstrations, and hands-on training on task trainers, prior to starting their ICU rotation. Residents were trained on all aspects of CVC placement. A 28-point survey was administered prior to the course and a post simulation training (ST) survey was carried out in their last month of residency. Pre and post-ST surveys were analyzed using the Wilcoxon-Mann-Whitney test for two group comparisons. Each survey question was graded from 1 to 5, on a Likert-type scale. Results: Baseline assessment prior to ST revealed insufficient training (median score 3) in CVC placement. Residents felt most prepared to place CVC in the femoral vein (median score 4) and least in the subclavian vein (median score 1). The post-ST survey showed a significant improvement in overall perception of training (p=0.002), confidence to insert CVC (p=0.02), familiarity with institutional CVC kit (p=0.04), utilization of ultrasound (p=0.02), maximum barrier precautions (p=0.006), and preparedness to teach CVC placement (p=0.003). No improvement was seen in insertion of CVC without ultrasound-guidance and placement in the subclavian vein. Conclusions: A pre-rotational simulation-based CVC training course raised overall confidence and preparedness of PGY-3 internal medicine residents in CVC placement and increased knowledge of maximum barrier precautions and ultrasound-guidance, as well as willingness to teach CVC insertion. We advocate ST to boost resident confidence in performing and teaching CVC placement.

898 REDUCING RISK FOR CENTRAL LINE BLOOD STREAM INFECTIONS IN THE PICU

Paul Bauer, Travis Sifers, Nicole Violert, Shekinah Hensley, Tara Benton

Learning Objectives: Checklists have been used in the ICU environment to decrease errors related to procedures, healthcare associated infections errors of omission on rounds. Daily assessment of need of the central line and convection of intravenous to enteral medications is part of the central line maintenance bundle. As part of our participation in the Children’s Hospital Association focus group on pediatric central line infections, we aimed to reduce the risk of central line infections by decreasing the average rate of central line entry by 25% over a 1 year period using a rounding checklist. Methods: Design: single-site quality improvement project in a pediatric ICU in a free standing children’s hospital. Data were analyzed in prospective time series. A rounding checklist with focus on line utilization practices was introduced to nursing and medical staff across the PICU. All patients admitted to the PICU from 9/2013 to 8/2014 were included for analysis. The primary outcome measure was the central line infection rate. The primary process measure was the number of central line entries during the period of intervention. Secondary measures included the utilization rate for the rounding checklist and the number of times that decisions to reduce labs, medication entries, and remove a central line were recorded. Results: Line infection rate decreased from 2.36 to 0.98 infections per 1000 central line days. Average line entry decreased from 13.8 to 11.6 entries per central line per day. Rounding checklist utilization outperformed EMR charting on central lines. Average utilization of the checklist variable from month-month and was driven by the presence of a central line. Conclusions: Risk reduction for central line infection can be successfully integrated into daily cross-disciplinary work in the pediatric ICU. Risks can be measured. Specifically, reduction in line entry in our unit was influenced by the utilization of a particularly designed rounding checklist, and associated with a decrease in line infection rate across the pediatric ICU.

899 BEST OF BOTH WORLDS: A SEMI-CLOSED MULTIDISCIPLINARY ICU MODEL WITH TRENDS TOWARD IMPROVED OUTCOMES

Anthony Basel, Heather Carrier, Crystal Breightner, Christopher Colombo

Learning Objectives: Variations in ICU organizational models show inconsistent results. We discuss the creation of a semi-closed multidisciplinary unit with a trend toward improved outcomes. Methods: Over a period of four yr, two critical care units (an open surgical (SICU) and closed medical (MICU)) were combined. In 2011 the units were physically consolidated but maintained separate patient care and teaching services, although nursing care was consolidated. In 2012, the unit was reorganized to a semi-closed model. All surgical patients were co-managed with a minimum of a critical care consult, and all medical patients had the intensivist as the primary. The teaching services were combined to include internal medicine, family medicine, general surgery and emergency medicine residents. The teaching service attendings included medical and surgical intensivists. Results: From 2009–2013, there was a decrease in CT surgery complications (20%) with anecdotal increases in patient age and pre-operative kidney disease implying surgeons accepted more complicated cases. More patients were extubated in less than 6hr (20% improvement). Of those not meeting that goal, a shorter median ventilator time was noted; the 75th percentile decreased from 19 to 7hr. Exit interviews show a consistent trend towards improved provider and learner satisfaction amongst all physician specialties, and nursing staff. Conclusions: The creation of a combined, semi-closed multidisciplinary ICU service staffed by medical and surgical intensivists shows a trend toward decreased complication rates and shorter mechanical ventilator times. Our experience is consistent with literature reports of improved quality, and in addition more easily accommodates the diverse educational and practice demands of graduate medical education. Multidisciplinary teaching rounds improved the educational experience of house staff, and physician nurse collaboration. Overall, this model appears both feasible and safe while showing trends toward improved educational and patient care outcomes.

900 IS IT TOO LOUD IN THE PICU? COMPARISON OF STAFF AND FAMILY PERCEPTIONS OF CAUSES AND INTERVENTIONS

Harshenee Kaur, Michael Nemergut, Karen Fryer, Gina Rohlik, Sandeep Tripathi

Learning Objectives: Effect of noise on the patient’s sleep and recovery from critical illness has been well documented. Unfortunately efforts to reduce the noise levels in hospitals either do not have appreciable impact or the impact progressively decreases over time. Most of these projects do not have stakeholder’s input or only include staff members to implement changes. We aimed to identify and compare the perceptions of PICU staff & families regarding causes of noise & effective prevention strategies. Methods: Provider survey was conducted by a web based software (redcap®) and the family survey was conducted as an in-person interview, over a 3 month period. Patients admitted to PICU for >24hr were approached for the survey. Participants were asked to rank the cause of noise on a scale of 1–10, with 10 being the highest and to identify the potential interventions to be effective or ineffective. Results: 115 people completed the survey (50 families, out of 251 admissions & 65 staff, 37% RR). Among all the respondents, medical alarms was rated highest (4.9 ± 2.1) as the cause of PICU noise, followed by noise from medical equipment (4.7 ± 2.1). This trend was consistent between PICU providers & family members. TV/radio and other family conversations were the lowest rated causes (2.0 ± 1.5 & 2.4 ± 1.6) between both groups. Among the various suggested interventions to reduce noise, keeping the patient room door closed was considered effective by 93% of the respondents (98% staff, 88% families), followed by designated quiet times by 82% (80% staff, 84% families). There was agreement among staff & families regarding silencing inappropriate alarms (80% each) and decreasing the phone ringer (59% and 54%). 71% of the staff felt that more staff education is required, only 50% of the patients considered it to be effective (p=0.02). Conclusions: Keeping the patient room door closed is considered the most effective strategy to reduce the noise exposure of patients. Although turning off alarms may be unsafe and inappropriate, alternative strategies to alert staff regarding vital sign changes should be explored.
Conclusions:
Anticoagulation management practices in ECMO and support tools for pharmacist monitoring of UFH dosing and laboratory tests

Survey responses from 17 ECMO centers revealed variability in laboratory monitoring and unfractionated heparin (UFH) target bleeding and thrombotic outcomes. These results were compared to email survey responses from the entire population of ECMO centers. The survey findings were used to develop guidelines and an electronic decision support tool (CDST). The CDST was implemented in July 2013 to August 2014 and retrospectively evaluated.

Results:
Compliance to current guidelines for diagnosis and management of HIT was assessed as composite end point including having 4Ts ≥4, all hepatic products discontinued when ELISA ordered, order for upper/lower extremity ultrasounds and formulary alternative anticoagulants bivalirudin, argatroban, and fondaparinux. The ELISA was linked to an order for SRA to be automatically placed. Eligible patients were ≥18 and ≥30 days postoperative. Fifty-four patients were managed with CDST from March 2015 – July 2015. Compliance with all parameters improved after CDST implementation (15% vs 4.2%). Forty-four patients (81%) had physician-calculated ∆4Ts ≥4 warranting ELISA order and in 96% all hepatic products were discontinued as instructed by the order set. Twelve patients (22%) were initiated on alternative anticoagulant and 13 (24%) had ultrasounds performed to rule out active thrombosis. Seven patients had positive ELISA with 2 patients having positive SRA. Conclusions: While overall compliance was still low this pharmacy-driven initiative allowed utilization of new technology to improve management of patients with suspected HIT.

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IMPROVING HAND HYGIENE COMPLIANCE IN HOSPITAL CARE
Mary Ashley Liu, Karrina van de Bruinhorst, Daiwai Olson, Venkatesh Aiyagari

Learning Objectives: Hand hygiene (HH) is an essential component of hospital care, however, it is not universally practiced by health care workers (HCW). High-tech solutions exist for monitoring HH, but are not widely used due to high cost and other limitations. The aims of this study were to build and test a high-tech intervention to improve HH compliance in a high-acuity neurologic ICU. The device consisted of three motion sensors, one on the hand sanitizing dispenser inside the patient room, one on the dispenser outside the room, and one on the door. The three sensors were configured to detect if entrance into or exit from a patient’s room was immediately preceded by use of the local dispenser. The device also used an audio and visual reminder when a subject failed to initially hand sanitize. A cloud-based method was used to record data on Excel spreadsheets. Compliance was defined as subjects hand sanitizing either immediately before entering or exiting the patient room or within the set time period that the reminder was given. Device functionality was tested via a direct observational period, after which observational data were compared with data recorded by the device. Results: Our device was able to monitor and record HH compliance in a high percentage of HCWs and visitors. Out of 100 observations, 73 were recorded by the device as compliant and 27 as non-compliant. Of the 73 compliant cases, 2 were actually NC of the 73 NC cases, 5 were actually compliant. The device was able to differentiate compliant from NC subjects entering or exiting the patient room, initiate a reminder and automatically record the data. Conclusions: Our study shows that HH compliance in hospital
905  CHARACTERIZATION OF WARFARIN MAJOR BLEEDING EVENTS IN REAL-WORLD CLINICAL PRACTICE
Sarah Stenkon, Karen Burgos, Janet Hoffman, John Koerber, Maureen Smythe

Learning Objectives: Warfarin has long been the gold standard for stroke and systemic embolism prevention in atrial fibrillation. Direct oral anticoagulants offer an alternative to warfarin but lack an established reversal agent. With increased attention on anticoagulation safety, there is a need for contemporary data evaluating warfarin major bleeding in the practice setting. Methods: This single center, retrospective, observational study identified patients with a warfarin bleeding event between July 2011 and June 2014. Identification occurred through health-system adverse event reporting or by cross-referencing warfarin with ICD-9 codes for atrial fibrillation, hemorrhage, transfusion, and an INR of >1.8. Charts were reviewed to confirm the presence of a major bleed (International Society on Thrombosis and Haemostasis criteria) and temporal relationship to warfarin. Patient characteristics, bleed management, and outcomes were evaluated. Results: A random sample of 58 patients was included. Gastrointestinal and intracranial bleeds occurred in 65% and 5% of patients, respectively. The mean age was 76.3 yr. Nearly 50% of patients were admitted to the ICU. Drug interactions were present in 81% and concomitant antplatelet therapy in 67%. Over half of patients had a history of renal dysfunction. Sixteen percent of patients had a procedure within 7 days of bleed, and 21% presented with an INR >5. Median HAS-BLED score was 4 and CHADS2 score was 3. Bleed management strategies included: procedure/surgery in 53%, blood products in 58%, vitamin K in 71%, and recombinant Factor VIIa in one patient. Anticoagulation was held at discharge in over half of patients. In-hospital and 30-day mortality were 7% and 12%, respectively. Conclusions: Patients experiencing a warfarin-related major bleed in practice were elderly and often on interacting medications or antplatelet therapy. Majority of bleeding events were gastrointestinal. Bleed management usually included vitamin K and blood products, while hemostatic agents were rarely used. In-hospital mortality was 7% while the 30-day mortality rate was 12%.

906  IMPACT OF PHARMACISTS ON TRANSITION OF CARE FROM INTENSIVE CARE TO PROGRESSIVE CARE UNITS
Joy Fujinaka, Patricia Louzon

Learning Objectives: Stress ulcer prophylaxis (SUP) and delirium treatment started during ICU stay are often continued in progressive care units without indication, leading to unnecessary cost and potential medication-related adverse effects such as over sedation and Clostridium difficile. Additionally, medications restricted to ICU that remain on the patient’s profile increase the risk for medication errors and patient harm. This study evaluates if pharmacist intervention during transition of care has a financial and medication safety impact by decreasing days of unnecessary SUP, delirium therapy, and ICU-restricted medications. Methods: This single center, IRB-approved, retrospective, observational study included patients admitted to the Medical ICU at Florida Hospital Orlando from November 17, 2014 to April 17, 2015. Prior to transfer, pharmacists used a checklist to evaluate each patient’s medication profile and assess the need to continue SUP, delirium treatment, and ICU-restricted medications. Physicians were contacted to discontinue medications that were no longer indicated. Data collected included number of discontinued medications and length of ICU and hospital stay. Days of therapy saved were calculated based on length of stay. Results: The study included 184 patients. During the study period, 357 SUP and 52 delirium treatment days were saved. 264 ICU-restricted medications were discontinued, consisting of sedation drips (45%), vasopressors (30%), and IV anti-hypertensives (25%). Though this resulted in minimal estimated cost savings of $1,832, the effectiveness at discontinuation of unnecessary medications likely has a clinical significance related to medication safety and adverse event rates. Conclusions: Implementation of a pharmacist-initiated transition of care checklist has minimal direct financial impact, but may decrease the number of unnecessary SUP and delirium treatment days. Further investigation is needed to evaluate the effectiveness of decreasing medication related events such as C. difficile rates and associated costs, and utility of the expansion of the checklist to other ICUs.

907  PEDIATRIC EARLY WARNING SCORE (PEWS) IS A RELIABLE PREDICTOR OF RAPID RESPONSE TEAM (RRT) CALL
Shivanand Medar, Jacqueline Weingarten-Anans, Chhavi Katal

Learning Objectives: Pediatric Early Warning Score (PEWS) is designed for early detection of clinical deterioration. Role of PEWS as a predictor of Rapid Response Team (RRT) call is not well described. We wish to explore the utility of PEWS score in predicting clinical deterioration and the need for RRT call. Methods: We conducted retrospective analysis of all pediatric RRT’s from January to March 2015. We calculated PEWS score at the time of admission to the pediatric floor, at the time of RRT call and the 24 hour period prior to RRT call. PEWS scores at the time of RRT call were compared to the scores at other pre-specified time points. Data was described using Median (1st and 3rd interquartile ranges) and percentages as appropriate. Comparison of PEWS score at various time points was performed using Mann Whitney U test. A two tailed p value ≤ 0.05 was used to denote statistical significance. Results: Sixty one pediatric RRT calls were identified, and complete data were available and included in the analysis. Median age was 11 mo (IQR 3.91) and 54% were males. The most common reason for RRT call was respiratory distress followed by altered mental status. Bronchitis and asthma were the two most common diagnoses associated with the RRT call. Median PEWS score at the time of RRT was significantly higher than admission PEWS score (4 (IQR 2.6) vs 2 (IQR 0.4); p=0.0006). The highest PEWS score was also significantly different from admission PEWS score (4(2.6) vs 2 (IQR 0.4); p=0.0003). A critical PEWS score (3 in any of the components) was found in 35/61 (57.3%) patients at the time of RRT call compared to 23/61 (37%) on admission, p=0.04. Forty out of the 61 patients (65%) were transferred to pediatric critical care unit, there was no statistically significant difference in the PEWS scores among patients who were transferred to PCCU or remained on the pediatric floor (4 (IQR 2, 6) vs 4 (IQR 2, 5.25); p=0.9). Conclusions: Worsening PEWS score is significantly associated with clinical deterioration and RRT call. We recommend using critical PEWS score ≥5 as a criteria for RRT call and further evaluation.
A STUDY COMPARING THE ACCURACY OF CGM DEVICE TO FSBG LEVELS AMONG PICU PATIENTS IN DKA
Shantaveer Gangu, Cynthia Tinsley, Shamel Abd-Allah

Learning Objectives: To compare the accuracy of a Continuous Glucose Monitoring (CGM) device to glucose values obtained by Finger Stick Blood Glucose (FSBG) method in diabetic patients admitted to Pediatric Intensive Care Unit (PICU) in Diabetic Ketoacidosis (DKA) at Loma Linda University Children’s Hospital (LLUCH). Methods: We enrolled 12 children aged 7–17 yr with diabetes mellitus in DKA undergoing treatment in our PICU. After informed consent was obtained, CGM sensor was inserted subcutaneously under aseptic condition and device calibrated. Continuous interstitial glucose levels were recorded as long as the patient was on insulin drip for DKA treatment. The decision to treat was made by the FSBG values as part of the current PICU guidelines. The CGM was disconnected at the end of DKA treatment. Results: We compared the values of both CGM and FSBG for a total of 103 paired measurements. SPSS software was used for statistical analysis. FSBG and CGM values had a correlation of 0.682 (p<0.0001) with overall mean absolute difference (MAD) of 24.2 mg/dl and mean absolute relative difference (MARD) of 20%. Clark-Error grid analysis was used to compare the accuracy of both measurements with 96% of glucose recordings falling in zone A and B. Conclusions: Continuous glucose monitoring has the potential to provide better assessment of patient blood glucose trending during DKA treatment. It can also reduce the number of painful finger sticks in these patients by more than 50%, which may improve patient sleep quality in ICU with less nursing workload.

SMART ELECTRONIC CHECKLIST ACCURACY AND EFFECTIVENESS IN PROCESS OF CARE COMPLETION IN THE ICU
Matthew Moldan, Amelia Barwise, Yue Dong, Ognjen Gajic, Brian Pickering

Learning Objectives: Patients in the Intensive Care Unit (ICU) are critically ill and providers need to be able to assimilate relevant information quickly to make effective healthcare decisions. Ambient Warning and Response Evaluation (AWARE) System is a novel interface which helps the ICU provider make decisions with all the necessary information easily accessible. A component of AWARE is the checklist, designed to reduce omissions and errors during daily rounds. The aim of this study was to assess AWARE checklist accuracy and effectiveness in process of care completion. Methods: This prospective observational study was performed in 1 medical and 1 surgical ICU at Mayo Clinic Rochester during May 2015. Unit level checklist completion rate for May 2015 was 95% in the surgical ICU and 92% in the medical ICU. Bedside nurses caring for ICU patients with a completed checklist were interviewed each day to determine process of care completion. High frequency process of care tasks were assessed including sedation break, delirium, pain, vascular and urinary catheter removal, spontaneous breathing trial and head of bed elevation in mechanically ventilated patients, DVT and stress ulcer prophylaxis, enteral nutrition, goals of care and physical therapy. Results: A total of 124 checklists were analyzed with a combined 1488 episodes of care over the study period. The most accurate question on the checklist with the appropriately carried out process of care was the head of bed being maintained at 30 degrees for mechanically ventilated patients with an agreement rate of 95.2% (83 episodes total). The least accurate question from the checklist was physical therapy with an agreement rate of 60.5% (124 episodes total). In total AWARE recognized 398 patient episodes of care which were not eligible for a particular question with an accuracy rate of 90.9%. Conclusions: Checklist accuracy in regard to completion of 12 different processes of care was analyzed with a range from 60–95% indicating moderate to high agreement. Furthermore the AWARE system was very accurate in its ability to eliminate unnecessary questions.

SAFETY OF THE PERIPHERAL ADMINISTRATION OF VASOPRESSOR AGENTS
Tyler Lewis, Cristian Merchán, Diana Esaán, John Papadopoulos

Learning Objectives: Vasopressors (VP) are an integral component of the management of distributive shock. Administration of VP via a central venous catheter (CVC) is the preferred route due to the risk of extravasation. CVCs take time to insert and have inherent risks, often necessitating temporary administration of VP through a peripheral venous line (PVL). The objective of this study is to determine the safety of administering VP through a PVL. Methods: We conducted a one-year retrospective review of patients who received VP in the medical ICU. Patients were excluded if a CVC was present at the onset of VP therapy or utilized a PVL for <1 hour. The primary outcome was to describe the number of extravasation events during the administration of VP through a PVL. We also described the type of VP infused, the site of administration, and duration of infusion through a PVL. Results: We have identified 92 patients who received a VP peripherally thus far. The patients had a median age of 78.5 yr and were primarily admitted for septic shock. The median APACHE II score was 21 with a median duration of 7 hr of VP through a PVL. Norepinephrine (NE) was the most common agent used (82%) at a concentration of 32 mcg/ml and a median dose of 0.07 mcg/kg/min. The site of administration was mainly located in the forearm and antecubital fossa. Ultimately 51% of patients were transitioned to a CVC for continuing VP therapy. The median time until CVC insertion and conversion of VP therapy was 7 hr. The median duration of VP for patients who never had a CVC was 1.5 hr. There were 4 extravasation events reported, all of which were grade 1 extravasations, that occurred a median of 12.5 hr into VP therapy. Two extravasations occurred on the top of the hand. The median dose in NE equivalents at the time of extravasation was 0.31 mcg/kg/min. All extravasations were managed conservatively with removal of the line and
warm compress. Conclusions: Our observed rate of extravasation from peripheral administration of VP is minimal; however, the safe administration of VP peripherally should be ensured by institution-specific protocols.

913 DESIGN AND WORLDWIDE PILOT OF A WEB-BASED, REAL TIME PEDIATRIC CRITICAL CARE DECISION SUPPORT TOOL
Manasi Hudyalkar, Harshleen Kaur, Lindsey Cooper, Chetak Baujaraja, Hakan Tekguc, Srinivas Murthy, Sandeep Tripathi, Grace Arteaga

Learning Objectives: Incomplete knowledge and adherence to best practices in critical illness often leads to complications and poor outcomes. Creation of an international collaborative using a Quality Improvement approach (Checklist for Early Recognition and Treatment of Acute Illness and Injury in Pediatrics, CERTAINp) can facilitate timely and improved best practice delivery in countries with limited local resources and training in pediatric intensive care.

Methods: A web-based platform was created using cognitive and ergonomic principles and integrated into the daily unit workflow to facilitate high quality, high value healthcare behaviors. 6172 pediatric critical care providers were contacted using World Federation of Pediatric and Intensive Care Societies listserve, with 78 PICUs across 34 countries responding (1.3%). 52% PICUs were classified as belonging to Low and Middle Income countries based on the World Bank Classification. 12/35 centers were recruited for this study. 5 centers are currently involved in baseline data collection phase with 2 centers entering the training phase. 183 decision support cards were designed and reviewed by pediatric critical care experts across the world. Innovative content management, team meetings and remote site co-ordination strategies were utilized using web platforms such as Google docs, Trello, MS Project, etc. Results: Data (demographic, lab, clinical, outcome measures, adherence to guidelines) has been collected on 75 patients from 3 centers with a mean patient age of 4.8 ± 4.9 yr; and ICU Length of Stay of 7 ± 6 days; 59% diagnoses were infection related, commonest being Pneumonia and Malaria; 28-day mortality was 28%. Logistic obstacles operating in 5 countries were time-zone differences, IT infrastructure, regional tropical diseases and varied usage of search engines. To overcome them, mobile and print versions of CERTAINp are being developed. Newer syndrome cards are frequently added. Conclusions: Requirement and opportunities exist for multi-center trials in developing countries. Adaptable research design and utilization of IT resources can overcome the barriers.

914 INTER-DISCIPLINARY COLLABORATION: A RETROSPECTIVE REVIEW OF THE URGENT REVERSAL OF ANTICOAGULANTS
Andrew Sundin, Jared Larson, Jb Breeding, Nicole Zantok, Julie Wibig, James Harmon

Learning Objectives: Four factor prothrombin complex concentrate (PCC) is a complex of clotting factors II, VII, IX, X, and protein C and S. PCC specifically replaces clotting factors which are depleted after use of vitamin K antagonist therapy (VKA), thus, is an ideal therapy for reversing coagulopathies induced by warfarin. Although 4 factor PCC is efficacious in reversing the effects of warfarin, its efficacy is questionable for other causes of coagulopathy. This study was conducted to look at utilization and outcomes with 4 factor PCC in our institution.

Methods: A retrospective review of 4 factor PCC use was performed at our facility. Stated order indications were as follows VKA therapy reversal (n=32), end stage liver disease (ESLD n=12) and other (n=3) which includes direct oral anticoagulation reversal (DOACs).

Results: Data (demographic, lab, clinical, outcome measures, adherence to guidelines) has been collected on 75 patients from 3 centers with a mean patient age of 4.8 ± 4.9 yr; and ICU Length of Stay of 7 ± 6 days; 59% diagnoses were infection related, commonest being Pneumonia and Malaria; 28-day mortality was 28%. Logistic obstacles operating in 5 countries were time-zone differences, IT infrastructure, regional tropical diseases and varied usage of search engines. To overcome them, mobile and print versions of CERTAINp are being developed. Newer syndrome cards are frequently added. Conclusions: Requirement and opportunities exist for multi-center trials in developing countries. Adaptable research design and utilization of IT resources can overcome the barriers.

915 COST-EFFECTIVENESS RESEARCH IN CRITICAL CARE BETWEEN 2004-2013: A SYSTEMATIC REVIEW
Torri Sutherland, Lily Foreman, Peter Neumann, Daniel Talmor

Learning Objectives: Introduction: In 2005, critical care costs were $81.7 billion in the United States; this sum accounted for 13.4% of all hospital costs and 0.66% of the gross domestic product (GDP). (1) Around this time, several land-mark reports called for improved quantity and quality of cost-effectiveness analyses (CEAs) in order to decrease costs and improve critical care patient outcomes. (2-4) This analysis seeks to establish trends in original cost-effectiveness research and evaluate interventions between 2004-2013.

Methods: A systematic review of the English language literature between 2004-2013 was conducted and compared to a review of articles published prior to 2004. Manuscripts that evaluated the cost-effectiveness of critical care interventions were selected. The trauma and pediatric literature were excluded from the primary analysis. Data on the intervention, study results, population, statistical analysis and cost ratios were obtained. Costs are presented in 2015 USD. Results: Thirty-five CEAs were included. More than sixty cost-effectiveness ratios were published with emphasis on interventions for sepsis, critical care systems, renal replacement therapy and antibiotic selection. Interventions were associated with cost savings and costs ranging from $485 to $1000,000. Ten studies identified intervention scenarios that were not cost-effective (QALY >$50,000; 2015). Conclusions: As expected, the emphasis on cost analysis and patient outcomes has increased since 2003. A prior review identified 19 CEAs that had been conducted prior to 2003; the number of studies has doubled in the past decade. One intervention with a attractive cost profile, Activated Protein C, has since been found to be ineffective and was excluded from the results. Favorable interventions include antibiotic selection, discontinuation of standard pulmonary artery catheter use and early goal-directed therapy in sepsis. Given the rise in critical care costs and the potential for overall cost savings, it is imperative that additional emphasis be placed on cost analyses in Critical Care Medicine.

916 VALIDATION OF DESATURATION AND APNEIC TIME DURING TRACHEAL INTUBATION WITH VIDEO OR DIRECT OBSERVER
Shefali Godara, Ting-Chang Hsieh, Aaron Donoghue, Maki Ishizuka, Taiki Kojima, Natalie Napolitano, Vinay Nadkarni, Akira Nishisaki

Learning Objectives: Desaturation level and number of tracheal intubation (TI) attempts reported in National Emergency Airways Registry for Children (NEAR-4KIDS) have been used as a quality improvement (QI) target in pediatric ICU (PICU) and Emergency Department (ED). Objectives were to validate reported QI data by independent observation and evaluate apneic time during TI attempts in PICUs.

Methods: Data extracted from local TI QI database (NEAR4KIDS) for TIs in PICU and ED in a large children’s hospital. TI directly observed in PICU by a QI team member from 3/2015-7/2015. Resuscitation bay TI video was reviewed from 8/2012-6/2015. Summary with median and interquartile range (IQR). Fisher’s exact test for categorical outcomes. Results: A total of 15 TIs in PICU were directly observed and 133 TIs in ED were video-reviewed. All 15 PICU TIs and 102 ED TIs had both NEAR4KIDS data and observed or video-reviewed SpO2. The difference between video-reviewed lowest SpO2 and QI-reported SpO2 was median 0% (IQR 0–3). The number of TI attempts matched with QI report and direct observation in 110/129 (85%) of TIs: 15/15 (100%) in PICU and 95/114 (83%) in ED. The number reported: QI > video in 9 (7%), video > QI in 10 (8%) in ED TIs. 21 attempts out of 15 TIs (1–4 attempts per TI) were directly observed in PICU: 5 infants (<1 year), 9 children (1–7 year), 3 older children/adult (>8 year). 4/11 (27%) had TI due to acute respiratory failure. All TIs had SpO2 > 97% before initial attempts. The median apneic time for each TI attempt was 43sec (IQR:28–61). Six TI attempts
(29%) were within 30 seconds. TIs with short apneic time (<30sec) had no desaturations (defined as SpO2<90%), while TIs with longer apneic time (≥30sec) had desaturation in 7/15 (47%) (p=0.06). Conclusions: Through direct observation in PICU and video review in ED, desaturation and number of attempts reported in local QI was highly accurate and unbiased. Less than 1/3 of TI attempts were completed within 30 sec. Future study is needed to evaluate TI process of care and outcomes.

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PEDIATRIC DAILY SPONTANEOUS BREATHING TRIAL: A MULTIDISCIPLINARY APPROACH TO EUBUTATION READINESS

Samer Abu-Sultanah, Aricsta Hole, Riad Lufti, Alvaro Tori, Brian Benneyworth, Christopher Mastrostropio

Learning Objectives: Establishing protocols to wean mechanical ventilation (MV) and test patients’ readiness for extubation with the goal of decreasing the incidence of extubation failure and its associated morbidities has become increasingly important in contemporary pediatric critical care units. To this end, we aimed to establish a respiratory therapist (RT) led daily spontaneous breathing trial (DBST) to assess extubation readiness. Methods: A working group of pediatric intensivists, RTs, nurses and information technologists was formed to establish the protocol, standardize documentation via the electronic medical record, and plan education. Protocol implementation began in 2/2015. All patients on MV were screened daily at approximately 4AM by bedside RT to determine DBST eligibility. DBST criteria included low ventilator support, FiO2 ≤ 0.5, hemodynamic stability, spontaneously breathing, and no planned procedures in the next 24 hr. If all criteria were met, patients were placed on continuous positive airway pressure (5 cmH2O) with pressure support (8 cmH2O) for up to 2 hr. If tolerated, patients were extubated to nasal cannula in the AM after intensivist approval. Daily audits were done to assess protocol compliance and accuracy of documentation. Case-based re-education was done in 5/2015 for ICU RT’s by RT educators. The rate of extubation failure was compared to baseline data from 2013 and 2014. Results: Protocol implementation began in 2/2015. Of 139 patients who met the inclusion criteria, 82 (62%) met DBST criteria. DSBT eligibility. Of 675 patients who met the inclusion criteria, 32 patients (average age 63 yr) in the pre-implementation group and 35 patients (average age 71 yr) in the post-implementation group. In the post intervention group, the number of days with delirium decreased from 2.2 to 1.2 (p=0.10), ventilator days decreased from 4.8 to 3.4 (p=0.19), ICU LOS decreased from 7.5 to 4.7 days (p=0.07), and hospital LOS decreased from 11.5 to 7.1 days (p<0.05). Conclusions: A multidisciplinary RT-led extubation readiness protocol was successfully implemented in a pediatric ICU with potential to decrease the incidence of extubation failure.

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IMPACT OF A COLLABORATIVE APPROACH WITH MID-LEVEL PROVIDERS ON ENTERAL NUTRITION DELIVERY IN THE ICU

Sohrab Mosaddad, Sahand Vafadary, Sungryub Lew, Abdul Zaid, Jennifer Plescher, Nirav Mistry, Fariborz Rezai, Paul Yodice

Learning Objectives: Early initiation of enteral nutrition in the critically ill reduces infectious complications, duration of mechanical ventilation, length of stay, morbidity and mortality. However, timely initiation and achieving target nutrition goals remains an obstacle. We studied the impact of vigorous education of medical residents and critical care nurses, application of standardized enteral nutrition orders and close collaboration with clinical dietitians on initiation and adherence to tube feeding protocols through stronger reinforcement by mid-level critical care providers in a closed ICU setting. Methods: A retrospective cohort study of the patients admitted to the ICU and initiated on an enteral feeding protocol was performed between 2011 and 2014. Data included total number of patients receiving tube feeds in the unit, number of patients started on a tube feeding protocol, number of patients reaching target feeding rate (Tg), time taken to reach target feeding rate (24h, 48h or goal not reached) and involvement of mid-level providers. Data was analyzed using the Chi square test, t-test and analysis of variance. Results: Among 675 patients who met the inclusion criteria, 68.6% were initiated on the feeding protocol. The rate of initiation of protocol increased from 46.0% in 2011 to 89.9% in 2014. The presence of mid-level providers was significantly associated with higher rate of protocol initiation when compared without mid-level providers: 55.8% and 78.5% respectively (p<0.001). When controlled for the presence of mid-level providers, partial association was observed between protocol initiation and reaching target feeding rate within 24hr: 84.6% with mid-level providers (p=0.017) and 76.8% without mid-level providers (p=0.143). Conclusions: Through an exhaustive multidisciplinary effort and addition of mid-level providers in the closed ICU setting, significant improvements were made in appropriate initiation of the tube feeding protocol and rate of reaching nutritional goal.

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THE IMPACT OF MOBILITY AND SEDATION PROTOCOLS ON DELIRIUM IN MECHANICALLY VENTILATED PATIENTS

Robin Haskell, Michelle Roor, James Curtis, Ian Butler, Dena Rocchio, Margaret Kramaric, Mary Fran Keating, Megan Doble

Learning Objectives: Delirium in ICU patients is a major independent risk factor for increased mortality, hospital length of stay (LOS), and cognitive impairment. To minimize delirium, we simultaneously implemented a minimal sedation protocol with an early mobility protocol. The aim of this study was to examine the impact of these protocols on the incidence of delirium, days on mechanical ventilation, ICU LOS, and hospital LOS. Methods: Two nurse-driven protocols, Early Mobility and ICU Sedation, were implemented in March 2014 in a 14 bed ICU in a 254 bed community hospital. The early mobility protocol started within 48 hr of admission and consisted of thrice-daily activities spanning from range of motion to ambulation. The sedation protocol emphasized intermittent dosing of a narcotic to achieve a target Richmond Agitation-Sedation Score (RASS); continuous infusions of a narcotic or sedative were used only if bolus sedation was ineffective. The Confusion Assessment Method for the ICU (CAM-ICU) was used to identify delirium. Retrospective data were collected on all medical patients admitted to the ICU between January and March 2013, prior to implementation, and were compared to data from medical patients admitted between May and July 2014, post implementation. Patients not requiring intubation were excluded from analysis. Results: There were 32 patients (average age 63 yr) in the pre-implementation group and 35 patients (average age 71 yr) in the post-implementation group. In the post intervention group, the number of days with delirium decreased from 2.2 to 1.2 (p=0.10), ventilator days decreased from 4.8 to 3.4 (p=0.19), ICU LOS decreased from 7.5 to 4.7 days (p=0.07), and hospital LOS decreased from 11.5 to 7.1 days (p<0.05). Conclusions: The implementation of Early Mobility and ICU sedation protocols resulted in a significant reduction of hospital LOS in medical patients who required mechanical ventilation. While the number of days with delirium, days on mechanical ventilation and ICU LOS were lower in the post-intervention group, the difference did not meet statistical significance.

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UTILITY OF AN OSMOLAR GAP AND OTHER LABORATORY VALUES IN THE DIAGNOSIS OF TOXIC ALCOHOL INGESTION

Neil Roe, Megan Van Berkel, Jessica Rivera

Learning Objectives: Diagnosing toxic alcohol (TOH) poisoning presents challenges, particularly in institutions without a toxicology service or readily available quantitative labs. Lab findings such as osmol gap have been used to aid detection, but unfortunately are not always reliable. Data from one poison control center demonstrated that in patients with a reported history of ingestion or a metabolic acidemia of unknown etiology, higher calcium, osmol gap, and anion gap were predictive of ethylene glycol (EG) ingestion. Our goal was to determine if such predictors provided utility in patients with an unspecified history of ingestion at adult medical centers without a toxicology service. Methods: We reviewed records for patients at five adult hospitals over four yr with serum ethanol (ME) or EG levels ordered. Patients were divided into two groups based on the presence (OH) or absence (NOH) of TOH. We calculated osmol gap, and anion gap, and osmol gap were calculated for both groups. Differences between groups were examined using a two way t-test. As categorical data, presence of serum calcium ≥9.4 mg/dl, pH≤7.4, anion gap ≥13, or osmol gap ≥10 were collected and compared using a Fisher’s exact test. Results: A total of 177 patients were evaluated; 132 were excluded due to missing lab values. A toxic alcohol was detected in 7 of 45
patients (1 ME, 6 EG). Differences in between-group means were only significant for osmolar gap (27.7 ± 18.3 OH vs 9.8 ± 10.4 NOH, p=0.04), however pH neared significance (7.22 ± 0.07 OH vs 7.33 ± 0.14 NOH, p=0.06). When lab values were analyzed as categorical data, there were no significant differences between groups and only pH7.4 neared significance (85% OH vs 66% NOH, p=0.07). Conclusions: Our study, though limited by sample size, did not identify higher calcium or anion gap as predictive for TOH ingestion as has been previously identified. Osmolar gap was higher in the OH group, but a value above 10 should be used for prediction of TOH ingestion. Early diagnosis of TOH ingestion remains a challenge. Readily available tests need further evaluation for predictive value.

**921 HYPOALBUMINEMIA AT ICU ADMISSION PREDICTS MORBIDITY, MORTALITY, AND RESPIRATORY FAILURE**

Choua Thao, Carmen Luraschi, Matthew Schreiber

**Learning Objectives:** The need for mechanical ventilation (MV) has been associated with poor patient outcomes (i.e. ICU and hospital length of stay, delirium, nosocomial infection, and mortality). Additionally, hypoalbuminemia has been shown to predict both morbidity (i.e. hospital length of stay, difficulty in weaning from MV [both invasive and non-invasive], need for mechanical support in heart failure, etc.) and mortality in oncologic, gastrointestinal, and cardiac disease processes. Early prediction of the need for mechanical ventilation in patients with severe underlying disease, evidenced by hypoalbuminemia, would provide clinical value in patient risk stratification. **Methods:** We reviewed consecutive admissions to the ICU teaching service between February 2013 and March 2014 with a measured serum albumin at admission. We collected demographic (age, sex, ethnicity), clinical (Charlson comorbidity score, categorization status, labs), severity of illness (APACHE II score, need for vasopressors, MV), and outcome data (mortality, length of stay [LOS]). Hypoalbuminemia was defined as serum albumin < 3.5 mg/dL. Univariate regression was performed on pre-determined variables with a cutoff of p=0.2 for final model inclusion. Multivariate regression was performed assessing associations of hypoalbuminemia and need for MV, length of stay, and mortality. **Results:** 1445 subjects were analyzed with a mean age of 54. 59% of patients were male with hospital mortality of 14% (ICU mortality 9%). 770 patients had hypoalbuminemia at admission (mean albumin = 3.3 g/dL, IQR 2.9–3.9). In univariate regression, hypoalbuminemia was associated with acute respiratory failure (OR 1.28, p=0.04), longer ICU and hospital LOS (additional 0.97 days, [95%CI 0.1, 1.8 days] and 7.2 days, [95%CI 2.3, 12.2 days], respectively), and increased ICU and hospital mortality (OR 1.75, p=0.02 and OR 2.1, p=0.001, respectively) in multivariate analysis. **Conclusions:** Hypoalbuminemia may be a clinically important, rapidly available, minimally expensive, assessment tool available for risk stratification in patients admitted to the ICU.

**922 COMMUNICATION BETWEEN ICU TEAM MEMBERS AND ITS EFFECT ON PATIENT CARE**

Natalie Martineau, Johnson Megan, Sarah Satink, Kimberly Slaydon, Sean Nix

**Learning Objectives:** The Intensive Care Unit is a complex environment with high stakes decision being made nearly continuously and the possibility of errors and patient harm is significant. The objective of this research is to identify the effectiveness of communication in the multidisciplinary ICU rounding team (MDT). The MDT included a physician, pharmacist, nurse, charge nurse, respiratory therapist and physical therapist. We also wanted to analyze the degree of redundancy or overlap in communication and the degree of overlap in response to actions performed post-escalation (p=0.14). A retrospective review of the electronic medical records was performed to detect relevant clinical interventions by the patient care team ordered within two hr of the alarm event. A Fisher’s exact test was performed to test for significant correlation between timing of paramedics’ actions and clinical interventions by the patient care team. **Results:** There were a total of 1137 alarms during the study period. 442/1137 (39%) of the alarms were escalated to the CLC paramedics. There were 96/1137 (8%) actions performed by the paramedics in response to alarms. There were 55/96 (57%) actions performed pre-escalation vs. 22/96 (23%) actions performed post-escalation in response to true alarms. There were 5/55 (10%) clinical interventions in response to actions performed pre-escalation vs. 5/22 (23%) interventions in response to actions performed post-escalation (p=0.14). **Conclusions:** Redundancy of alarms via escalation lead to changes in patient care.

**923 IMPACT OF ALARM ESCALATION ON INPATIENT CLINICAL CARE AT TWO CHILDREN’S HOSPITALS**

Trevor Mattos, Laura Goyack, Dandan Ma, Jim Miller, Gang Ye, Adalberto Torres

**Learning Objectives:** Little research has been done to determine the impact that physiologic alarm escalation software (Emergin, Philips) has on patient care and/or outcomes. The paramedics of the Clinical Logistics Center (CLC) at Nemours Children’s Hospital (NCH), a remote monitoring unit for every inpatient at NCH and Alfred I. duPont Hospital for Children (AIDHC), Wilmington, DE, directly address physiologic alarms, but also utilize alarm escalation software for redundancy. Hypothesis: While infrequent, some alarms noticed by the paramedic post-escalation do result in a change in patient care. **Methods:** This was a prospective observational study using a convenience sample of every inpatient at NCH and AIDHC. 2.5 that triggered a potentially significant physiologic alarm during the study. Over the course of five weeks, for 12 hr a day, three data collectors rotated through the CLC and recorded every alarm of potential clinical significance. The data collectors took note of the type of alarm, the timing of the alarm in the escalation protocol, and the action performed by the paramedic in response to the alarm. A retrospective review of the electronic medical records was performed to detect relevant clinical interventions by the patient care team ordered within two hr of the alarm event. A Fisher’s exact test was performed to test for significant correlation between timing of paramedics’ actions and clinical interventions by the patient care team. **Results:** There were a total of 1137 alarms during the study period. 442/1137 (39%) of the alarms were escalated to the CLC paramedics. There were 96/1137 (8%) actions performed by the paramedics in response to alarms. There were 55/96 (57%) actions performed pre-escalation vs. 22/96 (23%) actions performed post-escalation in response to true alarms. There were 5/55 (10%) clinical interventions in response to actions performed pre-escalation vs. 5/22 (23%) interventions in response to actions performed post-escalation (p=0.14). **Conclusions:** Redundancy of alarms via escalation lead to changes in patient care.

**924 MEDICATION UTILIZATION AND OUTCOMES WITH IMPLEMENTATION OF THE CRITICAL–CARE PAIN OBSERVATION TOOL**

Alexis Luckey, Jodi Taylor, Ashley Buckley

**Learning Objectives:** Pain is a common occurrence in critically ill patients and may cause significant consequences if untreated. Studies have shown that the Critical–Care Pain Observation Tool (CPOT) is a valid and reliable scale for pain assessment in ICU patients who are unable to self-report. Our institution transitioned from the use of the Face, Legs, Activity, Cry, and Consolability (FLACC) scale to CPOT for pain assessment within the medical ICU (MICU) to improve pain recognition in nonverbal patients. The purpose of this study was to compare opioid use, sedative use, and associated outcomes in patients assessed using the CPOT versus the FLACC scale. **Methods:** A retrospective observational study was conducted at a large community hospital to evaluate outcomes with the FLACC and CPOT pain scales in patients admitted to the MICU during February and March of 2014 and 2015. Data was collected for up to 5 days after ICU admission. The primary outcomes were opioid medication utilization in daily morphine equivalent doses (MED) and mean daily doses of sedatives. Secondary outcomes were length of mechanical ventilation, length of ICU stay, and need for naloxone administration. **Results:** A total of 37 patients were included in the final analysis. There were no statistically significant differences in baseline demographics. The daily MED administered during the study period was 16.5 mg and 30.9 mg for the FLACC
EVALUATION OF RISK FACTORS FOR HIGH VANCOMYCIN TROUGHS IN PEDIATRIC PATIENTS
Bethany Wartles, Michael Smith, Cindy Zoeller, Shannon Mayes

Learning Objectives: Vancomycin remains an important antibiotic for treatment of pediatric patients; however, it comes with the risk of developing vancomycin-induced nephrotoxicity (VIN). Historically, VIN has been associated with vancomycin accumulation and high trough levels. Other potential risks include use of concomitant nephrotoxins or vasopressors, high-dose therapy, pre-existing renal insufficiency, and extended duration of therapy. The purpose of this study was to determine risk factors for high vancomycin troughs and subsequent development of VIN. Methods: This study is a retrospective chart review of vancomycin troughs from September 2013 to December 2014. One trough per patient was included and patients were excluded if >18 yr or diagnosed with end-stage renal disease. All remaining troughs ≥25 mcg/mL were included. A similar number of troughs <25 mcg/mL were included by selecting every 10th level for analysis. Data collection for each group included: age, location, comorbidities, serum creatinine (SCr), pre-existing renal dysfunction, vancomycin level, dose, day of therapy, and concomitant use of nephrotoxins or vasopressors. Chi-squared and t-tests were used to compare discrete and continuous data. Results: A total of 122 patients were included; 61 patients in the <25 mcg/mL group and 61 patients in the ≥25 mcg/mL group. There were no statistically significant differences identified between the two groups for age, location, pre-existing renal dysfunction, trough day of therapy, concomitant use of nephrotoxic medications or vasopressors, and presence of comorbidities. Significantly more patients in the ≥25 mcg/mL group were receiving lower than standard dosing regimens (P = 0.0006). 18/61 (30%) patients in the ≥25 mcg/mL group met the criteria for VIN (50% increase in SCr after ≥72 h of vancomycin therapy). Conclusions: A lack of difference between the groups suggests all patients are at risk for VIN with sample size as a potential limitation. Our data showed trends towards significance for patients in the PICU, on vasopressors, or with certain comorbidities being more likely to develop toxicity.

INTERPROFESSIONAL ICU TEAM INTERACTIONS ABOUT ABCDE: DEVELOPMENT OF AN OBSERVATIONAL RATING TOOL
Deena Costa, Jennifer Dammeyer, Matthew White, Jose Galinato, Robert Hyzy, Milia Manojlovich, Anne Sales

Learning Objectives: The Awakening, Breathing Coordination, Delirium and Early Mobility (ABCDE) care bundle reduces time spent on a ventilator, risk for delirium and improves overall physical function for critically ill adults yet remains inconsistently implemented. Effective interprofessional team dynamics are cited as a key to successful ABCDE delivery but little is known about team interactions regarding ABCDE in the ICU. Robust measurement tools, which are lacking, are needed to assess team interactions about ABCDE. We sought to determine the reliability and validity of an observational tool to assess interprofessional team interactions about ABCDE to offer insight into complex evidence based care delivery by teams. We examined what interactions took place, which clinicians initiated interactions about ABCDE and what other clinicians engaged in these interactions during morning rounds. Methods: We adapted a semi-structured observational rating tool previously developed for a prospective ABCDE trial. We assessed content validity by input and feedback from clinicians. We then piloted this tool with two independent raters over 4 weeks in one medical ICU in an academic medical center. We examined agreement among raters and evaluated inter-reliability using Cohen’s kappa statistic. Results: We had complete data from team interactions for 23 patients. Agreement between raters ranged from 30% for who initiated discussion about ‘Awakening’ to as high as 96%, for whether the patient was mechanically ventilated or not. Inter-rater reliability demonstrated fair to moderate concordance for items that assessed which clinicians initiated discussion of ABCDE (κ = 0.13 – 0.48); however concordance was lower for items that assessed which clinicians participated in ABCDE interactions (κ = 0.05 – 0.56). Conclusions: We demonstrate fair inter-rater reliability of an observational rating tool to assess team interactions about ABCDE, specifically for which clinicians initiated interactions. Our observational tool may be reliable to identify initiation of interactions. Future work should further test and modify this tool in other ICUs.

SEDATION AND ANALGESIA UTILIZATION FOLLOWING RAPID SEQUENCE INTUBATION IN THE EMERGENCY DEPARTMENT
Michele Handzel, Glenn Oettinger, Robert Pugliese, Cara McDaniel

Learning Objectives: Management of sedation and analgesia is a cornerstone of therapy after intubation, yet evidence is concerning for inadequate treatment, especially immediately following rapid sequence intubation (RSI) with paralysis. In this study, the impact of a prescribing pathway on the time interval from intubation to sedation and analgesic administration in the emergency department is investigated. Methods: A retrospective cohort study was conducted at a level 1 trauma center to compare sedation and analgesia administration in consecutive cases undergoing RSI in the emergency department, before and after implementation of an electronic prescribing pathway. The primary endpoint was time to sedative administration. Secondary endpoints included time to administration of analgesia post- RSI and incidence of sedation and analgesia use in the emergency department following intubation. Results: The majority of patients received remifentanil for induction (76.7% and 72.4%) and rocuronium for paralysis (80.0% and 65.5%) in the pre- and post-intervention groups, respectively. The mean time from RSI to sedation administration was 28.7 and 24.0 min (p < 0.05), and the mean time from RSI to opioid analgesic administration was 78.0 min and 40.2 min (p < 0.05) between the pre- and post-intervention groups, respectively. After RSI, 93.3% in the pre-intervention cohort and 96.6% in the post-intervention cohort received sedation in the emergency department. Within three hr after intubation, 40.0% in the pre-intervention cohort and 48.3% in the post-intervention group received an opioid analgesic. The electronic post-RSI prescribing pathway was utilized in 62.1% of post-intervention patients. Conclusions: The addition of a prescribing pathway in the emergency department did not decrease time to sedation administration but did significantly decrease time to analgesic administration following RSI. The overall use of sedation and analgesia in the emergency department following intubation did not increase significantly.

UTILIZING PRE-HEALTH VOLUNTEERS TO SUPPORT REDUCTION IN CATHETER ASSOCIATED URINARY TRACT INFECTIONS
Daniel Hagg

Learning Objectives: By utilizing pre-health volunteers to perform regular chart auditing and data gathering, the Medical Intensive Care Unit (MICU) has developed a daily CQI plan to support the reduction of Catheter Associated Urinary Tract Infections in critically ill patients. Foley care as defined by MICU is a success when less than 10 hr span between pericare events. The MICU had previously faced challenges with pericare being completed consistently, and it was determined that direct feedback to nursing staff would reduce the percent of times pericare was not completed within less than 10 hr. Methods: Pre health research volunteers calculate the time between Foley care events as documented in the EMR by bedside Critical Care nurses. The volunteers alert the MICU charge nurse should any patient that a Foley not have pericare documented for ten or more hr which triggers the charge nurse to ensure Foley care is completed in a timely manner. At 10 pm each day, the pre-health volunteers calculate the percent success rate for the day, and fill out a Safety Cross which is posted in a high traffic area on the MICU. Results: Two mo post implementation of a Safety Cross as well as direct nursing feedback, has proven to reduce the average time between
Foley care events by 30 min and reduce maximum hr between Foley Care events from 16.5 hr to 13 hr from April to July of 2015. Since the implementation of the Safety Cross, May 2015, there has not been a CAUTI recorded on the MICU.

**Conclusions:** Volunteers are an integral part to implementing a successful CQI program within a medical ICU, without requiring large additional system resources. Utilizing volunteers to complete Foley care chart abstraction, communicate with nursing staff, and create data visuals has led to a reduction in average time between Foley care.

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**EVALUATING THE IMPACT OF COMMUNICATION TECHNOLOGY ON PICU INTERDISCIPLINARY ROUNDS**

Erika Setliff, Judith Ascenzi, Mary Terhaar

**Learning Objectives:** At a large academic medical center on the East Coast, the PICU is an expansive 40-bed unit, whose size brings unique challenges to communication among team members in an already complex environment. Hospital-issued telecommunication devices were supplied to all staff on the unit to facilitate communication. Anecdotal reports indicated frustration and interruptions. A comprehensive mixed-methods evaluation based on Health Information Technology (HIT) evaluation literature. In this secondary analysis, quantitative data pertaining to the use of these devices on twice daily multidisciplinary rounds were evaluated to describe their impact. **Methods:** Observations were conducted by a single observer using a template adapted from Weigl and colleagues’ (2011) communication study and tested in our environment. Three months of call and message data were obtained. All data were analyzed using SPSS 22. **Results:** A total of 345 events (interdisciplinary round on one PICU patient) were observed totaling over 58 hr. Fellows participating in rounds experienced the highest levels of interruption (2.36 interruptions per rounding hour observed on nights, 1.15 on days). On nighttime, 20.08% of the fellows’ rounding events were interrupted by a call and 25% on dayshift. Residents and Nurse Practitioners (NPs) (evaluated together based on unit roles) experienced interruptive call rates of 1.7 on days and 0.93 on nights per hour observed. bedside nurses received fewer incoming calls, but a higher message load. Messages were more likely to distract, but not interrupt the interdisciplinary communication. Twenty percent of all rounding events were interrupted by either a call or message to one of the primary members observed. **Conclusions:** Organizations should evaluate the role technology plays in both facilitating and interrupting important team communication and adapt unit processes to minimize disruptions to care.

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**IMPLEMENTATION OF THE CHOOSING WISELY DAILY LAB REDUCTION RECOMMENDATION IN AN ACADEMIC ICU**

Daniel Hagg, Hannah Lobingier

**Learning Objectives:** Choosing Wisely, an American Board of Internal Medicine strategy to reduce waste in medical systems, collaborated with various critical care societies to produce a list of “Five Things” that should be questioned by both providers and patients within the Critical Care setting. One suggested intervention is the reduction of ordering of diagnostic tests daily. Reduction in cost, better patient experience, and less patient harm all may be the result of ordering diagnostic testing to answer specific clinical questions. As part of an ongoing quality initiative in the medical intensive care unit (MICU), frequency and duration of labs ordered for patients in the MICU were tracked. **Methods:** Using pre-health research volunteers, chart abstraction was performed daily for the entire MICU census over a four-month period as a pre and post intervention. Using pre-health research volunteers, chart abstraction was performed daily for the entire MICU census over a four-month period as a pre and post intervention. Intervention occurred after a month of baseline data gathering in the form of verbal and written education plus development of a daily checklist. The Medical Director and Quality Chair of the MICU provided written education to members of the care team about the Choosing Wisely initiative. A second intervention was implemented to track whether patients were experiencing negative outcomes due to labs not being ordered during the second month of this quality project. **Results:** During AM rounding the care team was prompted to discuss whether a patient would need AM labs and whether there had been any negative outcome due to no daily labs being ordered in the last 24 hr. **Results:** A total of 1316 unique patients were included in this quality improvement project. There was a reduction of labs ordered on a daily basis per patient of 40%. Total number of labs ordered per patient was reduced by 50%. There have been no identified negative patient outcomes due to this initiative. **Conclusions:** Three months after the intervention, there was a significant reduction of labs being ordered in regular intervals and no negative patient outcomes that could be attributed to reducing regularly ordered daily labs MICU.

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**ULTRASOUND GUIDANCE FOR SUBCLAVIAN VENOUS ACCESS IN PEDIATRIC PATIENTS**

Brandon Kirkland, Eliotte Hirshberg

**Learning Objectives:** Recent analyses of subclavian central venous line (SCL) placement under ultrasound guidance (USG) have demonstrated improved success with fewer complications in adult patients. SCLs are utilized less frequently in pediatric patients, and little has been published about USG for SCL placement in this population. Here we describe our technique and experience in SCL placement using USG in our Pediatric Intensive Care Unit. **Methods:** Decision on appropriate line location is made on an individual patient basis. We utilize Philips Model CX50 and Fujifilm Sonosite M-Turbo point of care ultrasound systems in our unit. **Results:** Baseline geometry (lines) was assigned to each unit for landmark identification. The needle is inserted into the vein under direct visualization in real time with care to avoid the artery and pleural space. The operator is able to maneuver the needle to access the vein. **Conclusions:** USG for SCL placement in pediatric patients is feasible across a wide variety of patient ages and weights, may improve successful placement and decrease complications.

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**IMPACT OF REFLEX URINE STUDIES ON ANTIMICROBIAL USE AND HEALTHCARE COSTS IN THE ICU**

Marian Gaviola, Wesley McMillian, Christina Wojewoda, Gilman Allen

**Learning Objectives:** Urinary tract infections (UTIs) account for 20–50% of all nosocomial infections. Urine culture (UCx) has been regarded as the gold standard for identifying UTI. However, this method identifies patients who may have asymptomatic bacteriuria, requires prolonged processing time in clinical laboratories and may be associated with increased antimicrobial utilization and healthcare costs. The objective of this study was to describe the urine study practices and associated results at our institution to identify the number of potentially unnecessary urine cultures (UCx) that were ordered in the medical and surgical ICU. **Methods:** Patients who were admitted to the medical or surgical ICU and had urine studies (e.g. urinalysis [UA], UCx) ordered between January 1 and June 30, 2014 were randomly selected. Patients who were pregnant, on the transplant or urology services, or had urinary catheterization prior to admission were excluded. Physician ordering practices were separated into 6 groups based on timing of each urine study (reflex [CIFF], simultaneous, UA only, UA followed by UCx, UCx only, UCx followed by UA). Demographic data along with urine studies results, urinary catheter use and antimicrobial use measured as days of therapy (DOTi) were collected. Descriptive statistics were used to evaluate the use and results of urine studies and outcomes. **Results:** One hundred patients were included with a corresponding 123 urine studies. The most common orders for UA only (51 patients, 55 studies). Patients in the UCx only group had the highest mean antibiotic DOT (15 ± 21 days). Twenty-three (22%) were considered inappropriate orders which included those in the simultaneous, UCx only and UCx followed by UA groups. An additional four were considered inappropriate in the UA followed.
by UCs group due to a negative UA result. Conclusions: Current data shows there is an opportunity to decrease potentially unnecessary UCs in adult ICUs through use of reflex urine studies.

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DEVELOPMENT OF A PEDIATRIC TRANSPORT TRIAGE TOOL
Katherine Steffen, Corina Noje, Philomena Costabile, Eric Henderson, Bruce Klein, Kristen Nelson

Learning Objectives: A modified Pediatric Early Warning Score (PEWS) for transport has been successfully used to assess illness severity, but not to guide transport decision making. Many transport teams are composed of a group of providers with varied experience. In an effort to standardize triage practices, we developed a Pediatric Transport Triage Tool (PT3) to objectively guide selection of transport mode and team configuration in order to improve care for children during transport. Methods: PT3 was created for pediatric transport, incorporating objective evaluation of neurologic, cardiovascular and respiratory (NCR) systems along with a systems-based medical condition list to identify diagnoses requiring expedited transport and/or advanced team configuration not captured by NCR systems alone. A scoring algorithm was developed to guide transport mode and team configuration. Transport data were collected before and after PT3 initiation at a single tertiary center over an 18 month period. Transport mode, team configuration, complications during transport and disposition after transport [pediatric emergency department (PED), direct admission to pediatric ward or ICU (PICU)] were recorded. Results: We reviewed 4,391 inbound pediatric transport calls. Mean number of monthly transport calls (p=0.2) and initial patient disposition (PED p=0.2, PICU p=0.65) were not significantly different pre- and post-PT3 implementation. There were no differences in mean number of monthly medic (p=0.26), nurse (p=0.36), and physician level (p=0.49) calls, nor in transport mode (ground p=0.16, air p=0.5) utilized pre- and post-PT3. Need to upgrade team configuration or mode during transport was uncommon and not significantly different in pre- and post-PT3. No adverse patient safety events occurred with PT3 use. Conclusions: PT3 represents an objective triage tool to reduce variability in transport planning. PT3 did not result in increased resource utilization, or frequency of observed adverse outcomes. Transport teams with various staffing options and multiple modes of transport may benefit from such an objective assessment tool.

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EVALUATION OF DIABETIC KETOACIDOSIS/HYPEROSMOLAR HYPERGLYCEMIC STATE PROTOCOL AT AN ACADEMIC CENTER
Ah Hyun Jun, Marina Rabinoich, Shauntrrell Johnson

Learning Objectives: A recent report comparing the management of diabetic ketoacidosis/hyperosmolar hyperglycemic state (DKA/HHS) at Grady Health System (GHS) to other University HealthSystem Consortium (UHC) hospitals showed a trend towards higher length of hospital stay (average: 5.22 days versus expected: 4.15 days) and mortality rate (average: 2.63 percent versus expected: 2.09 percent) at GHS in 2014. The purpose of this study is to evaluate the efficacy and safety of and adherence to the current DKA/HHS protocol at GHS. Methods: Eligible patients are those >18 yr old who were diagnosed with DKA or HHS and treated with DKA/HHS protocol at GHS in 2014. A retrospective chart review was performed on randomly selected patients. Results: Fifty-five patients (50 DKA; 5 HHS) were included in the IRB-exempted study. Mean time to resolution was 19.3 hr for DKA and 32.3 hr for HHS. Sixteen percent of DKA patients and 20% of HHS patients had return of DKA/HHS during hospitalization. Mean ICU/stepdown and total hospital lengths of stay were 2.8 days and 5.1 days, respectively. No in-hospital mortality was observed. Intravenous fluid management and blood glucose assessment were performed per protocol 89% and 73% of the time, respectively. Initial insulin drip rate was ordered correctly in 91% of patients, although this does not reflect pharmacists’ interventions during order verification. Transition to subcutaneous (SQ) insulin was performed correctly 53% of the time. Electrolyte check was performed correctly in 58% of patients, and potassium and phosphate were repleted per protocol 28% and 26% of the time, respectively. Hypoglycemia occurred in 26% of the patients, with the mean number of hypoglycemic episode per patient being 1.6. Conclusions: The review of the DKA/HHS protocol revealed several areas needing improvement, especially blood glucose assessment, transition to SQ insulin, and electrolyte repletion. This provides an opportunity to revise the current insulin titration protocol and develop a nurse-driven protocol for electrolyte repletion. Educating the nursing and medical staff is an important future step.

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MORTALITY PREDICTION SCORING SYSTEMS FOR ADULTS ADMITTED TO EMERGENCY DEPARTMENT: SYSTEMATIC REVIEW
Vikas Bansal, Hiba Rehman, Muhammad Mangi, Rahul Kashyap, Eshan Shirazi, Enir Festic

Learning Objectives: Scoring systems in ICU were introduced almost 30 yr ago with the goal of using physiologic data available at ICU admission to predict individual patient outcomes. Later, the Emergency Medicine developed scoring systems for triage ED patient. However, there is limited experience with scoring systems in the ED. Therefore, we plan to perform a systematic review on this. We hypothesized that the scoring systems used in ED would have a low ability to assess severity in critically ill patient at admission. Methods: We conducted an extensive literature search using PubMed, Medline, EMBASE and the Cochrane Library, according to the PRISMA guidelines, on scoring systems used to assess severity in patients at admission. The primary endpoints were hospital mortality. The ability to identify patients at risk (discriminatory power) and agreement between observed and predicted outcome (calibration) along with the method of derivation and validation (application on a new cohort) were extracted. Results: We identified 1,871 articles. Out of them 16 were included. Studies derived for only a single or few diagnoses were excluded.11 systems used vital signs as variables,2 used vital signs and blood test and 2 relied on blood tests.15 systems derived using regression analysis,7 included patients admitted to MAU,7 in ED,1 included patient transported to hospital by helicopter and 1 included patient who activated EMS. Discriminatory power was specified for 14 of the scoring systems and was acceptable or better in 10 of these. The calibration was only specified for 6 scoring systems. In none of these studies impact analysis or interobserver reliability were analyzed. Conclusions: None of the 16 scoring systems are perfect, all have some flaws. Both the HOTEL and the SCS score were good in both discriminatory power and calibration but not externally validated. The REMS showed an acceptable discriminatory power but poor calibration. More research is needed especially external validation and impact analyses before the use of scoring systems can be fully implemented to the risk assessment of critically ill patients in ED admission.

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INTERDISCIPLINARY TEAM COMMUNICATION AND PATIENT SATISFACTION IN THE SURGICAL ICU
Josianna Schwanz, Hayley Crossman, Jason Brainard

Learning Objectives: Provider teams in Intensive Care Units (ICU) are often large, complex, and confusing to patients, especially in large academic medical centers. Teams includes providers from multiple professions (physicians, nurses, respiratory therapists, pharmacists) and services (intensive care, surgery, infectious disease, renal) as well as providers at different levels of education (intern, resident, attending). This study aimed to assess patient and patient family member understanding of complex provider team structures as well as patient satisfaction with communication and overall care. Methods: A 12-question electronic survey was created to evaluate patient and patient family member understanding of interdisciplinary care team structure as well as overall satisfaction with communication and clinical care. It was distributed to patients and patient family members in a Surgical ICU at a tertiary care academic medical center in Aurora, CO. Results: A total of 36 surveys were completed over 7 weeks. 33% of respondents were patients and 67% were patient family members. 75% of participants had been receiving care in the ICU for >24 hr. Data demonstrated that 33% of participants were not aware that there was more than one team of healthcare providers (i.e. surgical team versus intensivist team) caring for them or their family member and 28% of participants did not know whether the physicians caring for their family member were an intern, residents, or attending physicians. Although 81% of participants

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Vascular access is necessary in patients admitted to the Intensive Care Unit (ICU) as well as the medical ward. Currently, there are multiple modalities to achieve adequate vascular access; each with its own difficulties and drawbacks. Often, in patients with certain comorbidities, it is difficult to obtain a peripheral intravenous (IV) line, which can lead to multiple failed attempts in achieving access. We describe the safety and efficacy of inserting an ultrasound (US) guided peripheral IV catheter into the Internal Jugular vein (IJ) in such populations. Methods: This was a retrospective case series in patients with difficult or failed peripheral IV access. All patients underwent sterile insertion of a peripheral IV catheter (2.5”, 18 gauge) into the IJ under ultrasound guidance. Results: Nineteen consecutive patients were included in this small series. A total of twenty US guided peripheral IJV catheters were placed. The mean patient age was 57. Sixty percent of patients were male and the mean BMI was 26 (14.1–51.5). The mean time taken to place the peripheral IJ catheter was 4.8 min. Eighty-five percent of catheters placed were placed in the right IJ. There were no complications upon follow up. Conclusions: US-guided placement of peripheral IV catheters in the IJ is a safe, quick, and feasible way to achieve short-term IV access in a selected patient population who failed traditional peripheral IV placement. Further, larger trials are needed to confirm safety and long term complications of this method.

DECREASING THE INCIDENCE OF CATHETER ASSOCIATED URINARY TRACT INFECTIONS IN THE INTENSIVE CARE UNIT

John Agapian, Remi Okwechime, Alicia August, Sue Henningen, Daniel Ludi, Afsheen Molkara, Sylvia Gnass

Learning Objectives: Catheter Associated Urinary tract Infections (CAUTIs) are among the most common type of healthcare associated infections (HAIs), accounting for more than 50% of all HAIs; they contribute to an increased risk of morbidity and mortality on patient outcomes, with an estimated 13,000 annual deaths. Furthermore, there is increased hospital revenue spent on CAUTIs, on the order of $0.4–0.5 billion per year. The Intensive Care Unit (ICU) of Riverside County Regional Medical Center (RCRMC), was historically reporting very high Standardized Infection Ratio (SIR) for CAUTI, with values reaching up to 3.97 during the second quarter in 2013; this is a marker that indicates poor performance. Methods: Our objective was to assess the impact of a Surveillance and Prevention Program set up by the hospital on CAUTI rates. A CAUTI Prevention Compliance Monitoring Program was implemented in February 2014. A multi-disciplinary team consisting of ICU nurses, infection control personnel, and champion physician was created to help implement a CAUTI prevention program. Daily surveillance was conducted using a CAUTI Prevention Bundle tool with consistent definitions, targeting critically ill patients with indwelling urinary catheters. Monitoring included strategies for prevention during urinary catheter maintenance. Education included regulated scheduled meetings, increased presence of infection control personnel on the unit, and publicly displayed posters in the ICU to track CAUTI SIR, by quarter and also by the absolute numbers per month. Results: CAUTI SIR (observed CAUTI/expected): 3.97 (second quarter 2013); n=17 1.59 (second quarter 2014) 0.31 (first quarter 2015); n=1 92% overall improvement p<0006, 95%CI:0.004,0.43 Conclusions: CAUTI rates are an important ICU quality measure by which hospitals are rated, not to mention the important impact on patient care outcomes. Our institution struggled with this problem, and consistently had SIRs higher than the national benchmark. Implementation of a multidisciplinary prevention program helped lower our CAUTI rates, and our SIRs are now below the national average.

CHOOSING TIME ZERO CRITICALLY AFFECTS QUALITY PERFORMANCE METRICS IN PEDIATRIC SEPSIS

Nirica Borges, Curtis Kennedy, Andrea Cruz, Binita Patel, Eric Williams

Learning Objectives: The timeliness of care delivery has increasingly become a regulatory quality metric in examining performance in pediatric sepsis. Single institutions have improved adherence to ACCM/PALS guidelines with a systematized approach. The definition and recognition of Time Zero may vary depending on patient circumstances, transitional geographies and sampling frequency. We hypothesized that variations in Time Zero critically affect assessment of adherence to ACCM/PALS guidelines. Methods: We evaluated performance in resuscitation of 18 patients that had 19 episodes of sepsis spectrum illnesses with ICU admission from March through April 2015 at a tertiary care children’s hospital. TZ1 was: time of initial vital signs (surrogate for when patient known to the healthcare system), TZ2 was: time of IV placement (surrogate marker for provider recognition of shock), and TZ3 was: start time of first fluid bolus (surrogate for intent to resuscitate). Adherence to bundled elements: iv 5 min, oxygen 5 min, antibiotics 60 min, & Fluids 60 min, pressures 60 min were quantified as percentages. Times are presented as (median: 25%; 75%). Normality was tested with Anderson-Darling. Non-parametric comparisons were made with Mann-Whitney. *p<0.05 Results: TZ1 times to: iv (35:17:131), antibiotics (199:54:469), fluid (54:25:117), TZ2 times to: antibiotics (143:51:320), Fluids (11:139), pressures (195:76:277), TZ3 times to: antibiotics (124:22:539), fluid (54:14:86), pressures (114:17:249). Adherence to bundles were: iv 19%, oxygen 47%, TZ1 Fluids 61%, TZ1 antibiotics 19%, TZ1 pressures 20%, TZ2 Fluids 64%, TZ2 antibiotics 42%, TZ2 pressures 28%, TZ3 antibiotics 35%, TZ3 pressures 30%. TZ1 Fluids to TZ2 Fluids (54:25:117) vs (11:13:9)*. Conclusions: The choice of Time Zero is critically important in the assessment of performance in the resuscitation of pediatric sepsis. Vital sign sampling frequencies vary by geography and may not
identification of patients at risk in a timely fashion. Given regulations on quality performance, the complexity of care delivery must be characterized to target Quality Improvement efforts.

941 VENTILATOR WEANING PROTOCOL REDUCES DURATION OF VENTILATION IN A PEDIATRIC ICU
Ashley Sandeen, Christina Cirra, Gregory Schmidt, A Volk, Sameer Kamath

Learning Objectives: Prolonged intubation and mechanical ventilation in children can lead to higher rates of ventilator-associated events with increased morbidity and mortality. Protocol-driven ventilator weaning has been shown to reduce the duration of ventilation. Despite this, no definitive guidelines currently exist regarding ventilator weaning and extubation in children. Our objective is to determine the difference in ventilator days and PICU/hospital length of stay among mechanically ventilated PICU patients before and after the implementation of a standardized ventilator liberation protocol. Methods: We are conducting an interrupted time-series analysis of the duration of ventilation, PICU/hospital length of stay, and extubation failure rates among mechanically ventilated patients in our PICU before (7/2012–6/2014) and after (7/2014–6/2016) the implementation of a ventilator liberation protocol. Essential elements of the protocol include daily spontaneous breathing trials in patients meeting criteria. Data is obtained from patient medical records and our local Virtual PICU Systems database. Comparisons between means and proportions were performed using the z-test and ratio of means respectively. Results: We have data for 237 patients before and 73 after implementation, as enrollment continues. There are no significant differences between groups in age, weight, and gender. Cardiac admissions are higher after implementation (20% vs 36%, p=0.007). The mean duration of ventilation days decreased (5 before vs 4 after, p=0.16) although not reaching statistical significance. Extubation failure rates were not significantly different between groups. There was a significant increase in the mean PICU (10 vs 17, p=0.001) and hospital days (16 vs 26, p=0.007) before and after implementation. Conclusions: Preliminary data suggests that the implementation of a ventilator liberation protocol reduces the duration of ventilation in children without a significant increase in extubation failure. An increase in PICU/hospital length of stay was observed, which contributing factors will require further analysis.

942 COMPARATIVE STUDY OF OPTIC NERVE SHEAT DIAMETER IN HEALTHY WOMEN, PREGNANT AND PREECLAMPSIA / ECLAMPSIA
Joel Ortega, Claudia Arteaga, Emma Urias

Learning Objectives: Introduction: Preeclampsia / eclampsia is a potentially serious disease associated with maternal complications, including neurologic. In patients with increased intracranial pressure, the diameter of the optic nerve sheath increases because of its close association with the flow of cerebrospinal fluid. Her measurements using ultrasound transorbital have shown correlation with increased intracranial pressure. 20% of patients with preeclampsia, the diameter of the optic nerve sheath consistent reaches intracranial pressure values above 20 mmHg. Objectives: To compare the diameter of the optic nerve sheath transorbital measured by ultrasound between healthy women, pregnant women and pregnant women with preeclampsia / eclampsia. Methods: Methods: Cross-sectional, multicenter study. 3 groups were included: Group1: healthy women. Group2: women with pregnancy. Group 3: women with preeclampsia / eclampsia. We obtained urine protein, serum creatinine and platelets, blood pressure, related symptoms. Diameter 3 mm behind the eyeball and an axis perpendicular to the optic nerve was measured. Three measurements of each eye were made, averaging them to give a mean to minimize the variability of the measurement. Results: Results: 60 patients, 20 in each group. The diameter of the optic nerve sheath was higher with statistical significance (p < 0.05) for both eyes in patients with preeclampsia / eclampsia. In group 3, 20% in the right eye and 25% in the left eye had a diameter of optic nerve sheath above 5.0 mm. Conclusions: Conclusion: Pregnant patients with the diagnosis of preeclampsia / eclampsia had diameters larger than the optic nerve sheath compared with women with normoevolutive pregnancies and healthy women. In this sense, measurement transorbital DVNO by ultrasound appears as a new promissory tool, affordable, accessible and non-invasive evaluation and timely care of patients with preeclampsia / eclampsia to rule elevated intracranial pressure.

943 AVERSE OUTCOME FOR PATIENTS DISCHARGED FROM THE ICU BETWEEN 22:00 AND 06:59 HOURS
SAHAR BIUK, Jerry Thomas

Learning Objectives: Discharging patients from the ICU implies that the patient has been deemed fit enough for the continuation of their care on the ward. Discharging patients out of hr is thought to place them at an increased risk of clinical deterioration, and hence it is advised that any patient whose care is to be stepped down from ICU on to the ward should ideally be discharged during the day when there are normally higher numbers of staff available to monitor them. According to the UK NICE guideline CG50 (Acutely ill patients in hospital – Recognition of and response to acute illness in adults in hospital), if an ICU discharge occurs between 22:00 and 06:59 it should be documented as an adverse incident. However, due to adverse factors, such as bed requirement, it may become necessary to discharge patients from ICU during these undesired hr. This clinical audit looked at whether the discharge of patients from a intensive care unit between 22:00 and 06:59 is safe. Methods: It is a retrospective review of all patient discharges from a general intensive care unit in 2014 (1st of January 2014 to 31st of December 2014). Statistical tests were applied to the results to determine whether or not they were of any significance. Results: After performing statistical tests on these data, it was found that the difference in the percentages of patient deaths between patients who were discharged from ICU out-of-hr and those who were discharged within-hr was of a statistical significance (P = 0.0187) The difference in the rate of readmission between the two groups was not of statistical significance (P = 0.5132), although a higher percentage were readmitted within the first 48 hr from the out-of-hr group compared to in-hr (25% and 6.25% respectively, P=0.2746). On average, patients who were discharged from ICU out-of-hr spent 5.9 days more on the ward than those who were discharged in-hr. Conclusions: Our audit demonstrated adverse outcomes for patients discharged out of from a general Intensive Care Unit. This has helped to highlight Critical Care capacity issues in the ward.

944 RESPIRATORY THERAPIST AND NURSES COLLABORATE TO PREVENT RESPIRATORY DEVICE-RELATED PRESSURE ULCERS
Tara Mahramus, Vivian Bartlett, Jennifer Brown, Mayury Gil, Melissa Knizeley, Tiffany Niederhauser, Daleen Penoyer

Learning Objectives: Respiratory care device (RD) use is associated with pressure ulcers (PU) and is often used in critical care. Variation in skin assessments, prevention, and treatment of PUs exists. In response to a rise in RD-PUs, a multidisciplinary team designed a respiratory therapist (RT) and nurse (RN) collaborative prevention strategy. The project aimed to improve awareness and collaboration of RD-PU prevention strategies across disciplines and result in fewer RD-PUs. Methods: A prospective, descriptive design in two critical care units was used to assess feasibility of the collaborative intervention, consisting of documentation under RDs and initiation of a care plan to prevent and treat RD-PUs. Audits of the medical record (EMR) were done to determine compliance with the intervention. Satisfaction and perceptions by RTs and RNs was assessed. Incident reports were used to assess RD-HAPUs before and after. Results: We performed 736 documentation audits to assess compliance with the intervention. Seventy seven satisfaction surveys were completed. The collaborative skin assessment was documented only 30% in the EMR, but the survey data indicated that RTs and RNs enjoyed performing the collaborative skin assessment together and considered it best practice to identify and prevent RD-PUs. Participants recommended that a documentation section be added to the EMR to help communicate skin assessment findings between disciplines. Timing the collaborative skin assessment was a barrier to performance. Only one RD-PU was reported during the pilot study. Conclusions: Enhanced awareness of the need to assess skin under RDs and increased collaboration between RTs and RNs during the pilot study period. While compliance with documentation was low, participants...
INTRODUCTION OF NEW ELECTRONIC ORDER REDUCES BLOOD CONSUMPTION HOSPITAL WIDE
Ross Gaudet, Todd Dodick, Michael O’Connor, Jacqueline Poston, Angela Treml, Eleanor Valenzi, Ariana Dye

Learning Objectives: While red cell transfusion is understood to be a life saving intervention, there is a substantial body of literature that suggests that restrictive strategies for red cell transfusion produce comparable outcomes at less cost. A variety of strategies have been employed and deployed to promote restrictive transfusion practices. As a group, practitioners resist being compelled to practice in a particular way. We hypothesized that by adding a reflective component to a new electronic order in our medical record system, providers would be more thoughtful about their red blood cell transfusion practices, and might shift their practice to be more restrictive.

Methods: Before our interventions, providers were able to order red cell transfusions as they saw fit. In November 2014, we made two substantial modifications to our computer order sets to promote a more restrictive transfusion practice. First and foremost, practitioners were asked to select the “indication” for the transfusion order. Secondly, a new option was inserted that allowed providers to select two separate orders: transfuse single unit or transfuse multiple units. Retrospective data were collected through various databases of total red blood cell transfusions hospital wide from November 2014 - April 2015 and compared to pre-intervention data from November 2013 - April 2014.

Results: Our retrospective data suggest that the new order set reduced our absolute utilization of red cells (year over year) by 936 units, or approximately 8%.

Conclusions: Reflective strategies allow practitioners to retain autonomy with respect to care while encouraging them to improve the quality of their care. Unlike other approaches, reflective strategies are unlikely to trigger resentment. Will this reduction in utilization be sustained? Only time will tell.

DEVELOPMENT AND IMPLEMENTATION OF AN EARLY ACTIVITY PROGRAM IN A SURGICAL ICU
Ashly Nealon, Paul Ricard, Cindy Dwyer

Learning Objectives: Early mobility of an ICU patient is known to have multiple benefits that include a decrease in ICU acquired weakness, decrease in episodes of delirium and reduction in sedative usage. To date, most research has been conducted in the medical ICU and relies upon a rehabilitation model. Using the quality improvement process of focusing on available resources and current and ideal processes we developed and implemented a multidisciplinary early mobility program. The main outcomes were to achieve planned early mobility for all patients by the most appropriate service provider and increasing the total amount of activity sessions per day. Our hypothesis was that by implementing a formal rounding process with a rehabilitation provider and nursing staff more patients would receive a higher level of mobility and be mobilized more frequently with our utilizing additional rehabilitation or nursing staff.

Methods: Due to the variability in patient mobility needs, a hybrid RN/Therapist model was developed. A screening tool was created to assess a patient’s clinical readiness for an activity session. During daily rounds, this screening tool was reviewed by the rounding therapist and bedside RN. If a patient was deemed clinically safe for an activity session, a Highest Level of Mobility (HLM) target was set for the day. Results: Using October 2013 through December 2013 as a baseline to determine average HLM for our patient population and average number of days to first therapy consult, we showed improvement in all main areas: 93% of patients have a target set each day, 60% of patients meet that target (increase from 34% first quarter, not measured in baseline data), time to first PT visit decreased from 2 days to 1 day, patient ICU days with mobility treatment increased from 15% at baseline to 23% currently. Conclusions: By developing a multidisciplinary mobility model in our SICU, we have been able to increase compliance with daily HLM target setting, increase average HLM per patient each day and decrease the overall time to first PT/OT consult for appropriate patients.
949 EVALUATION OF NEUROLEPTIC UTILIZATION IN THE ICU DURING TRANSITIONS OF CARE
Brian Gilbert, Jason Ferreira, Randi Scarey, James Morales, Donald Johnson

Learning Objectives: The purpose of this study was to identify risk factors associated with inappropriate continuation of neuroleptics post-discharge from the ICU and hospital. Methods: A retrospective chart review was performed including all patients greater than 18 yr of age who received neuroleptic medications in an ICU. Results: One hundred sixty-one patients were included during the 12-month study period. There were 85 patients (53%) discharged from the ICU with inappropriate continuation of a neuroleptic medication. There were 54 patients (34%) discharged from the hospital with inappropriate continuation of a neuroleptic medication. Patients were more likely to be discharged from the ICU with an inappropriate neuroleptic if they were prescribed multiple neuroleptics (p=0.02), did not have a urine drug screen collected at admission (p=0.023), or if trazodone was utilized in their therapy (p=0.004). Patients were more likely to be discharged from the hospital with a neuroleptic if they had multiple neuroleptic orders (p=0.0001) or if trazodone was utilized in their therapy (p=0.0023). Conclusions: Risk factors associated with the continuation of inappropriate neuroleptics upon discharge from the ICU or the hospital include multiple neuroleptic medications prescribed, the lack of a urine drug screen upon admission, and the utilization of trazodone.

950 DECREASING CLONIDINE MEDICATION ERRORS WITH INDICATION SPECIFIC ORDER ENTRY
Santosh Kaipa, Regina Cregin, Nilam Gandhi, Chhavi Katyal, Henry Ushay

Learning Objectives: ClonIDine is a centrally acting α-2-adrenergic agonist that is used for treatment of hypertension, smoking cessation, Attention Deficit Hyperactivity Disorder (ADHD) and in critical care units for abstinence symptoms from prolonged use of dexmedetomidine. A cluster of 3 severe (NCC MERP category D) adverse drug events (ADEs) related to clonIDine occurred over a 2 month period in our center triggering an in depth review of clonIDine safety. Methods: In reviewing the 3 ADEs, an Interdisciplinary Task Force (ITF) found the errors were due to mistakes in converting micrograms (mcg) to milligrams (mg) and lack of a specific indication being stated so that a verifying pharmacist could check to make sure the prescribed dose was correct for the patient. In July 2014 a strict indication guided order set was created which included instructions on computerized physician order entry (CPOE) screens on how to convert mcg to mg. In order to assess the efficacy of these interventions, a review of all clonIDine orders from July 2015 to July 2015 was conducted. All orders were checked for dosing mistakes, clonIDine-associated ADEs and also for inappropriately ordered doses which were retracted (near misses). Results: There were 524 clonIDine orders entered during the 12 month (7/13 – 7/14) pre-intervention phase and 741 during the 12 month (7/14 – 7/15) post-intervention period (38% increase). There were 3 ADEs prior to the intervention and 0 post intervention (P=0.03). There were 15 near misses (retracted orders) pre-intervention and only 4 post-intervention (P=0.008). Conclusions: Creating indication specific CPOE and dose calculation assistance has significantly reduced serious clonIDine related ADEs as well as near miss errors in our hospital, even in the face of increasing clonIDine use. It might useful for institutions, to create strict CPOEs for drugs with serious adverse effects and different doses for different indications to reduce ADEs which account for about 19% of all adverse events in hospitals.

951 PREVENTION OF AIRLOCKS AND NEGATIVE BLADDER PRESSURE USING A NOVEL URINARY DRAINAGE SYSTEM
Bruce Friedman, Derryani Nanduri, Jordan Wolf, Daniel Burnett, Evan Luxon, George Kramer

Learning Objectives: Urine output (UO), measured using an indwelling catheter, drainage tube and urometer, is used as an indicator of kidney function and global perfusion. When placed correctly with the urometer at the foot of the bed and slack in the drain line to prevent urethral trauma, urine is trapped in the bladder by air pockets in the drain line, termed “airlocks”. When this occurs, urine ceases to drain, accumulating in the bladder until the bladder pressure overcomes the airlock or the drainage line is manipulated by nursing staff. While these manipulations break the airlock they generate a negative pressure in the bladder, which causes suction trauma. Here, we compare a traditional drainage system in the ICU to a novel urine drainage system (Accuryn, Portero Medical Inc.) designed to eliminate airlocks, thereby reducing episodes of retained urine and negative pressures spikes. Methods: In a randomized controlled ICU study, UO and drainage line pressure data were compared between 10 control patients with a traditional urine drainage system and 10 test patients with the Accuryn System. Data analysis identified the occurrence of airlocks and associated retained volume of urine, and the negative pressures in the drainage line. Results: In over 500 hr, 8/10 control patients had 29 airlocks with associated retained urine ranging from 31–295 mL, compared to 0/10 test patients with airlocks (chi-square (1) =13.3, p<0.001). 7/10 control patients had negative pressure spikes in the drainage line compared to 1/10 test patients (chi-square (1) = 7.5, p<0.01). Conclusions: Airlocks and their associated episodes of retained urine and negative pressure spikes during drainage line manipulations are common in the ICU with traditional UO drainage/monitoring systems and predispose to urinary tract infections (UTI). The Accuryn System eliminated airlocks and associated retained urine while reducing the occurrence of negative pressure spikes. More accurate UO monitoring offers benefit for the use of UO as a key vital sign. The relationship between negative pressure spikes in the bladder and UTI requires further research.

952 PLANNED EVACUATION OF AN ICU AS PREPARATION FOR DISASTER MANAGEMENT
Marian Von-Maszewski, Gregory Botz

Learning Objectives: Evacuation of an ICU requires a coordinated effort among all areas of health care, patient care before, during and after the move must be continuous. Resources and staff must be prepared for a variety of emergency events. We used the preparation for planned opening of a new unit to conduct a needs assessment in a real-time setting to close educational gaps and ensure resource availability. Methods: Simulations were performed with multidisciplinary groups to ensure preparedness for the move. Isolated patient critical events were incorporated into larger full-scale efforts to determine staffing and resource needs, response times and educational lapses. Training in the new location ensured availability of all resources and increased staff familiarity with storage of supplies. The hospital performed a total of 5 generator tests as part of a large construction project, each covering an individual component of support or area of the hospital including electricity, lighting, and gas supply. We used these events as a training opportunity for triage of ICU patients for transport, preparation for interruptions of supply chain and transfer of patients with requirements for high ventilator availability. Identifying the needs of the most critically ill patients during each event allowed familiarization with potential life-threatening issues and solutions to enable safe transport and hand off. Results: Identification of resource needs has enabled us to devise an evacuation plan, develop visual tools, stock appropriate supplies and familiarize team members with the process of emergent evacuation in a non-emergent setting. Conclusions: Evacuation or large-scale transfer of ICU patients can be achieved successfully by preparing staff and resources through use of simulation and by taking advantage of isolated patient needs and planned hospital events to uncover deficiency of learning and supplies.

953 DEVELOPING A STANDARDIZED OR TO ICU HANDOFF PROCESS
Meghan Lane-Fall, Joe Pascual L., Meredith Collard, Juliane Jablonski, Rinad Beidas, Jacob Gutsche, Lee Fleisher, Frances Barg

Learning Objectives: Operating room (OR) to ICU handoffs may place patients at risk for preventable harm. Recommended handoff procedures have been described following cardiac surgery, but no general OR-to-ICU handoff system has been developed. Methods: As part of the Handoffs and Transitions in Critical Care (HATRICC) study (ClinicalTrials.gov NCT02267174), we sought to develop a postoperative handoff procedure by conducting interviews...
Phenytoin is the most frequently used antiepileptic medication. Learning Objectives: Nadia Ismail

EVALUATION OF PHENYTOIN MONITORING PRACTICES

The importance of the OR to ICU handoff, but identified several barriers to consistently achieving an ideal handoff, mainly: time pressure, unclear expectations, and confusion about other clinicians’ informational needs. Participants were receptive to a standardized handoff process provided that it was not overly proscriptive. Surveys (n=133) revealed unreliable information transfer with current OR to ICU handoffs. Field notes from meetings with clinical leaders indicated widespread agreement with standardizing the postoperative handoff process. Using these data, we developed a novel handoff process suitable for use in a mixed surgical ICU. This handoff process had 2 parts: (1) choreographed information exchange at the patient bedside and (2) a template for recording pre-specified patient care details. Conclusions: OR and ICU teams agree on handoffs’ importance, but express important barriers to consistently practicing ideal handoffs. Future work is needed to determine whether the handoff procedures developed by incorporating bedside provider perspectives improves patient outcomes.

IMPLEMENTATION OF COMMUNICATION BOARD DOES NOT IMPROVE SURVEYED OPINIONS ON ICU COMMUNICATION SKILLS

Meagan Mahoney, Kim Horn, Rachel Saunders, Samantha Seals, Larry Martin, Richard Risher, T. Elizabeth Robertson

Learning Objectives: Communication between healthcare providers, patients, and families is a crucial part of intensive care. In response to a previous survey identifying team-to-team communication as an area for quality improvement, the surgical ICU at an urban level one trauma center implemented previously described glass door communication boards modified for local needs. These boards include areas for ICU plans, collaborating team plans, line insertion dates, antibiotic dates, and checkboxes for the ICU team. This study was conducted to determine if healthcare providers identified a communication improvement after implementation of the boards. Methods: A validated survey was distributed to employees working in or with the surgical ICU of a level one trauma center before and after the implementation of the communication boards. Respondents were asked to identify their role in the ICU and their opinions of communication and healthcare within the ICU by answering eleven questions with strongly disagree, disagree, neutral, agree, or strongly agree responses. The before board survey (BBS) and after board survey (ABS) responses were treated as categorical and compared using chi-square test for equal proportions. Results: There were 85 respondents in the BBS and 55 respondents in the ABS. No significant change was noted in the opinions reported except regarding meeting the needs of patients’ families. In the BBS, respondents (n=17) either disagreed or strongly disagreed with the statement, “Our unit does a good job of meeting family members’ needs”. The number of total disagree opinions decreased (N=4) in the ABS (p=0.0464). Conclusions: The implementation of bedside communication boards did not result in a statistically significant change in the opinions of healthcare providers regarding communication and healthcare within our ICU. Improvement was noted in the area of meeting family members’ needs. Prior research has demonstrated an actual decrease in the number of handoff errors. Future research is needed to determine if decline in error events correlates with perception of improved communication.

EVALUATION OF PHENYTOIN MONITORING PRACTICES IN ADULT CRITICALLY ILL PATIENTS

Nadia Ismail

Learning Objectives: Phenytoin is the most frequently used antiepileptic medicine in critically ill patients. Therapeutic drug monitoring is essential in this population due to alteration in drug distribution, elimination and protein binding. regular review of phenytoin level is essential important in neurosurgical case due to phenytoin level variations in this setting. In this study we will assess the degree of compliance with therapeutic drug monitoring guidelines of phenytoin in critically ill patients. Methods: A retrospective chart review was conducted to include adult patient receiving phenytoin therapy for greater than 7 days, between January 1, 2014 and December 31, 2014. Patient screening list was obtained from the pharmacy’s electronic medication chart, using the search term all ICU patients on phenytoin therapy. A standard data collection form was used to collect patient data including demographics, type phenytoin therapy, renal function test, albumin level, phenytoin serum level, sampling time, and indication for phenytoin. Results: of the 171 patient chart reviewed only (69%) 119 met the inclusion criteria. 31% (38) were female, while 68% were male. Total Serum phenytoin level was done for 85% (105) of patients. While serum phenytoin level was not performed for 14% (17) of cases. Total measured phenytoin and the calculated free level were above therapeutic level in 10 % (12). Conclusions: this study shows that appropriate therapeutic drug monitoring is still suboptimal for critically ill patient.

FAILURE TO RESCUE: CAUSES AND EDUCATIONAL OPPORTUNITIES FOR NURSING AND MEDICAL STAFF

Asim Mohammed, Nicholas Pozessere, Ankush Anuja, Ana Maheshwari, Yub Raj Selthai, Joshua Pegnarr, Ravi Sankar Reddy Edara, Dominic Valentino

Learning Objectives: The understanding behind Failure to Rescure (FTR) is to prevent a clinically important deterioration, such as death or permanent disability from a complication of an underlying illness or a complication of medical care. Nearly 98,000 patients die annually because of medical errors, despite protocols to prevent these mistakes. Failure to rescue thus provides an opportunity for providers to respond to adverse occurrences that develop on their watch. Methods: We performed a retrospective case study of the hospital deaths during the period from January 2013 to December 2013 at Mercy Fitzgerald hospital. For each patient, we performed a targeted chart review and extracted information regarding demographics, change in vital signs, recent organ failure, rapid responses and code blue. Patients were divided in ICU level of care and non ICU level of care. Descriptive statistics were generated using Microsoft Excel. Results: Of the 150 deaths that occurred in the hospital, 55% (n=82) occurred in the ICU. Various parameters were recorded, of which respiratory rate (p=0.04, 95% CI 0.51–0.66), oxygen titration (p=0.038, 95% CI 0.60–0.75) and GCS score (p=0.041, 95% CI 0.43–0.59) were identified to have significantly changed 24 hr prior to death. Deaths occurring at the beginning of academic year (July-August) were 1.6% compared to 1.8% for the remainder calendar year. Of all the non ICU deaths, hospice was consulted on 40% (p=0.059, 95% CI 0.28–0.51) of the patients compared to 54% in ICU (p=0.55, 95% CI 0.43–0.64). Of the remaining 60% of non ICU patients, rapid response was called in 23% of patients (p=0.051, 95% CI 0.13–0.34). Conclusions: We suggest that electronic medical records system can be configured to send alerts about patients who are at risk of clinical deterioration, thus allowing earlier interventions. Of note, there was no major difference in the mortality rate during the beginning of the new academic year compared to the remainder year, despite popular press reports of this phenomenon. Limitations of the study are a small patient population, thus small power and absence of a control arm.

CLINICAL OUTCOMES ASSOCIATED WITH TRANSFUSION OF GREATER THAN 30 UNITS OF RED BLOOD CELLS IN THE ICU

Amanda Murphy, Nicole Zantek, Dane Thompson, Andrew Cleland, Jb Breeding, Julie Welbig, Jagadish Patil, James Harmon

Learning Objectives: Massive transfusion protocols (MTP) serve to efficiently provide large volume transfusion for patients with rapid bleeding. The MTP utilized in our institution is used in all hospital locations, including the Intensive Care Unit (ICU). This study was conducted to evaluate the clinical outcomes...
of ICU patients requiring large volume MTPs. **Methods:** The MTP activations in the ICUs at our facility were retrospectively reviewed, with a detailed analysis of ICU patients who received greater than 30 units of red blood cells (RBCs). Clinicians activate the MTP in anticipation of massive transfusion resulting in the preparation of ongoing sets of 4 RBC, 4 plasma, and 1 apheresis platelet units. **Results:** A total of 360 MTP activations occurred from 4/2009-6/2015, including 221 initiated in the ICU. Six patients (4 males, 2 females) received greater than 30 RBC units. The leading diagnoses for the patients were end stage liver disease (2), aneurysm repair (2), and liver transplant (2). The mean number of units issued was RBC 40.7 (range 36–48), plasma 40.0 (36–38), platelet 10.7 (6–13), and cryoprecipitate pools 2.8 (0–6). Immediately prior to and during the MTPs, laboratory values [mean (range)] were as follows: hemoglobin minimum(min) 5.8 g/dL (3.9–7.4), maximum (max) 12.8 g/dL (11.2–16.7), mean 9.4 g/dL (7.9–12.2); platelet count min 31 x 10^9/L (5–42), max 142 x 10^9/L (88–312), mean 77 x 10^9/L (39–161); PT min 40 seconds (11.2–16.7), mean 9.4 g/dL (7.9–12.2); platelet count min 31 x 10^9/L (5–42), max 142 x 10^9/L (88–312), mean 77 x 10^9/L (39–161); PTT min 40 seconds (30–50), max 124 seconds (47–255), mean 63 seconds (35–50); INR min 1.12 (0.69–2.15), max 3.99 (1.33–5.63), mean 1.86 (1.13–2.73); and fibrinogen activity min 108 g/dL (71–193), max 316 g/dL (17%–550), mean 190 g/dL (132–236). All patients were intubated and required full ventilator support. The 30-day in-hospital survival was 33% in this patient group. **Conclusions:** ICU patients requiring greater than 30 RBC units during MTP activation have variable laboratory results and high morbidity and mortality. An institutional policy now requires communication between the Transfusion Medicine and ICU faculty members when 40 RBC units are issued to optimize ongoing care of the patient.

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DATA UTILIZATION DURING INTERHOSPITAL TRANSFERS OF CARE FOR CRITICALLY ILL PATIENTS
Kelly Pennington, Alexander Kogan, Jeff Jensen, Ognjen Gajic, John O’Horo

**Learning Objectives:** Failure to clearly communicate critical information at times of transition, such as inter-facility patient transfer, significantly increases the risk of harm to patients. Previous studies have demonstrated a high degree of misinformation associated with ICU handovers, which can compromise medical judgment. In an attempt to objectify data and improve care across the continuum during transport, we conducted a study to prospectively observe the direct admission process. **Methods:** We conducted a pilot prospective observational study of 15 physician-patient interactions taking place upon transfer of patients from outside hospitals to the Medical ICU at St. Mary’s Hospital (SMH). During the observations, we recorded the information physicians requested as they received the patient, and the data that was available for their use. We conducted an analysis to identify the relative frequency that various items were requested, as well as an examination of the discordance between provided and available data. **Results:** The most commonly requested items by ICU staff were, in order: medications administered at outside hospital (60%, 9/15), code status (53%, 8/15), medications administered en route (53%, 8/15), results of imaging studies (47%, 7/15), and past medical history (40%, 6/15). The least requested items were basic laboratory values including elements of complete blood count (4%) and electrolyte panel (2%). The most frequently requested and unavailable data were code status, living will, and medical power of attorney; unavailable in twenty percent of encounters. **Conclusions:** Data that were easily reproducible upon arrival to the accepting facility was least frequently requested by providers, such as basic laboratory data. Goals of care topics including code status, living will, and medical power of attorney was frequently requested but most often unavailable to accepting providers.

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OPTIMIZING ABSTRACTION OF BENCHMARKING DATA IN A PICU
Pamela Marshall, Sally Rodriguez, Deborah D’Ambrosio, Gail Parazynski, Eric Williams

**Learning Objectives:** Comparative reporting of PICU patient outcomes is one component provided by international pediatric benchmarking databases. It is essential that institutions enter accurate and timely data. In December 2014, we experienced a reorganization of our data abstraction team and were 9 mo behind on data submission with an unacceptable error rate. We hypothesized that a systematic approach to data abstraction would reduce our percentage of errors and increase our productivity rate. **Methods:** Our team comprised of nurses: a coordinator, and three abstractors (1 full, 2 part time). Pre-reorganization there was inconsistent data extraction. With the same team numbers, procedural changes were implemented; updating our hospital’s data collection profile, revising our data collection form, documenting institution-specific abstraction guidelines, refining our internal auditing process to include 16 pre-submission queries, setting minimum productivity goals, and assigning specific roles to personnel. Error data are presented as percentages, productivity rates as cases per hour, and discharges per month as Mean±SEM. After procedural changes to our process were implemented, we compared pre-submission (internal audit) error rates, and post-submission (manual validation) error rates, via Fisher’s Exact Test. **p<.05.** **Results:** Our 31-bed PICU’s monthly discharge rate is 189 ± 5. Within 2 mo, the internal audit error rates decreased from 21.5% to 5.6%. Manual validation error rates decreased from 8.5% to 3.0%. In the subsequent 3 mo, the Internal audit error rates decreased from 3.6% to 0.8% and the Manual validation error rates decreased from 3.0% to 0.9%. In 5 mo, we met submission deadlines and continue to be current with data abstraction. From Pre- to post-intervention our productivity rate increased from 0.6 to 1.2 cases/hr. **Conclusions:** We improved the accuracy of data abstraction and productivity by developing a nurse-led standardized internal audit procedure. Providing reliable, timely data for benchmarking allows the information to be applied strategically.

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IMPACT OF PRBCS TRANSFUSION ON VAP IN ICU PATIENTS
Aristeidis Vakalos, Victor Popko

**Learning Objectives:** Transfusion is not risk free, and is associated with allergic reactions, lung injury, infectious disease, circulatory overload and immunosuppression in recipients, while cost of blood screening and storage is high. On the other hand, Ventilator Associated Pneumonia (VAP) is one of the most frequently seen infections in ICU setting and may have an impact not only to the length of ICU stay, but also ICU outcome as well. The aim of our observation retrospective study was to test the hypothesis that a correlation exists between pRBC transfusion and incidence of VAP in our both medical and surgical ICU served in community hospital. **Methods:** From January 2006 to June 2014 admitted to our ICU 620 patients. From our database we looked for incidence of VAP (% ventilation days) and the following indexes: pRBC cross matched and transfused: Total, per patient, per hospitalization days, per patient under mechanical ventilation, per ventilation days and the ratio pRBC cross matched over transfused. Using linear correlation method, we looked for linear slope, correlation coefficient (r), and coefficient of determination (r^2), and by linear regression method using ANOVA test we looked for p value, according VAP and pRBC transfusion. **Results:** Correlation between VAP and pRBC transfusion and cross matched indexes. (Index: p value) Total cross matched: 0.9405. Total transfused: 0.8916. Cross matched per patient: 0.1659. Transfused per patient: 0.3122. Cross matched per hospitalization day: 0.4773. Transfused per hospitalization day: 0.7011. Cross matched per patient ventilated: 0.1904. Transfused per patient ventilated: 0.3620. Cross matched per ventilation day: 0.2444. Transfused per ventilation day: 0.4062. Cross matched over transfused: 0.6778 **Conclusion:** According to our data, there was no statistically significant correlation detected between VAP and pRBC transfusion and cross matched indexes, nor cross matched over transfused. Our data suggest that even though pRBC transfusion may have an impact on immunosuppression and infection disease developing, the impact on VAP is not statistically significant.

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REDESIGN OF A NOVEL ELECTRONIC MEDICAL RECORD DASHBOARD USING A MULTI-STEP, HUMAN-CENTERED APPROACH
Marc Ellsworth, Amelia Barwise, John Dyke, Brian Pickering, Vitaly Herasevich

**Learning Objectives:** AWARE (Ambient Warning and Response Evaluation) is a novel electronic medical record (EMR) dashboard designed by clinicians to support bedside clinical information management in the ICU. Initially created...
and evaluated for adult ICU care, AWARE was redesigned to meet the specific needs of neonatal ICU (NICU) providers using a multi-step, human-centered approach. Methods: A survey was distributed to NICU providers asking them to rate the importance of 98 unique data items in helping them make routine clinical decisions in the NICU. Prototype design and dissemination allowed for end-users to evaluate the proposed changes and make recommendations for further alterations and improvements. A review of the literature was used to generate age-appropriate data values for embedded color-coded alerts within AWARE. Finally, focus group discussions with potential end-users were held to generate checklist requirements and design preferences. Results: Survey results (23 responses - 92% response rate) showed consistency between and within provider types that allowed for generalizable redesign principles regarding data item inclusion/exclusion and layout. Prototype evaluation by end-users resulted in an alteration of certain data item displays and inclusion of additional items that were not identified by survey results. A gestational age display function was created, an item not currently contained in EMR interfaces at the institution. Color-coded alerts were created using evidence-based and unit norms to alert providers of potential concerning or critical results. The creation of a NICU specific checklist was accomplished that included integrated daily progress note writing capabilities organized in a way to match our NICU’s traditional rounding and note writing formats. Conclusions: A novel user interface was redesigned and adapted to the specific needs of NICU providers. A stepwise approach with continual provider input and review was utilized in order to maximize clinical utility and improve usability among end-users.

Research Snapshot Presentations: Renal

962 IMPACT OF HEMODIALYSIS FOLLOWING ARF ON MORTALITY IN ADULT STEM CELL TRANSPLANT RECIPIENTS

Natalia Martinez-Schlurmann, Sankeerth Rampa, Nalliah Ramesh, Veerasathpurush Allareddy, Alexandre Rotta, Veerajalandhar Allareddy

Learning Objectives: Stem cell transplantation (SCT) recipients are at risk for renal failure due to a variety of causes during their course of therapy. The outcome associated with acute renal failure (ARF) necessitating hemodialysis (HD) is unclear at a large population level. We sought, to estimate the prevalence of ARF in hospitalized SCT recipients and to examine the impact of HD following ARF on in-hospital mortality (IHM). Methods: We performed a retrospective analysis of the Nationwide Inpatient Sample for the years 2004 to 2010. All patients aged >18 yr who underwent a SCT procedure were selected. Among this cohort, those who underwent HD following ARF were identified and this was the primary independent variable. The outcome variable was IHM. The association between independent and outcome variable was examined by a multivariable logistic regression model. The confounding effects of age, sex, type of SCT, race, insurance status, type of admission, comorbidity burden, teaching status of hospital, and geographic region were adjusted in the regression model. The study was IRB approved. Results: During the study period, a total of 85,060 patients older than 18 yr of age underwent a SCT procedure. Among these, 8,227 patients (9.7%) had ARF. A total of 1,740 patients (2% of all SCT patients) who had ARF underwent a HD procedure. The mean age of the patients who had SCT was 51 yr and 58.7% were males. A total of 3,867 patients (4.9%) died in hospital. Following adjustment of patient and hospital level confounding factors, ARF necessitating HD was associated with significantly higher odds for IHM (Odds Ratio=26.78, 95% CI=18.36–39.05, p=0.0001) when compared to rest of patients. Conclusions: In this large cohort of hospitalized adult SCT recipients, nearly 1 in 10 patients developed ARF and, of these, nearly one-fifth required HD. Patients who developed ARF and had HD were at significantly higher risk for IHM. ARF is a common occurrence in SCT recipients and management strategies for early identification/modification may be necessary to optimize outcomes.

963 POST-OPERATIVE ACUTE KIDNEY INJURY AMONG PATIENTS ADMITTED FROM THE EMERGENCY ROOM FOR MAJOR SURGERY

Joshua Swan, Beverly Shirley, Linda Moore, Michael Johnson, Wadi Sukki, A Osama Gaber

Learning Objectives: This study describes the association of post-operative acute kidney injury (AKI) with mortality and length of stay among patients who were admitted from the emergency room (ER) and underwent major surgery. Methods: Patients admitted from the ER to a quaternary teaching hospital in 2012–2013 with a major surgery as the principal procedure (AHRQ procedure class 3 or 4) within 1 day of admission were included. Patients <18 yr, undergoing nephrectomy, and with preexisting AKI or stage 5 chronic kidney disease (CKD) were excluded. AKI was staged per Kidney Disease Improving Global Disease Outcomes guidelines. Results: A total of 963 patients admitted from the ER, 1,090 (9%) required major surgery within 24 hr and were included. Patients were 50% male, 60% white, and 44% aged ≥65. Post-operative AKI was detected in 16% (n=178). Of AKI cases, 81% (n=144) were stage 1, 13% (n=23) were stage 2, and 6% (n=11) were stage 3. In-hospital death occurred in 2.2% (n=24). The average length of stay was 5.8 days (SD 5.9). Baseline CKD (per iCD-9 codes) was present in 6% (n=65) and was associated with AKI (54% CKD vs. 14% no CKD, P<0.001). In-hospital death occurred in 7% (12 of 178) of patients with AKI and 1% (12 of 912) of patients without AKI (Unadjusted RR=5.1, 95%CI 2.4 to 11.2). Incidence of inhospital mortality increased with AKI severity (1% no AKI, 5% stage 1, 9% stage 2, and 27% stage 3; P<0.001). Post-operative AKI was associated with 5.6 days of increased length of stay (10.5 days AKI vs. 4.9 days no AKI, P<0.001). Urgent interventions with the most cases of AKI were hip fracture/dislocation (19%, 19 of 98), PTCA (15%, 22 of 149), and cholecystectomy (13%, 16 of 125). Conclusions: Post-operative AKI occurred in 16% of patients admitted from the ER and undergoing major surgery. AKI was associated with a 5-day increase in length of stay and a 5-fold increase in mortality. Modifiable risk factors of AKI should be identified and reduced to prevent AKI in this population.

964 INTRAOPERATIVE DATA ENABLES MACHINE LEARNING CLASSIFIERS TO BETTER PREDICT POSTOPERATIVE ACUTE KIDNE

Charles Hobson, Tezcan Orzagat Baslanti, Paul Thottakara, Petar Momciclovic, Parisa Rashidi, Azza Bihorac

Learning Objectives: Postoperative acute kidney injury (AKI) is associated with an up to 10 fold increase in hospital mortality and decreased survival for up to 15 yr after surgery. Current perioperative complication risk scores do not fully utilize available physiologic data. We have previously developed and validated a clinical AKI risk assessment tool using a machine learning approach applied to clinical preoperative data. Our hypothesis is that incorporating intraoperative physiologic data into this existing machine learning classifier model will improve the prediction of postoperative AKI. Methods: We assembled a single-center retrospective cohort of 7215 adult surgical patients hospitalized between 2000 and 2010 who had intraoperative physiologic time series data available. We developed generalized additive models applying non-linear mathematical modeling of preoperative clinical risk factor data to calculate probabilistic risk scores for postoperative AKI. We incorporated physiologic time series with approximately 600 observations per patient including mean arterial blood pressure (MAP), minimum alveolar oxygen concentration and heart rate into the models and assessed AKI prediction associated with intraoperative events. We also included available lab results, medications administered and estimated blood loss. We extracted time series features and added them to the preoperative model. Optimizing two cut-offs for each score allowed us to stratify patients into low, medium and high risk categories. Results: After the addition of intraoperative data we re-classified patients originally with a low AKI risk score to medium (n=556, 13%) and high postoperative risk (n=200, 5%) for AKI. The incidence of AKI among those patients who were reclassified from low to medium and medium to high risk categories was 25% and 32% respectively. The receiver operating characteristics curve area (AUC) of the combined model was 0.86 (95% CI 0.84–0.87). Conclusions: Intraoperative physiologic time series data can be incorporated into preoperative risk scores data to better identify patients at risk for AKI.
Our analysis of a large national database using matched controls and total charges ($621,649 vs. $305,576) were higher for hemodialysis patients. Significantly higher among hemodialysis patients compared with matched controls. Mortality was still significantly higher among hemodialysis patients (35.4% vs 14.9%; p<0.01). Results: Of the 201 surveys begun, 170 (85%) were completed. Most respondents (94%) reported fluid balance as a daily “vital” sign and prescribed daily weights in those at risk for FO (76%). Almost all physicians (92%) were using FO to detect AKI and the majority (62%) was aware that FO impacts serum creatinine. When asked to define FO, the most prevalent answer was that FO is not an independent diagnosis (37%). The most frequent number threshold used for FO was 10% as chosen by 25% of respondents, the remainder used “goal.” Only 4% chose the intended answer of 15% or net positive more than 150 mL per kilogram. The majority of the physicians (73%) denied that avoiding FO can prevent AKI. In patients at risk for FO or AKI, respondents were split over the use of fluid restriction: 56% fluid restrict and 44% do not. Physicians who reported that avoiding FO can prevent AKI had 4.8 fold higher odds of fluid restricting at risk patients (OR 4.76, 95%CI 2.02–11.21, p<0.0001). Although 86% of physicians report FO was an independent indication for renal replacement therapy (RRT), only 36% used strict numeric thresholds to initiate RRT. More than 50% of respondents reported using urine output as a decision point in initiating RRT for FO. Conclusions: Pediatric critical care physicians recognize the importance of daily fluid balance as a “vital” sign but are not routinely diagnosing FO as an independent medical problem. Strict numeric thresholds are not being used to diagnose FO or to initiate RRT.

OUTCOME OF VENTILATED CHILDREN REQUIRING HEMODIALYSIS: A PROPENSITY SCORE MATCHED STUDY
Sushil Devarashetty, Fernando Beltramo, Balagangadhar Totapally

Learning Objectives: Hemodialysis is commonly used in pediatric ICUs for the management of fluid and electrolyte issues. We have investigated outcomes of children who required hemodialysis compared to those who did not in critically ill children using propensity score-matched data from the 2012 Kid’s Inpatient Database (KID). Methods: The KID is a part of a family of databases developed for the Healthcare Cost and Utilization Project and are based on discharge abstracts created by hospitals for billing. We used the 2012 KIDS database for this project. All mechanically ventilated children aged 1 mo to 17 yr who were discharged during 2012 were included. Hemodialysis patients were identified (ICD 9 code 39.95) and demographic and outcome data compared with all others without hemodialysis. In a separate analysis, hemodialysis patients were matched 1:1 with corroborative propensity score using age, elective admission, gender, hospital region, income quartiles, race, presence of chronic renal failure, bone marrow transplantation, cardiac surgery, trauma, and APRDRG severity score. Outcomes in the hemodialysis group were compared with controls. Data were weighted to give national estimates. Results: 729 (1.4%) children underwent hemodialysis among 53,468 hospitalized mechanically ventilated patients. Overall mortality was significantly higher among hemodialysis patients (35.4% vs 14.9%; p<0.01). Gender, discharge quarter, or emergency admission status had no effect on the prevalence of hemodialysis procedure. Hemodialysis was less prevalent in NE region, among whites and more prevalent among ECMO and BMT patients. 430 hemodialysis patients were matched 1:1 with controls. Mortality was still significantly higher among hemodialysis patients compared with matched controls (35.4% vs 14.75%, p=0.00). In addition, length of stay (30 vs 18.9 days) and total charges ($621,649 vs. $305,576) were higher for hemodialysis patients. Conclusions: Our analysis of a large national database using matched controls in mechanically ventilated children confirmed that the need for hemodialysis is associated with increased mortality.

PLASMA RESISTIN LEVELS ARE ASSOCIATED WITH ACUTE KIDNEY INJURY IN CRITICALLY ILL TRAUMA PATIENTS
Michael Shaarawy, Nuara Meyers, John Reilly, Daniel Holena, Paul Lanken, Harold Feldman, Muradally Reilly, Jason Christie

Learning Objectives: Body mass index (BMI) is a risk factor for acute kidney injury (AKI) after trauma. We hypothesized that alterations in circulating adipokines contribute to the BMI-AKI association. Methods: We conducted a case-control study in a prospective cohort of critically ill trauma patients. AKI was defined by AKI Network creatinine criteria within 6 days of presentation. Of 183 cohort subjects with plasma available, we selected all 13 with AKI stage 2–3 and randomly selected 27 with AKI stage 1 and 46 with no AKI, frequency matching those with and without AKI for trauma mechanism and age quartile. We determined the association of plasma leptin, resistin, interleukin-6 (IL6), and monocyte chemoattractant protein-1 (MCP1), measured at presentation and 48 hr, with AKI stage using multivariable ordinal logistic regression. We used Spearman’s rho to test correlation of these plasma markers with BMI. Results: The median age was 40.5 yr, 86% were male. 65% had blunt trauma mechanism, and median injury severity score (ISS) was 24.5. Plasma resistin levels at presentation were associated with subsequent AKI: median 55.1 (IQR 43.9–69.9) ng/mL for stage 2–3, 32.2 (10.9–57.4) ng/mL for stage 1, 20.9 (14.0–33.3) ng/mL for no AKI, p<0.001 for trend. Median resistin levels were higher at 48 hr and remained associated with AKI stage (p<0.001). BMI was correlated with resistin levels at presentation (rho 0.22, p=0.046) and 48 hr (rho 0.25, p=0.021). In multivariable analyses, presentation resistin level attenuated the association of BMI with AKI stage (p=0.248 with resistin, p=0.093) without resistin remaining significantly associated with AKI stage (p=0.008). Adjustment for confounders such as age, sex, trauma mechanism, ISS, and medical comorbidities did not significantly weaken the resistin-AKI association. IL6 and MCP1 were significantly associated with AKI, (p<0.001 for trend). Median resistin levels were higher at 48 hr and remained significantly associated with AKI at 48 hr (p<0.001). There was no association between positive as compared with even FB and renal recovery (AOR 0.9, 95% CI, 0.51 – 1.59; P=0.715). However, Negative as compared to Even FB was associated with mortality (AOR 1.55, 95% CI, 1.02 – 2.35; P=0.04), while Positive FB was not associated with mortality (AOR 1.28, 95% CI, 0.75 – 2.18; P=0.37). Among survivors at 1 year, we found no association between Negative (AOR, 0.95, 95% CI, 0.36 – 2.5; P=0.91) or Positive FB (AOR 1.8, 95% CI, 0.48 – 6.87; P=0.38) and renal recovery. Conclusions: In the critically ill, Negative FB at RRT initiation is associated with decreased odds of RRT independence at 1 year. This association is mainly driven by higher mortality. We found no association between positive FB and long-term RRT dependence.

ON “FLUID OVERLOAD”
PEDIATRIC CRITICAL CARE PHYSICIANS’ PERSPECTIVE
Amanda Hassinger, Sudha Garamella, Brian Wronniak, Jo Freudenheim

Learning Objectives: Recent evidence has shown that fluid overload (FO) is an independent diagnosis with increased risk of morbidity and mortality in critically ill children with all types of conditions. This study was performed to describe the current perspective of pediatric critical care physicians on the diagnosis and management of FO. Methods: An electronic questionnaire sent to an international sample of attending physicians in pediatric critical care intended to measure the current state of AKI practice, with one third of the content specific to FO. Results: Of the 201 surveys begun, 170 (85%) were completed. Most respondents (94%) reported fluid balance as a daily “vital” sign and prescribed daily weights in those at risk for FO (76%). Almost all physicians (92%) were using FO to detect AKI and the majority (62%) was aware that FO impacts serum creatinine. When asked to define FO, the most prevalent answer was that FO is not an independent diagnosis (37%). The most frequent number threshold used for FO was 10% as chosen by 25% of respondents, the remainder used “goal.” Only 4% chose the intended answer of 15% or net positive more than 150 mL per kilogram. The majority of the physicians (73%) denied that avoiding FO can prevent AKI. In patients at risk for FO or AKI, respondents were split over the use of fluid restriction: 56% fluid restrict and 44% do not. Physicians who reported that avoiding FO can prevent AKI had 4.8 fold higher odds of fluid restricting at risk patients (OR 4.76, 95%CI 2.02–11.21, p<0.0001). Although 86% of physicians report FO was an independent indication for renal replacement therapy (RRT), only 36% used strict numeric thresholds to initiate RRT. More than 50% of respondents reported using urine output as a decision point in initiating RRT for FO. Conclusions: Pediatric critical care physicians recognize the importance of daily fluid balance as a “vital” sign but are not routinely diagnosing FO as an independent medical problem. Strict numeric thresholds are not being used to diagnose FO or to initiate RRT.
FLUID BALANCE HAS VARIABLE ASSOCIATION WITH LONG-TERM SURVIVAL IN THE CRITICALLY ILL
Vikram Balakumar, Raghavan Murugan, Florentina Sileanu, John Kellum

Learning Objectives: Several studies have suggested an association between fluid balance (FB) and short-term survival but the association with long-term outcome is less clear. We examined the association between FB and risk-adjusted 1-year survival among critically ill patients. Methods: We analyzed a large ICU dataset involving adults admitted to a tertiary care academic medical center over 8-year period. Cumulative daily FB was calculated from ICU admission until the end of the ICU stay or initiation of renal replacement therapy divided by hospital admission weight expressed as percentage. FB was categorized as follows: Negative, <0%; Even, 0–5%; and Positive, >5%. Acute kidney injury (AKI) was defined according to KDIGO criteria. We used Gray’s model to estimate risk-adjusted hazard ratios (AHR) for the association between FB and 1-year mortality including all other possible predictors of illness. Results: Of 13,358 patients, the distribution of Negative, Even, and Positive FB were 81.8%, 13.3%, and 4.9%, respectively. The corresponding 1-year mortality was 25%, 32% and 46.5%, respectively (P <0.001). After accounting for differences in age, sex, race, body mass index, reference creatinine, surgery, comorbidity, malignancy, and day 1 ICU characteristics such as mechanical ventilation, vasopressors, hypotensive index, severity of illness, sepsis, AKI and oliguria, we found that the AHR for association between Negative compared with Even FB and survival varied over 1 year (AHR range, 0.61–1.32, 95%CI, 0.52–1.57, P=0.001). Negative FB was only associated with survival up to 45 days, subsequently, however, Negative FB was associated with increased mortality. Positive FB, as compared with Even FB was associated with increased mortality throughout 1-year (AHR range, 1.23–1.41, 95% CI, 0.99–1.86, P=0.008). Conclusions: Among critically ill patients, FB has variable association with survival. While Negative FB was associated with improved short-term survival, in the long-term both negative and Positive FB were independently associated with mortality.

EFFECT OF EARLY INITIATION OF ECULIZUMAB IN PATIENTS WITH AHUS ON RENAL OUTCOMES: A POOLED ANALYSIS
John Kincade, Spero Cataland, Johan Vande Walle, Yhsous Delmas, Gianluigi Ardissono, Jimmy Wang

Learning Objectives: Atypical hemolytic uremic syndrome (aHUS) is a severe, life-threatening disease of complement-mediated thrombotic microangiopathy (TMA) and irreversible organ damage. Four prospective clinical trials reported safety and efficacy of eculizumab (ECU), a terminal complement inhibitor, for treatment of aHUS. We compared the effect of ECU on renal function in patients (pts) starting treatment ≤7 d with those starting >7 d after the current TMA manifestation. Methods: Data from pediatric and adult pts with aHUS with documented date of onset of current TMA manifestation and baseline (BL) estimated glomerular filtration rate (eGFR) <90 mL/min/1.73 m2 from 4 phase 2, open-label, single-arm trials of ECU were pooled. Changes in eGFR from BL were analyzed using repeated measures analysis. Effects of individual BL characteristics on renal recovery were evaluated using multiple regression analyses with coefficients reported for continuous variables only. Results: Median (range) age at enrollment (N=97) was 29 (0–80) y and duration of current manifestation to start of ECU was 23 (1–1447) d. ECU was initiated in 21 pts ≤7 d and 76 pts >7 d after presentation; median BL eGFR was 11 and 16/mL/min/1.73 m2, respectively. Mean change from BL in eGFR was 51 and 27/mL/min/1.73 m2 at 6 mo (P<0.01 between groups) and 57 and 23/mL/min/1.73 m2 at 1 y (P<0.05 between groups), respectively. BL characteristics that independently contributed to eGFR improvements at 6 mo included age (coefficient, -0.81; P=0.0001), lactate dehydrogenase (LDH) level (0.09; P=0.005), duration of current TMA manifestation prior to eculizumab (0.22; P=0.095), and single vs multiple TMA manifestation history (P=0.01). Conclusions: Pts with aHUS initiating ECU within 7 d of onset of a TMA manifestation had greater improvements in eGFR than those with more delayed initiation, suggesting that rapid diagnosis and treatment are important for renal function recovery. Shorter duration from current TMA manifestation to treatment, younger age, higher BL LDH level, and single TMA event (vs multiple) may also be associated with greater eGFR improvements.

CLINICAL EFFECTIVENESS OF DIURETICS FOLLOWING CONTINUOUS RENAL REPLACEMENT THERAPY
Hye Ryoun Jang, Do Hee Kim, Chi Ryang Chung, Kyeonjman Jeon, Jung Eun Lee, Woosong Huh, Gee Young Suh, Ha Young Oh

Learning Objectives: There is no consensus regarding diuretic therapy in acute kidney injury (AKI) patients weaning from continuous renal replacement therapy (CRRT). The effects of diuretics on the clinical course of critically ill patients with AKI was analyzed focusing on urine output (UO), renal functional changes following CRRT, and optimal administration method of diuretics. Methods: A total of 1213 adult patients who survived more than 3 days after discontinuing CRRT between 2009 and 2014 were included and categorized depending on re-initiation of CRRT within 3 days. Changes in renal function and UO depending on the prescription of diuretics during 3 days were analyzed. Results: A total of 545 patients were CRRT cessation group and 668 were RRT restart groups (conventional hemodialysis or CRRT resuming groups). There was no difference in baseline characteristics among all groups. CRRT cessation group had greater UO after discontinuation of CRRT compared with other groups. Overall, patients receiving diuretics showed greater UO than patients without diuretics after cessation of CRRT, and there was no difference in renal functional changes. In CRRT cessation group, continuous furosemide infusion showed greater UO compared to other administration methods (intermittent intravenous vs. oral vs. continuous intravenous; median UO on day 3 (ml/day): 1295 vs. 90 vs. 1925 (P<0.001)). However, serum creatinine of the continuous furosemide infusion group increased significantly when infusion continued for >1 day. Multiple regression analysis identified higher UO of the day before discontinuation of CRRT and prescription of diuretics as prognostic factors for successful cessation of CRRT. Conclusions: Diuretic therapy following CRRT increases UO significantly without causing significant deterioration of renal function. Continuous furosemide infusion increases UO significantly compared with other administration methods, but also increases serum creatinine further when continued for more than 1 day. Our study suggests clinical effectiveness of diuretics in patients weaning from CRRT and the necessity of prospective study.

MEMBRANE VERSUS PERISTALTIC BLOOD PUMP FOR EXTRACORPOREAL THERAPIES: COMPARISON ON INDEX OF HEMOLYSIS
Francesco Garrotto, Sean Baghaw, Claudio Ronco

Learning Objectives: Hemolysis during extracorporeal treatments mainly occurs as a consequence of mechanical stress on the blood. Red blood cell deterioration is underdetected because it is far from any acute hemolytic threshold but represents a potential harm for patients. A newmembrane piston driven pump device designed for continuous renal replacement therapies (CRRT). Aim of this investigation is to compare the membrane with peristaltic pumps by measuring the Normalized Index of Hemolysis (NIH) during in vitro testing. Methods: Three sessions of hemoperfusion with a line inserted in place of a hemofilter were performed both with SAM and Prismaflex (© Baxter International). A single pool of fresh heparinized bovine blood (Heparin 500 u/L, Hb 12±1 g/dl) was split into three aliquots containing 900 mL (Control, SAM, Prismaflex) and circulated for 6 hr/session. Blood samples were drawn at baseline, 30 min and every 1 hour. NIH were calculated as median hourly variation of free hemoglobin and used for comparison. Data was compared with two tailed Student’s test based on P<0.05 results. Results: NIH values of 0.12±0.03 and 0.13±0.09 mg/100 mL for SAM and Prismaflex respectively are lower than those reported in literature due to the simplified circuit used (no vascular access inactivation) Device compatibility in terms of lethal damage to blood cells, is an important aspect of the development of artificial organs. Since a validation based on dangerous level of free hemoglobin do not exist, an empirical
evaluation using comparative test suggest that piston driven membrane is safe from a hemolysis point of view.

A UNIQUE APPLICATION OF THE GRADE CRITERIA: DRUG-COMBINATION ASSOCIATED AKI
Ryan Rivosecchi, Joseph Dasta, John Kellum, Sandra Kane-Gill

Learning Objectives: The GRADE Criteria provide a systematic approach to review a body of literature through a quality of evidence assessment. The criteria have been applied to numerous consensus guidelines evaluating large numbers of studies. There are two components to the GRADE: the quality of evidence and a practice recommendation. The purpose of this evaluation was to apply the quality of evidence metric of GRADE to a topic. 'Drug combination-associated nephrotoxicity,' allowing for a structured assessment of a large quantity of literature.

Methods: A systematic review of drug combination-associated AKI was completed. Medline and Embase databases were searched from 1946 to September 2014. Inclusion criteria included English language, full-text availability, and at least one drug combination reported. Articles discussing contrast-induced nephrotoxicity and non-original research were excluded. A panel of 14 reviewers evaluated the relevant literature using the quality of evidence component of GRADE. Unique drug combinations were voted on by each reviewer, with >75% agreement required in order to assign a quality of evidence score. Results: A total of 1952 citations were screened with 118 unique full-text articles being reviewed. The full-text articles produced 117 drug combinations, with 75 being unique. Overall, 57 combinations (76%) were considered of "very low" quality. Eleven combinations (15%) were considered to be of "low" quality. There were 7 (9%) combinations of "moderate" quality and zero combinations of "high" quality. Three combinations are still awaiting a consensus GRADE. Conclusions: A unique application of the GRADE Criteria methodology demonstrates that the evidence base for nephrotoxicity of drug combinations is weak. This evaluation demonstrates the application of the quality of evidence component of the GRADE Criteria and provides consideration of its use for future systematic reviews.

CHARACTERISTICS AND OUTCOMES OF SEVERE HYponATREMIA (Na≤ 125 MEQ/L) IN THE MICU: A RETROSPECTIVE STUDY
Phani Kantammenni, Jorge Guzman, Siddharth Dugar, Ajit Moghekar, Abhijit Duggal, Sudhir Krishnan

Learning Objectives: Hyponatremia is common in the ICU. Diagnosing and treating severe hyponatremia can be challenging. Severe hyponatremia (Na≤125 meq/l) is associated with increased mortality. The appropriate rate of sodium correction is debatable. Rate of sodium correction ranging from 6 to 12 meq/l/24 hr have been proposed. Rapid correction of severe hyponatremia is fraught with complications and the response to therapy can be unpredictable. We hypothesized that the inherent difficulty in assessing the intra vascular volume in the critically ill, impacts the rate of sodium correction and could exceed proposed guidelines and affect outcomes. Methods: This is a single center retrospective observational study in a cohort (convenient sample) of patients admitted to the MICU with severe hyponatremia over a 20 month period (Jan 1st 2013 to Aug 30th 2014). Parametric and non-parametric tests were employed as required to compare outcomes of patients with and without rapid correction of sodium and the impact of sodium levels at presentation & at 24 hr. Results: 2% (n=166) of 7076 MICU admissions presented with severe hyponatremia (mean Na at admission=118, SD=5.21). Severe Hyponatremia was the primary diagnosis in 46% (n=78) on admission. The mean age was 60.2 (SD=13.45) and APACHE 3 score was 71 (SD=29). 48% were women. Of the 160 patients, 18% presented with neurologic symptoms, with altered mental status as the predominant symptom and 3% had seizures. Cirrhosis and head injury complicated 34% and 18% of cases respectively, 10% (n=17) of patients with severe hyponatremia had Na corrected at rates more than proposed guideline over 24 hr[mean 15.2 meq/l(±2.8)]. The hospital mortality was 19%. Rate of sodium correction had no effect on mortality (p=0.2). In a multivariable model, Na at presentation and at 24 hr (adjusted for APACHE) was not associated with increased mortality (p=0.7). Conclusions: Severe Hyponatremia (Na≤ 125 meq/l) was noted in 2% of MICU admission. Our study suggests that rapid correction of sodium could complicate 10% of the cases and may not be associated with increased mortality.
DYSCHLOREMIA A RISK FACTOR FOR THE DEVELOPMENT OF ACUTE KIDNEY INJURY IN CRITICALLY ILL PATIENTS

Shao Min, Guangxi Li, Kumar Sarvottam, Shengyu Wang, Charat Thong-prayoon, Yue Dong, Ogojen Gajic, Kianoush Banaei-Kashani

Learning Objectives: Dyschloremia is common in critically ill patients. The impact of dyschloremia on ICU patients is not well studied. We investigated the epidemiology of dyschloremia and its impact on the chance of acute kidney injury (AKI) in a large cohort of ICU patients. Methods: This report is a single-center, retrospective cohort study of patients admitted to ICU at Mayo Clinic Hospital-Rochester from Jan 1, 2006 to Dec 30, 2012. Baseline serum chloride was defined as the serum chloride value during the month prior to ICU admission. Patients with known AKI and CKDV before ICU admission were excluded. Demographics, comorbidities, APACHE III scores were abstracted from the medical record along with outcomes such as AKI, ICU and hospital length of stay (LOS) and mortality. Logistic regression analysis was used to compare outcomes of patients with dyschloremia. Effects of age, gender, severity scores were adjusted in the regression model. Results: Total 6025 patients were enrolled in the analysis following implementation of eligibility criteria. From the whole cohort, 1970 patients (32.7%) developed AKI. Baseline serum chloride was relatively lower in AKI than in non-AKI group [100 (96–104) vs. 102 (98–105), p<0.001]. Of the total patients enrolled, 4174 patients had a record of their baseline serum chloride. From this group 1530 (56.7%) had hypochloremia and 257 (6.2%) were hyperchloremic before ICU admission. The incidence of AKI was higher in hypochloremic and hyperchloremic patients as compared to those with normal serum chloride level (43.3% vs.30.4% and 54.2% vs.30.4%, respectively p<0.01). In a multivariable logistic regression model, baseline serum chloride of ≤96 mmol/L remained to be independently associated with AKI (OR: 1.684, 95% CI: 1.108–2.567). However, baseline chloride of >94-100 mmol/L (OR 1.228; 95% CI 0.847–1.780; p = 0.2799) and >108 mmol/L (OR 1.066; 95% CI 0.592–2.249; p = 0.8673) had no significantly association with AKI. Conclusions: Dyschloremia is common in critically ill patients and severe hypochloremia is independently associated with an increased risk of development of AKI.

PREDICTORS OF IN HOSPITAL MORTALITY IN PATIENTS ON CONTINUOUS VENO-VENOUS HEMOFILTRATION IN THE ICU

Amina Saquib, ABULHASAN SIDDIQI, Modi Jawalam, MAsood Raja, Suzanne El Sayegh, Theodore Maniatis

Learning Objectives: In Intensive Care Units, acute renal failure is mostly a part of multiple organ dysfunction syndrome, with mortality ranging from 28% - 90%. Continuous Veno-Venous Hemofiltration (CVVH) is a predominant mode of renal replacement therapy used in the ICU. Methods: The objective of this study is to describe the demographic characteristics of patients undergoing CVVH. It aims to establish an association between these characteristics and the variables that define the severity of illness and in-hospital mortality outcomes of patients undergoing CVVH. Medical records of patients who underwent CVVH at our institution from January 2007 to December 2013 were analyzed. Chi-square test was done for categorical variables. Descriptive analysis was used to identify demographic data and clinical parameters. Results: 253 patients underwent CVVH at our institution from January 2007 to December 2013. The overall mortality was 75.22%. Acute respiratory failure requiring mechanical ventilation was associated with significantly increased mortality 76.74% vs. 40.0% (p = 0.04). Septic shock was the most common reason for ICU admission (71.2%). The most common indication for CVVH was ATN 63.9% followed by hyperkalemia (57.0%). CVVH for metabolic acidosis was associated with the highest mortality at 81.06% vs. 67.02% in patients who underwent CVVH for other indications. Escalating pressor support was associated with worse outcomes with a mortality of 78% and 79.17% in patients requiring 2 and 3 pressors, respectively. Increasing APACHE II scores were associated with higher mortality, scores ranging from 0–24 were associated with an overall mortality of 69.9% while scores ranging between 25–50 had a mortality rate of 80.5%. Conclusions: This observational study in patients undergoing CVVH revealed that patients presenting with worse baseline APACHE II scores, requiring mechanical ventilation and pressor support, had worse in-hospital outcomes. CVVH initiation for metabolic acidosis was associated with higher mortality. Our study may aid in delineating the group of patients who may benefit the most from use of CVVH.

LONGITUDINAL STUDY OF CARDIAC MORTALITY IN HYPERKALEMIC PATIENTS

Venu Velagapudi, Jeffrey Stoff, Anu Vellanki, John O’Horo, Yazeen Haddad

Learning Objectives: The impact of an episode of hyperkalemia on long term cardiac mortality is not well studied. We postulated that hyperkalemia contributes to arrhythmic or cardiovascular causes of death in survivors. Methods: Retrospective, observational case-control study in tertiary care ED To evaluate the effect of hyperkalemia on cardiac mortality Cases were hyperkalemic (defined as non-hemolyzed K >5.5 mEq/L) with non-hyperkalemic controls matching for age, gender, and comorbidities. The impact of an episode of hyperkalemia on long term cardiac mortality was determined by Social Security Death Index, National Death Index and medical record review. We defined cardiac mortality per ICD 10 codes I00 to 109, I11, 120 to 151, Q20 to Q24, and R95 to R99 or ICD-9-CM codes 410–414 Results: 223 cases and 64 controls with incidence of hyperkalemia at 1.54%. Cox proportional hazard regression analysis showed that for each 1-unit increase in admit potassium, the hazards for all-cause mortality increased significantly (Hazard Ratio (HR): 1.54, 95% Confidence Interval (CI): 1.22–1.96). Subgroup analyses in specific populations showed higher mortality in acute kidney injury patients and those with heart failure (HF). Over total follow-up time of 490 person-yr, overall survival probabilities for cases of 50.2% and 76.5% in controls (log-rank p-value=0.0011). 44 /64 deaths in cases met the definition of cardiac mortality and 2 hyperkalemic deaths 5 control deaths were coded as cardiac, and none hyperkalemic. Cardiac replacement therapy in Weil syndrome.

IMPACT OF DIFFERENT METHODS OF RENAL REPLACEMENT THERAPY IN WEIL SYNDROME

Sergio Cleto, Ceila Malaque, Camila Rodrigues, Jaques Szajnjbok, Antonio Seguro, Lucia Andrade

Learning Objectives: Leptospirosis is a health problem worldwide. Its most severe form, Weil’s disease, is a classic model of sepsis, provoking acute respiratory distress syndrome and acute kidney injury (AKI), with associated mortality that remains unacceptably high. We previously described the effects of hemodialysis dose in Weil’s disease, using sustained low-efficiency dialysis (SLED), and demonstrated that early initiation of SLED Followed by daily SLED significantly decreases mortality. However, the mode of clearance can also affect dialysis patient outcomes. Hemofiltration and hemodialysis can provide convective or diffusive clearance, respectively; hemofiltration reportedly provides greater clearance of medium-size and large molecules and thus might benefit critically ill AKI patients by clearing more large-molecule toxic inflammatory cytokines. Therefore, we compared the effects of convective clearance, using hemofiltration (SLEDf), and diffusive clearance, using hemodialysis (SLED), in Weil’s disease patients. Methods: In a prospective, randomized clinical trial, conducted in the ICU from 2009 through 2012, we compared two groups—SLED (n= 19) and SLEDf (n= 20)—evaluating demographic, clinical and biochemical parameters, as well as serum levels of interleukins, up to the 3rd day after admission. Both groups received early, daily dialysis. Results: All patients received norepinephrine and were on mechanical ventilation. Although clinical data, demographic profiles and severity (SOFA/APACHE scores) were similar, TNF-α, IL-2 and IL-5 were higher in SLEDf patients than in SLED patients. Over a 3-day period, IL-7, IL-17 and MCP-1 trended lower in SLEDf patients than in SLED patients. Duration of mechanical ventilation, length of ICU stay and mortality did not differ between the groups. In a logistic mortality model, the area under the ROC curve increased by 0.7 with advanced age; higher APACHE and SOFA score; higher serum urea and creatinine; lower pO2/FiO2; and higher peak inspiratory pressure (P<0.05 for all). Conclusions: The mode of dialysis clearance might not affect outcomes in Weil’s syndrome.
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SAFETY AND CHANGES IN VITAL SIGNS OF PATIENTS ON CRRT DURING ACTIVE MOBILIZATION IN THE MICU
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Learning Objectives: Safety of active mobilization for critically ill patients have been verified by many previous studies. However there is a few investigation of changes of vital signs in patients on continuous renal replacement (CRRT) during active mobilization. The purpose of this study is to prove the safety of active mobilization for the ICU patients on CRRT.

Methods: We reviewed our experience of passive physical therapy (PT) and active mobilization for patients on CRRT in terms of vital signs and CRRT values. We reviewed medical records of thirty three patients who received PT during CRRT. Changes of vital signs and safety events were compared among the passive PT, bed activities, sitting and standing or marching on spot active mobilization.

Results: Of the thirty three patients, fifteen patients (45.4%) received passive PT and eighteen (54.5%) active mobilization during CRRT. 34 passive PT sessions (41.4) were performed. In the mobility sessions, 10 sessions (12.2) of bed mobility, 29 sessions (35.3) of sitting on the edge of bed and 9 sessions (10.9) of standing or marching on spot were conducted. There was no significant difference in comparisons of changes in vital signs among the passive PT and three levels of active mobility sessions. No safety event was occurred. Conclusions: There was no clinically significant safety events and changes of vital signs in patients on CRRT. We found CRRT was not contraindication for active mobilization. Thus, early active mobilization for patients on CRRT might be safely implemented in ICU.

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THE CURRENT STATE OF ACUTE KIDNEY INJURY KNOWLEDGE AND MANAGEMENT IN PEDIATRIC CRITICAL CARE
Amanda Hastings, Sudha Garimella, Brian Wrotniak, Jo Freudenheim

Learning Objectives: Increasingly prevalent in pediatric intensive care, acute kidney injury (AKI) carries significant short and long term burden. Disparities exist between advances in research and worsening outcomes in pediatric AKI. This study set out to describe the knowledge and the clinical application of AKI guidelines (GL) by pediatric critical care physicians. Methods: An electronic questionnaire sent to an international sample of practicing attending physicians in pediatric critical care. An adherence score (AS) was calculated using the Kidney Disease: Improving Global Outcomes (KDIGO) GLs. Associations between AS and respondent characteristics were investigated. Results: Of the 201 surveys begun, 170 (85%) were completed. The mean total AS was 10.8 ±3.3 out of 25, 3.4 ±1.5 out of 10 in knowledge and 7.4 ±2.5 out of 15 points in practice. There were no associations between AS and any respondent characteristic. The PRIFLE criteria were the most recognized (78.8%) and used (51.2%). AKI, KDIGO and Renal Angina index were used by 11% of respondents combined. Awareness of each GL carried 30% lower adherence score. Conclusions: There were no associations between AS and any respondent characteristic. The PRIFLE criteria were the most recognized and used. AKI, KDIGO and Renal Angina index were used by 11% of respondents combined. Awareness of each GL carried 30% lower adherence score. Conclusions: Awareness and use of AKI GLs is low among pediatric critical care physicians and overall reported practice deviates from current recommendations. GL knowledge is tied to better performance. Few physicians are using novel BMs; the majority still rely on SCr. Physicians of all experience, PICU size, nephrology presence, and geographic region could benefit from AKI education.

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STROKE VOLUME INDEX (SVI) DURING HEMODIALYSIS: USEFUL OR USELESS GUIDE TO TARGET FLUID REMOVAL?
Herbert Patrick, Kenneth Knowles, Eladio Vazquez

Learning Objectives: In ICU patients receiving hemodialysis (HD), net fluid removal is a balance between plasma refilling rate (PRR) and ultrafiltration rate (UFR). Net fluid removal may be less than target, often due to PRR less than UFR and the resulting hypotension and/or tachycardia. Hypothesis: Reduced SVI occurring during HD predicts PRR less than UFR. If PRR is known to be less than UFR, proactive corrections could be introduced to achieve target fluid removal. Methods: This retrospective study examined patients receiving HD in our Med Surg ICU between 01Feb15 and 30Jun15. HD sessions were performed using the Fresenius 2000™ with a F800™ membrane. A subset of patients had an arterial catheter for pressure monitoring independent of HD. The catheter was connected via the Edwards Flo-Trac™ transducer to the Edwards Vigileo™ designed to display SVI in mL/min/m². Vigileo™ data downloads were transferred by USB drive and analyzed in MS Excel. Change in SVI (%) was defined as averaged SVI data in two time windows as 100 x (4 hr pre-HD average minus HD average)/4 hr pre-HD average. Net fluid removal in mL for each session was chosen as the discriminator for analyzing change in SVI (%): positive, 0 (euvolemic), negative 1-1000 mL and greater than 1000 mL. Nursing and HD flow sheets were reviewed for vital signs and use of vasoressors. Patients receiving SLED were excluded. The HD team did not use Critline monitoring, nor did the team perform adjustments during the HD session based on the SVI display. Results: A total of 32 patients received 81 HD sessions (2.8 sessions per patient); 10 patients with arterial catheters received 21 sessions with complete data (2.1 sessions per patient). Net fluid removal in these 21 sessions were positive (n=2), 0 (n=1), 1-1000 (n=9), and above 1000 mL (n=9). Change in SVI varied from -18.3% (SVI HD higher) to 31.0% without correlation to net fluid removal. Conclusions: 1. Change in SVI pre-HD versus during HD did not predict PRR less than UFR in our patient population. 2. Limitations of this study include single site, retrospective design, and small sample size.

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ANION GAP AS A PREDICTIVE VALUE FOR CLINICAL OUTCOME IN CRITICALLY ILL CHILDREN
Alicia Fernández, Jennifer Ruiz, Nilka De Jesús, Janice Gómez-Grayar, Anabel Puig-Ramos, Ihovanni Barroso

Learning Objectives: Plasma anion gap and delta anion gap have a great significance in the clinical diagnosis of a variety of acid-base disorders and are particularly useful for evaluating patients with mixed metabolic acidosis. In adults, studies have shown that a high Anion Gap (AG) is a good predictor of mortality in critically ill patients. However, in critically ill children it has not been established. Methods: Retrospective observational study including patients, 0 to 21 yr old, admitted to the Pediatric Intensive Care Unit (PICU) at the University Pediatric Hospital from January to November of 2010. Admission anion gap was calculated and evaluated patient’s clinical outcome. Mann-Whitney and Fisher exact test was used for statistical analysis. Results: A total of 201 patients meet the inclusion criteria: 42% (84) were female, median age was 7.5 yr (~6.1), mechanical ventilation days were 12 days (~17) and the overall mortality was 9% (18 patients). Patients with elevated AG had more mechanical ventilation days, 7 (4–8) p =0.035. Also, patients with elevated AG had increased mortality, 15% (10/65) p=0.027. Conclusions: Data suggest that elevated AG in children critically ill can be used as a predictor of mortality and mechanical ventilation days. Elevated AG must be compared with other mortality score predictors in pediatric critical care setting such as PRISM or PIM Score to determine if there is a correlation with high AG values with high PRISM or PIM score. We are currently analyzing which predictor of mortality score best correlates with an elevated AG at the pediatric critical care setting.

Elevated AG must be compared with other mortality score predictors in pediatric critical care setting such as PRISM or PIM Score to determine if there is a correlation with high AG values with high PRISM or PIM score. We are currently analyzing which predictor of mortality score best correlates with an elevated AG at the pediatric critical care setting.
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USE OF NONINVASIVE METHODS TO DETECT SEPSIS-INDUCED ACUTE KIDNEY INJURY IN CRITICALLY ILL CHILDREN
Olga Zand, Sudha Garimella, Ian Najdzionek, Amanda Hassinger

Learning Objectives: Sepsis is the most common cause of acute kidney injury (AKI) in critically ill pediatric patients in the United States. Current clinical practice relies on serum creatinine (SCr), creatinine clearance, and urine output to detect AKI; despite these being late and insensitive markers of AKI. The resistive index (RI) in the renal artery, as determined by Doppler methods, has proven to be a useful technique to quantify alterations in renal blood flow. Renal near infrared regional spectroscopy (RNIRS) is a novel technology that has shown to correlate with elevated SCr values 48 hr later when placed on infants after cardiac surgery. Our study was performed to test the hypothesis that RNIRS and/or RI could detect clinical changes consistent with sepsis-associated AKI before the changes in SCr occur.

Methods: Prospective observational study of critically ill pediatric patients aged 2 weeks to 20 yr old with suspected or confirmed sepsis. RNIRS probes were in place until 48 hr after sepsis resolution. Using bedside Sonosite ultrasound machine, renal arterial RI was evaluated every 12–24 hr. The primary outcome of AKI was determined by an increase in adjusted SCr by 25% from baseline using the definition of “RISK” “Injury” “Failure” “Loss” and “End-stage” (pRIFLE) AKI staging criteria. SCr values were adjusted for net fluid balance.

Results: Of the 18 patients enrolled in the study, four patients (22.2%) developed “RISK” according to pRIFLE criteria. Lower RNIRS values were associated with SCr increases 1 and 2 days later in septic AKI (rs=-0.775; p=0.041 and rs=-0.900; p=0.039 respectively). There were no meaningful associations between RI and changes in SCr. 8 patients had technical problems with the application of RNIRS including displacement of probes with movement, sweating. Conclusions: Lower RNIRS on sepsis day 2 and 3 were associated with changes in renal function on sepsis day 3 to 4 and days 5 to 6 in critically ill children. RNIRS can be technically challenging in children with obesity, scoliosis, excessive sweating. Bedside Doppler RI was not reliable in predicting AKI in this study.

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HISTIDINE-RICH GLYCOPROTEIN AS A NEW BIOMARKER FOR SEPSIS: COMPARISON TO PROCALCITONIN AND PRESEPSIN
Kouuke Kuroda, Hiroshi Morimatsu, Hidenori Wake, Shiji Mori, Masahiro Nishibori

Learning Objectives: There are many biomarkers and therapies for sepsis used in clinical practices, but a few become the standard. Histidine-rich glycoprotein (HRG) is a plasma protein produced in the liver. Our group reported that plasma HRG levels decreased in mice with sepsis and that supplemental HRG infusion significantly improved the survival rate in mice model of sepsis. In this study, we measured HRG levels in SIRS patients and compared the HRG with procalcitonin (PCT) and presepsin.

Methods: We prospectively studied the ICU patients fulfilled at least two of the diagnostic criteria for SIRS. We collected blood samples within 24 hr of ICU admission. HRG levels were determined with original ELISA, and we assessed prognostic significance of HRG, PCT and presepsin.

Results: We studied 70 SIRS patients, including 20 septic patients and 50 non-septic patients. HRG levels in septic patients were significantly lower than those in non-septic patients (11.21 ± 6.35 vs. 34.85 ± 10.75 µg/ml; p<0.01). Both PCT levels and presepsin levels in septic patients were significantly higher than those in non-septic patients. HRG levels in non-survivors (n=8) were significantly lower than those in survivors (n=62) (11.40 ± 8.70 vs. 30.25 ± 13.65 µg/ml; p<0.01). Presepsin levels in non-survivors were also higher than those in survivors (285.1 ± 2688 vs. 675.5 ± 1563 µg/ml; p<0.01). On the other hand, PCT levels had no differences between survivors and non-survivors. The receiver operator characteristics (ROC) curve analysis for diagnosing sepsis revealed that the areas under the curve (AUC) for HRG, PCT and presepsin were 0.97, 0.82 and 0.77, respectively. Furthermore, the ROC curve analysis for mortality revealed that AUCs for HRG, PCT and presepsin were 0.97, 0.82 and 0.77, respectively.

Conclusions: We found that the HRG levels in septic patients were lower than those in non-septic patients, and that the HRG levels were significantly related to mortality. We also demonstrated that the HRG might not be inferior to PCT and presepsin. These results suggested that HRG could be a novel prognostic biomarker in septic patients.

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RHS-TM COULD CONTRIBUTE TO INHIBIT THROMBIN GENERATION IN SEPSIS-INDUCED DIC
Noriko Saito, Hideaki Suzuki, Kazuma Shibahara, Noboru Akiduki, Mizuho Namiki, Munekazu Takeda, Arino Yaguchi

Learning Objectives: Recombinant human soluble thrombomodulin (rhs-TM), Asahi Kasei Pharma Co., Tokyo) administration has been used in adult patients with sepsis and disseminated intravascular coagulation (DIC) in Japan. A large randomized controlled study of the phase 3 clinical trial is ongoing in other countries. In a previous study, we reported rhs-TM could have a synergistic effect both in inflammation and DIC, however the mechanisms of rhs-TM has not been elucidated. The purpose of the present study is to further clarify rhs-TM’s action by evaluating molecular markers.

Methods: This retrospective observational study included adult patients treated with rhs-TM for sepsis induced DIC in our ICU from November 2008 to May 2015. The rhs-TM therapy consists of 380µg/kg intravenously every 24 hr for 6 days. Before the start of rhs-TM therapy and on the day after finished the therapy, soluble TM (ng/ml), protein C activity (PC) (%), thrombin-antithrombin III complex (TAT) (ng/ml), fibrinmonomer (FM) (µg/ml), a2-plasmin inhibitor-plasmin complex (PIC) (µg/ml), tPA-PAI-1 (ng/ml), complement 3 (C3) (mg/dl) and complement 4 (C4) (mg/dl) were evaluated. Values were expressed as mean ± SD. Data were analyzed by Wilcoxon signed-ranks test. A p < .05 was considered as statistically significant.

Results: Fifty six patients (36 men, 20 women; age mean 67.6±14.5; studied were TM values and PC activity were statistically significantly increased (58.7 ± 175.2 vs. 391.3 ± 441.8, p<0.001, 47.8 ± 28.3 vs. 53.8 ± 26.2, p=0.035, respectively), while TAT and tPA-PAI-1 decreased after rhs-TM therapy (14.7 ± 18.7 vs. 7.2 ± 9.1, p=0.024, 66.1 ± 77.9 vs. 30.2 ± 22.5, p=0.010, respectively). C3 was also significantly increased after the therapy (69.0 ± 21.0 vs. 78.7 ± 20.5, p=0.032). There were no differences in FM, PIC, and C4 (31.8 ± 41.1 vs. 28.0 ± 51.1, p=0.42, 2.3 ± 3.5 vs. 2.2 ± 2.9, p=0.37, 18.5 ± 8.2 vs. 17.2 ± 5.9, p=0.64, respectively.)

Conclusions: Rhs-TM increased PC activity and C3 activity, while it decreased activation of coagulation and fibrinolysis. Rhs-TM could contribute to inhibit thrombin generation.

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M-TYPE CHOLINERGIC RECEPTOR ANTAGONISTS TREATMENT SLOW THE PROGRESSION OF LPS-INDUCED INFLAMMATORY
Zhen Wang

Learning Objectives: The pathogenesis of sepsis is complex, a variety of reasons can directly or indirectly lead to the occurrence of sepsis. Recently studied cholinergeric anti-inflammatory pathway has been shown to control the pro-inflammatory response and reduce the release of pro-inflammatory cytokines such as tumor necrosis factor(a(TNF-a). Objective: The aim of this study was to verify the efficacy of atropine in inhibiting sepsis progression and determine whether M1 selective muscarinic receptor antagonist pirenzepine and M2 selective muscarinic receptor antagonist AF-dx116 play roles in preventing experimentally induced septic shock, as to explore what role the muscarinic acetylcholine receptor plays to affect sepsis progression.

Methods: 57 mice were injected with LPS (150µg/kg, i.p.) to induce septic shock. Atropine, pirenzepine, AF-dx116 were respectively administered 30 min before the injection of LPS. Survival was monitored and analyzed via Kaplan-Meier survival analysis using the log-rank test. The effects
of three agents on the inflammatory cytokine TNF-α were monitored at different time intervals following LPS injection in mice that were respectively treated with atropine, pirenzepine, AF-dx116, and normal saline. Results: Both atropine and pirenzepine pretreatment improved the rate of survival and prolonged the survival time. On the contrary, AF-dx116 accelerated the death. Atropine and pirenzepine administration prior to LPS induction of the inflammatory response resulted in reduced TNF-α level, while AF-dx116 administration elevated TNF-α level. Conclusions: The administration of atropine or pirenzepine may have a beneficial clinical effect on septic mice.

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A COMPUTER-BASED DECISION SUPPORT TOOL ACCURATELY IDENTIFIES SEVERE SEPSIS IN ED PATIENTS.

Robert Sherwin, Cheryl Courage, Hao Ying

Learning Objectives: Early and accurate identification of severe sepsis is critical to comply with guideline recommendations and improving patient outcomes. We designed a clinical decision support tool called ‘Sepsis Alert’ to assist in identifying patients with severe sepsis or septic shock early in the course of the emergency department (ED) stay. Methods: Sepsis Alert’s specific logic was based on contemporary literature, local data analysis and expert opinion and was designed to identify adult ED patients highly likely to have severe sepsis or septic shock. The model’s variables included vital signs, white blood cell count, lactate, past medical history, age and nursing assessments. Only data commonly available within the initial six hours of a patient’s ED stay was used. Sepsis Alert is based in the electronic health record where it continuously monitors patient data and issues an “alert” to a dedicated pager when the cumulative data exceeds the predefined threshold. The performance metrics of Sepsis Alert were assessed based on a retrospective 3-month sample of adult ED patients. This included sensitivity, specificity, positive predictive value, negative predictive value and area under the ROC curve. The gold standard for severe sepsis and septic shock was a combination of ICD-9 coding consistent with severe sepsis or septic shock and selective chart review. Results: There were 20,919 unique patient visits of which 5,637 were admitted to the hospital. The prevalence of disease was 0.6% for the overall sample and 2.0% for all admitted patients. The sensitivity and specificity of Sepsis Alert was 82.3% and 97.8% respectively with a positive predictive value (PPV) of 20.4%. The sensitivity improved to 92.7% for the subgroup of patients admitted to the hospital. In the overall population, the area under the ROC curve was 0.910 (95% CI, 0.877–0.943) for Sepsis Alert to identify ED patients with severe sepsis and septic shock. Conclusions: The Sepsis Alert model accurately identified severe sepsis and septic shock in ED patients. Performance improved when applied to admitted patients only.

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USING BIOMARKERS TO ENHANCE 60-DAY IN HOSPITAL MORTALITY PREDICTION FOR EARLY SEPSIS PATIENT

Li Zhu, Gilles Clermont, Li Ang Zhang, Ericka Mochan-Keef, Robert Parker, David Swigon, Francis Pike

Learning Objectives: Few mortality prediction models of them have considered inflammatory biomarkers to improve outcome prediction in sepsis patients. Methods: The Protocol-based Care in Early Septic Shock (ProCESS) trial prospectively enrolled 1341 patients with sepsis with a 60-day in hospital mortality of 19.3% (Yealy et al., 2014). Those subjects were randomly assigned to training (67%) and validation in an independent testing set (33%). Clinical variables measured 60-day in hospital mortality as outcome are developed in the training set (67%) and validated in an independent testing set (34%). Logistic regression (LR) models with mortality of 19.3% (Yealy et al., 2014). Those subjects were randomly assigned to training (67%) and validation (33%). Receiver operating characteristic (ROC) and time-dependent variables (e.g., vital signs) and a clinical-only model was developed in the training set (67%) and validated in an independent testing set (34%). Receiver operating characteristic (ROC) and time-dependent variables (e.g., vital signs) and a clinical-only model was developed in an independent testing set (34%). Conclusions: The baseline clinical model showed moderate ROC, owing to low mortality and limited sample size. Yet, a small number of baseline inflammatory biomarkers provided incremental prediction ability.

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IDENTIFYING PULMONARY MICROCIRCULATION OF MURINE SEPSIS MODEL USING INTRAVITAL MICROSCOPY

Inwon Park, Kibaek Choe, Yoonha Hwang, Hownon Seo, Eunjoo Song, Jinhyo Ahn, Pilhan Kim

Learning Objectives: In vivo real-time imaging of pulmonary microcirculation in cellular-level could deepen our understanding of sepsis-induced acute lung injury. However, due to severe motion-artifact induced by normal physiologic respiration, to date, conventional intravital microscopy approach of pulmonary microcirculation has been limited. We implemented a motion-stabilized lung imaging window device integrated to a custom-built intravital microscopy system and observed the alteration of pulmonary microcirculation in sepsis in vivo. Methods: C57BL/6J mouse was divided into two groups. (Sham/CLP), 24 hr after CLP procedure, both groups of mouse were anesthetized, intubated and mechanically ventilated. After performing thoracotomy, we applied suction device combined with lung window on the lung surface for motion stabilization. By utilizing a custom-design video-rate laser scanning confocal microscopy system, we acquired dynamic cellular-level microscopic images of lung. Fluorescence angiography with FITC-dextran dye and RBC track imaging analysis was performed to identify endothelial surface layer representing glyocalyx in vivo. Also, to investigate the obstructive characteristics of capillary flow, DID labelled RBC was injected via tail vein and video analysis was performed. Results: Width of RBC exclusion zone, endothelial glyocalyx between two groups were significantly different (0.532 ± 0.179μm vs. 1.715 ± 0.082μm, p < 0.001). Number of arrested RBC, which represents the obstruction of flow, was significantly higher in sepsis group compared with control (22.8 ± 5.97 vs. 2.0 ± 1.70 per 262μm2, p < 0.001). Conclusions: Pulmonary microcirculation including endothelial glyocalyx and capillary obstruction by arrested RBC was evaluated in vivo by using a custom-built intravital microscopy system for dynamic lung imaging. Implication of our model will enhance future research to understand pathophysiology and develop treatment strategy of sepsis-induced ALI.

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EFFECTS OF RECOMBINANT HUMAN THROMBOMODULIN ON SEPSIS-INDUCED DISSEMINATED INTRAVASCULAR COAGULATION

Tatsuki Uemura, Hiromitsu Hiruma, Akiyoshi Hagiwara, Ryuichiro Makinouchi, Wataru Matsuda, Akio Kimura

Learning Objectives: Several retrospective studies have found that recombinant human thrombomodulin (rhTM) improves survival among patients with sepsis-induced disseminated intravascular coagulation (DIC). However, a hidden bias could not be completely excluded. The present randomized control trial aimed to determine whether or not rhTM can increase patient survival. Methods: This open label trial including 92 patients diagnosed with sepsis-induced DIC proceeded at a single tertiary hospital. Patients with DIC scores ≥ 4 as defined by the Japanese Association of Acute Medicine (Crit Care Med. 2006; 34: 25–631) were diagnosed with DIC. Randomization was balanced using the enveloped method. A treatment group (TG, n = 47) was injected intravenously with rhTM within 24 h of admission (day 0) and a control group (CG; n = 45) did not receive anticoagulants. Data were collected on days 0 (admission), 1, 2, 3, 5, 7 and 10. The primary outcome was survival at 28 and 90 days. The secondary endpoints comprised changes in DIC scores, platelet counts, antithrombin III (ATIII), D-dimer, Sequential Organ Failure Assessment (SOFA) scores, and C-reactive protein (CRP) values. All analyses proceeded with intent to treat. Results: The primary outcomes were 83% (TG) vs. 80% (CG) on day 28, and 72% vs. 73% on day 90 (p = 0.94, Log rank test). The secondary outcomes were as follows. Rates of recovery from DIC (< 4) were significantly higher in TG than in CG.
RESULTS:

Sequences within fecal samples collected during dietary modification and at the 24 h. Fecal bacterial communities were profiled by analyzing 16S rRNA gene in a separate cohort (n=16). Cytokines were measured in plasma samples at the time of animal sacrifice.

CONCLUSIONS: Although rhTM was not shown to increase survival in patients with sepsis-induced DIC, DIC and SOFA scores did show improvement with their related biomarkers.

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OBESITY IS ASSOCIATED WITH A LOWER RISK OF MORTALITY IN ADULTS HOSPITALIZED DUE TO SEPTICEMIA IN THE USA

Veerajalandhar Allareddy, Natalia Martinez-Schlurmann, Sankehrth Rampa, Nallah Romesh, Alexandre Rotta, Veerasathpurush Allareddy

Learning Objectives: Infections continue to be a major cause of morbidity & mortality. There is an increasing prevalence of obesity in USA. The association between obesity and septicemia and its effect on outcomes is unclear at a large population level. The objective of this study is to examine the impact of obesity on outcomes (in-hospital mortality-IHM, hospital charges-HC, and length of stay-LOS) in adult patients who were hospitalized due to septicemia.

Methods: We performed a retrospective analysis of the Nationwide Inpatient Sample for the years 2009 to 2010. All patients 18 yrs and who were hospitalized due to septicemia were selected. Amongst this cohort, the prevalence of obesity was estimated. The impact of obesity on IHM, HC (adjusted to year 2010 $ value), and LOS was examined by multivariable logistic and linear regression models. The confounding effects of age, sex, race, insurance status, type of admission, co-morbid conditions, hospital location, hospital region were adjusted in the regression models. Effects of clustering of outcomes within hospitals was adjusted. This study was IRB approved.

Results: 4,705,272 adult hospitalizations with a primary diagnosis of sepsis occurred during the study period. Amongst these, 308,601 (6.6%) were also obese. The mean age of patients with obesity was 61 yr (70 for those without obesity). Outcomes in obese vs non-obese patients included: IHM rate (10.7% vs 17.8%), mean HC ($75,301 vs $67,196) and mean LOS (9.1d vs 8.8d). Following adjustment for confounders, obesity was not significantly associated with HC (estimate=0.008, p=0.44) or LOS (estimate=0.001, p=0.07). Following adjustment for confounders, obese patients exhibited significantly lower odds for in-hospital mortality (Odds Ratio=0.67, 95%CI=0.65–0.69, p<0.0001) when compared to their counterparts. Conclusions: In this large population based study, obese adult patients hospitalized due to septicemia had a significantly lower risk of mortality compared to their counterparts. The obesity paradox identified in this study merits further research at a physiological/biological level.

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DIETARY FIBER SUPPLEMENTATION CONFEWS PROTECTION IN A MURINE MODEL OF SEPSIS

Valentina Di Caro, Jessica Cummings, Diana Pang, Victor Fisseur, Jerngbum Kim, Robert Clark, Michael Morowitz, Rajesh Aneja

Learning Objectives: Links between the host-microbe relationship and inflammation are poorly understood. Recent data suggest that the gut microbiome plays a critical role in maintaining immune homeostasis and that the microbiome can be reshaped by dietary changes. Dietary fiber intake is beneficial in chronic inflammatory models, but its effect on acute inflammation has not been studied. In this initial study, we aim to understand if increased dietary fiber intake confers protection in murine sepsis models, and explore potential mechanisms that underlie such protection. Methods: Four to six w old mice (n=24) were randomized to receive either low, basal or high fiber diets (containing 0.3, 3, and 30% cellulose respectively) for 3 weeks. Mice were then subjected to cecal ligation and puncture and monitored for survival. An alternative model of sepsis, intraperitoneal endotoxin (700 µg/kg) administration was also used in a separate cohort (n=16). Cytokines were measured in plasma samples at 24h. Fecal bacterial communities were profiled by analyzing 16S rRNA gene sequences within fecal samples collected during dietary modification and at the time of animal sacrifice. Results: High fiber diet significantly improved survival (62.5% vs 38%, P<0.05) as compared to low and basal fiber diets, and attenuated plasma levels of cytokines tumor necrosis factor, interleukin 1 and monocyte chemotactic protein 1. Furthermore, high fiber diet was also associated with a reduction in sepsis-induced organ damage as compared to animals on low and basal fiber diet. Prior to dietary modification, all animals contained similar gut bacterial communities. The high fiber diet-induced many changes in the microbiome, including a sharp increase in the abundance of Akkermansia, a bacterial genus with health-promoting properties. Survival curves were similar when endotoxin was administered to induce sepsis. Conclusions: High fiber diet is protective in murine sepsis models leading to a favorable gut microbiome and improved survival. Further studies are in progress to identify gut flora-immune interactions in the host response to sepsis.

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CHARACTERIZATION OF MYOCARDIAL DYSFUNCTION AND ITS CLINICAL CORRELATES IN PEDIATRIC SEPTIC SHOCK

Feifei Williams, Ritu Sachdeva, Courtney McCracken, Senthil Ramamurthy, Xin Sun, Kiran Hebar

Learning Objectives: Myocardial dysfunction is a known complication of pediatric septic shock (PSS), but little is known about its extent and effect on clinical outcomes. We sought to determine left ventricular (LV) and right ventricular (RV) systolic and diastolic dysfunction and their clinical correlates. Methods: Records of patients (<21yr) with fluid and catecholamine refractory PSS between April 2010 to July 2013 were reviewed. Age based z-scores on echocardiographic measures were obtained using historical data on healthy subjects. LV systolic dysfunction was defined as ejection fraction <55% and/or mitral annular S’ velocity z–score <–2; RV systolic dysfunction as tricuspid annular S’ velocity z–score <–2 and/or tricuspid annular plane systolic excursion z–score <–2. LV and RV diastolic dysfunction were defined as mitral E/A’ and tricuspid E/A’ z–scores <–2. LV and RV global dysfunction were defined as their myocardial performance index z-score >2. All these measures were correlated with β-type natriuretic peptide, lactate, D-dimer values were significantly lower in TG from day 1 (12.1 vs. 17.0 µg/mL; p = 0.03). SOFA scores and CRP were significantly lower in TG from day 2 (2 vs. 3; p = 0.049 and 4.9 vs. 9.7; p = 0.029, respectively). Conclusions: Although rhTM was not shown to increase survival in patients with sepsis-induced DIC, DIC and SOFA scores did show improvement with their related biomarkers.
to be Th2-like if they were CD3+, CD4+, CD25+, CD45RO+,CCR4+, and CCR6-. To conduct these experiments in a mouse model, we used house dust mite (HDM) sensitization and challenge to induce a Th2 response, followed by intravenous infection with S. aureus to induce sepsis. We monitored survival and weight loss to determine the impact of Th2 activation on the course of S. aureus infection. Results: Among patients who survived for 90 days compared with matched patients who died after S. aureus infection, we found an increased percentage of circulating Th2-like cells at both timepoints (p = 0.003 at days 2–4 and p = 0.09 at days 6–9). In addition, we found that activation of Th2 responses in mice completely protected against S. aureus lethal infection and resulted in less weight loss compared with unsensitized mice (p = 0.01). Conclusions: Using both human samples and a mouse model, we found that activation of type 2/Th2 responses is associated with survival from S. aureus infection. These data suggest that type 2 immune responses play a heretofore-unrecognized role in protecting against development of sepsis and may represent a novel pathway for understanding and manipulating the septic inflammatory response.

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**A PARSIMONIOUS TRANSCRIPTIONAL SIGNATURE CAN ROBUSTLY DISTINGUISH VIRAL FROM BACTERIAL INFECTIONS**

Timothy Sweeney, Hector Wong, Jason Andrews, David Spain, Purvesh Khatri

**Learning Objectives:** Distinguishing viral from bacterial infections can be difficult, especially in the critically ill. Inappropriate diagnoses lead to increased morbidity, mortality, and antimicrobial resistance. Further, most viral diagnostics are specific to only one virus. Distinguishing bacterial from viral infections based on host response may be a more effective approach. Here we studied gene expression in viral and bacterial infections using a multi-cohort analysis framework with which we have previously identified diagnostic gene sets in transplant rejection, pulmonary tuberculosis, and sepsis. Methods: We performed a systematic search for public-genome-wide expression studies of viral and bacterial infection. All microarray data were re-normalized and log2 transformed. We applied our multi-cohort meta-analysis framework to find statistically differentially expressed genes. A greedy forward search was used to find a diagnostic gene set. The resulting gene set was validated in independent patients using a targeted nanogold digital multiplex gene quantitation assay. Results: We identified 7 datasets (whole blood and PBMCs) composed of 367 patients (101 viral and 266 bacterial infections, including children and adults, medical and surgical patients, and with respiratory and systemic viral infections). Multi-cohort analysis identified 72 genes significantly differentially expressed (FDR<1% and effect size ≥2-fold) between patients with viral versus bacterial infections. A forward search identified a subset of 7 genes which robustly distinguished viral from bacterial infections (mean ROC AUC=0.96, range=0.85–1.0). NanoString assays validated these results in independent whole blood samples from children with sepsis (AUC 0.85 for pediatric sepsis in discovery, AUC 0.86 for pediatric sepsis in validation). Conclusions: A parsimonious set of 7 genes can robustly differentiate viral from bacterial infections in 7 clinically heterogeneous datasets, and was validated using a targeted assay. Further optimization and validation will be performed in the remaining public data prior to prospective validation.

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**TYPE 2/TH2 INFLAMMATORY RESPONSES PROTECT AGAINST THE MORTALITY OF STAPHYLOCOCCUS AUREUS INFECTION**

Philip Verhoef, Jared Greenberg, Cara Hrusch, Paulette Kroshack, Anne Sperling

**Learning Objectives:** The Type 2/Th2 inflammatory response, characteristic of allergies and asthma, likely evolved to mediate tissue repair and counter inflammation induced by helminth infections. We hypothesized that this response is advantageous in countering the septic inflammatory response and restoring inflammation induced by helminth infections. We hypothesized that this response may be useful in countering the septic inflammatory response and restoring inflammation induced by helminth infections. We hypothesized that this response in allergic patients, peripheral blood mononuclear cells were isolated from a cohort of 65 adult patients with Staphylococcus aureus blood stream infections to determine the percentage of circulating Th2-like cells. Samples were drawn at two time points after diagnosis of infection: days 2–4, and days 6–9. The 14 patients who died during days 7–90 after diagnosis were matched by comorbid medical conditions to 14 patients who survived at least 90 days. We considered cells

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**NEURORADIOLOGIC AND HISTOPATHOLOGIC CORRELATES OF BRAIN INJURY IN A MURINE MODEL OF SEPSIS**

Diana Pang, Yijen Wu, Jessica Cummings, Victor Hsue, Valentina Di Caro, Robert Clark, Patrick Kochanek, Rajesh Aneja

**Learning Objectives:** Acquired brain injury associated with sepsis is a serious complication that affects up to 70% of critically-ill patients. There are no imaging studies that examine blood-brain barrier (BBB) disruption or correlate neuroradiologic and histopathologic changes in a sepsis model. Our aim is to use magnetic resonance imaging (MRI) and immunohistochemistry (IHC) to define neuropathology in a murine model of sepsis. Methods: Polybiomicrobial sepsis was induced in 6–10 w.o. male C57BL/6 mice by cecal ligation and puncture (CLP). Mice underwent MRI of the brain at 1 and 4 days (d) after CLP. To assess BBB permeability, T1-weighted images were obtained after i.v. injection of gadolinium (Gd). Cerebral edema was evaluated with diffusion tensor imaging (DTI) and apparent diffusion coefficient (ADC). Brains (n=4–6/group) were...
harvested to identify microglia via IHC with anti-iba-1 Ab. Shams underwent surgery without CLP. Results: The survival rate after CLP was 62%. MRI studies revealed enhanced Gd uptake in the right hippocampus, thalamus and cortex at 1 and 4d after CLP indicating BBB disruption. ADC values were lower after CLP in the following regions at d1: left hippocampus (0.48x10^{-3}±0.01x10^{-3} mm^2/s vs 0.60x10^{-3}±0.08x10^{-3} mm^2/s, P=0.04), right thalamus (0.50x10^{-3}±0.02x10^{-3} mm^2/s vs 0.69x10^{-3}±0.08x10^{-3} mm^2/s, P=0.05), and bilateral cortices (right 0.48x10^{-3}±0.01x10^{-3} mm^2/s vs 0.60x10^{-3}±0.02x10^{-3} mm^2/s, P=0.04; left 0.49x10^{-3}±0.03x10^{-3} mm^2/s vs 0.58x10^{-3}±0.06x10^{-3} mm^2/s, P=0.93). By d4 these regions were similar to sham. Decreased ADC values indicate cytotoxic cerebral edema. IHC showed that the right thalamus had more microglia after CLP on d1 (59.2±4.4 cells vs 9.5±6.7 cells, P=0.06), and this difference decreased on d4. Our data show that neuroradiographic and histologic changes peak on d1 after CLP and diminish by d4. Conclusions: In sepsis, BBB disruption, cerebral edema, and neuroinflammation occur transiently and vary by brain region. Correlations between cellular changes and MRI findings will help establish a neuroradiologic signature of brain injury in sepsis.

1001 REHOSPITALIZATIONS AND FATAL OUTCOME ARE COMMON AMONG SEVERE SEPSIS SURVIVORS
Petros Kopterides, Ives Diane, Nicole Lucko, Nathan Shapiro, Peter Flou, Michael Filbin, John Kellum, Sachin Yende

Learning Objectives: Studies using administrative data have shown that death and hospital readmissions are common following hospital discharge after severe sepsis. We sought to determine the frequency of death as well as the frequency and causes for readmissions in severe sepsis survivors by reviewing their case records. Methods: We conducted a prospective, multicenter, observational study enrolling patients who were discharged alive after a hospitalization for severe sepsis. We analyzed rehospitalizations, defined as an overnight hospitalization, among survivors of severe sepsis hospitalizations. Rehospitalizations were identified by post-discharge telephone interviews, subject/nex of kin self-report, and surveillance of hospital records. We, then, obtained health records for each rehospitalization, including diagnostic and procedure codes, discharge summaries, admission history and physical examinations, and diagnostic tests and procedures. Death certificates were obtained for fatal events outside of the hospital. Results: 171 patients (mean age: 58; males: 54.0%; whites: 79.0%) have been enrolled and followed for a median (IQR) period of 161 (69–280) days. Thirty-seven (21.7%) patients died. In addition, 61 (35.6%) patients were rehospitalized at least once; among them, 37.6%, 22.9%, and 39.5% were rehospitalized 1, 2, and 3 or more times, respectively. The median (IQR) post-discharge time to death and rehospitalization were 137.5 (68–298) and 88 (38–119) days, respectively. Approximately one-third of rehospitalizations were due to a new septic episode and one-fifth due to a cardiovascular (e.g., CHF exacerbation/chronic syndrome/arrhythmia) or a respiratory event (e.g., COPD exacerbation). Conclusions: Rehospitalizations and fatal outcomes are common in severe sepsis survivors. Understanding the reasons for these events and designing interventions to decrease the rehospitalization rate may reduce resource utilization and improve outcomes of severe sepsis survivors.

1002 VALIDATION OF A NOVEL HOST RESPONSE ASSAY TO DISTINGUISH SIRS AND SEPSIS IN CRITICALLY ILL PATIENTS
Russell Miller, Bert Lopansri, MD, Leo McHugh, Antony Rapisarda, Therese Seldon, John Burke, MD

Learning Objectives: Traditional diagnosis of sepsis relies upon a combination of clinical parameters and pathogen detection based on culture results. A novel diagnostic approach may provide additional information in discriminating infection negative systemic inflammation (SIRS) from infection-positive system inflammation (sepsis). Methods: We examined the performance of SeptiCyte® Lab, a host response RT-qPCR-based test that quantifies the expression of four genes involved in host immune responses, using an algorithm to combine measured gene expression values into a numeric score. The reference method for determination of sepsis was clinical impression using a published method of retrospective physician diagnosis, including adjudication, based on review of all clinical data at the time of hospital discharge. We report descriptive statistics for clinical characteristics of the cohort and area under the receiver operating characteristic curve (AUC) for this association. Results: In a prospective, observational, clinical trial of adult ICU patients with two or more signs of SIRS in the first 24h of critical illness, we enrolled 129 subjects with mean (SD) age 58 (17) yr, APACHE III score 92 (26), SOFA score 6.5 (3.3), and ICU length of stay 5.4 (4.9) days. Mortality was 9%. Patients deemed septic were sicker, with lower mean arterial pressure, higher temperature, and higher white cell count (all p<0.001) and higher admission APACHE III (p<0.05) and SOFA (p<0.07) scores. Higher SeptiCyte® Lab scores performed strongly in comparison to clinical reference determination, with higher numeric values correlated directly with an increased likelihood of sepsis. AUC was 0.88 (95% CI 0.80 – 0.94) for this association. SeptiCyte® Lab independently outperformed other clinical, demographic, and laboratory parameters tested individually and in combination to differentiate SIRS and sepsis. Conclusions: The novel SeptiCyte® Lab test appears to accurately distinguish SIRS from sepsis among adult ICU patients and does so independently of other clinical and laboratory parameters.

1003 HYPERFERRITINEMIA IN PEDIATRIC SEVERE SEPSIS
Dennis Simon, Bradley Podd, Robert Clark, Joseph Carrillo

Learning Objectives: In hospitalized children, hyperferritinemia is associated with increased risk of ICU admission and mortality (Bennett et al. PCCM 2011 Nov; 126(6): e233-6.). The individual subunits of ferritin, light-chain (FTL) and heavy-chain (FTH), have shown immunomodulatory effects in in vivo and in vitro. We explored the association between ferritin, mortality, and organ failure in pediatric patients with severe sepsis. In addition, we examined a subset of patients with hyperferritinemia for the relative increase in FTL and FTH subunits in severe sepsis. Methods: Pediatric patients with severe sepsis admitted to a PICU at a tertiary children’s hospital with severe sepsis. Initial serum ferritin was measured within 48 hr of diagnosis with severe sepsis and enrollment in the study. Organ failure was calculated using organ failure index (OFI), indicating the number of failing organ systems. The maximum OFI for each patient was included for analysis. Serum from patients with ferritin <1000, 1000–3000, and >=3000 ng/ml (n=5 per group) was evaluated for FTL and FTH subunits using western blot. Results: Median initial ferritin was 195ng/ml (range: 30-15,000ng/ml). 28-day mortality was 1.2%, 22%, and 50% in patients with ferritin <1000, 1000–<3000, and >=3000 ng/ml, respectively (p<0.001). ROC curve of initial ferritin vs. mortality had AUC of 0.88 (p<0.001). There was a stepwise increase in maximum organ failure index for patients: (Median, IQR) ferritin <1000 (OFI = 2, 1–2.75), 1000–<3000 (OFI = 2, 2–4), and >=3000 ng/ml (OFI = 4, 3–5) (ANOVA p<0.001). Western blot demonstrated increased FTL (mean OD: 1.3 vs. 5.6) and FTH (mean OD: 1.2 vs. 7.0) in patients with ferritin >3000 compared to ferritin <1000 (p<0.01). Conclusions: In children with severe sepsis, hyperferritinemia composed of both extracellular FTL and FTH is associated with increased OFI and mortality. Further study is ongoing to determine whether extracellular FTL and/or FTH modulate the immune response or serve as a damage-associated molecular pattern (DAMP) in human sepsis. Support: R01 GM108618 (Carcillo).

1004 CANDIDA ALBICANS PROMOTES GRAM-NEGATIVE BACTERIAL DISSEMINATION FROM THE NEONATAL MURINE GI TRACT
Padma Garg, Laura Coughlin, Julie Mirpuri, Andrew Koh

Learning Objectives: Mice with mature and intact gut microbiota are resistant to C. albicans (CA) gut colonization whereas germ-free or antibiotic-treated mice can be sustainably colonized with CA. Neonatal mice have immature gut microbiota, so we hypothesized that neonatal mice would be susceptible to sustained CA GI colonization and may also be more prone to CA dissemination. Methods: Postnatal day (P)7, P14, P21, and P35 mice (C57BL/6) were + orally gavaged with C. albicans strain SC5314. 7 days after oral gavage, mice were euthanized. Postnatal day (P)7, P14, P21, and P35 mice (C57BL/6) were + orally gavaged with C. albicans strain SC5314. 7 days after oral gavage, mice were euthanized. CA levels were measured and microbial gDNA was isolated from feces. Protein and RNA was extracted from flash-frozen cecal, ileal, and colonic tissues. Microbial taxonomic analysis (16S rRNA and bacterial group specific qPCR analysis)
was performed on microbial gDNA. Transcriptome analysis (qPCR) was performed on RNA extracted from intestinal tissues. Results: CA GI levels were highest in P7 mice. CA levels decreased as mice matured, and undetectable in P42 mice. In P7 mice gavaged with CA, 100% of mice were symptomatic (hunched, ruffled fur, cold, decreased mobility) and had evidence of gram-negative bacterial dissemination (E coli/Shigella spp.). Remarkably, there was no evidence of CA dissemination. Bacterial group qPCR of microbial gDNA revealed a 25-fold increase in Enterobacteriaceae (the bacterial family that includes E. coli and Shigella spp.) in P7 mice gavaged with CA compared to age-matched controls. In contrast, P14 and P21 mice colonized with CA had no evidence of gram-negative bacterial dissemination. Furthermore, P7 mice colonized with CA had marked modulation of intestinal antimicrobial peptide expression and significant increase in pro-inflammatory cytokine gene expression in small intestinal tissue. Conclusions: Acquisition of the commensal fungi, Candida albicans, in the neonatal murine gut leads to expansion of gram-negative bacteria and resultant bacterial dissemination. Thus, this observation may be a previously unrecognized pathogenic mechanism for the development of gram-negative bacteremia in premature human infants.

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EFFECT OF PROCALCITONIN (PCT) TESTING ON HEALTHCARE UTILIZATION AND COST
Robert Balk, Zhun Cao, Craig lipkin, bozzette samuel, Sameer Kadri, Scott Robinson

Learning Objectives: Biomarkers may facilitate earlier diagnosis of sepsis and lead to faster ICU admission, appropriate antibiotic, fluid, and vasopressor administration, which should result in improved outcome, shorter length of stay (LOS), and lower costs. The biomarker, PCT identifies critically ill patients with a high propensity for sepsis and may improve sepsis care. Methods: We performed a retrospective analysis of the Premier research database to evaluate the impact of PCT on total cost and healthcare outcomes of ICU pts. A targeted analysis compared pts who had 1–2 PCT samples obtained on the 1st or 2nd ICU day against a propensity-score matched (1:3 on demographic, hospital, and visit characteristics, and admission diagnosis) sample who did not have PCT testing. The primary endpoint was total cost. Secondary endpoints included inpatient mortality, hospital and ICU LOS, number of days without antibiotics, ICU, pharmacy, lab, antibiotic, and other costs. Chi squared test, t-test, generalized linear models, and logistic regression were used to analyze differences between groups. A p value of <0.05 was considered statistically significant. Results: 132,112 ICU pts were included with 33,569 (25.4%) having PCT guidance. Total cost of a PCT managed admission was significantly lower $25,513 ± $31,965 vs $33,164 ± $42,008, p<0.001) than non PCT managed admissions. PCT pts had a shorter hospital (10.5 ± 9.1 days vs 12.8 ± 12.9 days, p<0.001) and ICU (4.8 ± 5.9 vs 5.6 ± 7.0 days, p<0.001) LOS. Although PCT pts had significantly lower ICU, pharmacy, lab, antibiotic, and room and board costs, they had higher sepsis/septicaemia related readmission rates and higher inpatient mortality (19.3% ± 18.2%, p < 0.001). PCT pts were more likely to be discharged home. Conclusions: Use of PCT on the first day of ICU admission was associated with significantly lower hospital and ICU LOS and cost of care. Whether the slightly higher mortality seen with PCT-use is a function of unmeasured differences in severity of illness or attributable to PCT-guided changes in management is unknown.

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VITAMIN D STATUS AND DISRUPTION OF METABOLIC HOMEOSTASIS IN CRITICAL ILLNESS: A COHORT STUDY
Jessica Lasky-Su, Augusto Lintonu, Angela Rogers, Rebecca Baron, Kris Mogensen, Sadeq Qureshi, Karin Amrein, Kenneth Christopher

Learning Objectives: Maintenance of metabolic homeostasis is disrupted in critical illness illustrated by substantial alteration of multiple metabolic pathways. We hypothesized that metabolic profiles would differ in critically ill patients with vitamin D deficiency (25(OH)D < 15 ng/ml) relative to those with 25(OH)D ≥ 15 ng/ml. Methods: We performed a prospective cohort study in 65 adult MICU patients with SIRS or Sepsis. Metabolomic profiles were generated within 72 hr of ICU admission, targeting 411 metabolites. Plasma 25(OH)D level was obtained via chemiluminescence immunoassay from the same plasma sample as the metabolic profiles. 25(OH)D was categorized a priority as deficiency (25(OH)D ≤ 15 ng/ml). To identify plasma metabolites and metabolite pathways that differ by vitamin D status, we performed an integrated discovery approach that included gas and liquid chromatography, mass spectrometry, partial least squares-discriminant analysis, random forest analysis, metabolite set enrichment analysis, hierarchical clustering and logistic regression. Results: Most patients were male (58%) and white (85%). The mean (SD) age at ICU admission was 55.3 (15.2) yr. The mean (SD) 25(OH)D was 20.1 (15.9) ng/ml. 63% of cohort patients were diagnosed with sepsis. The mean APACHE II score was 25.6 (9.7). The 28-day mortality of the cohort was 35.4%. In our cohort, quantitative enrichment analyses show increases in the glutathione (GSH) pathway metabolites cysteinylglycine, pyroglutamyl, L-Cysteine were significantly associated with 25(OH)D>15 ng/ml. Pyrogulatmine was also identified in random forest predictor analysis as classifier of vitamin D status (25(OH)D>15 ng/ml). Further, pyrogulatmine was identified as predictive of vitamin D status (25(OH)D>15 ng/ml) and of 28 day mortality adjusted logistic regression analysis. Conclusions: Vitamin D status is associated with differential metabolic profiles early in critical illness. Common to all of our metabolome analyses, glutathione metabolism which plays a principal role in cellular redox regulation, was significantly altered with vitamin D status.

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ORGAN SUPPORT-BASED SURROGATE OUTCOME MEASURE FOR SEPSIS TRIALS
Perron Kopfeides, (Joyce) Chung-Chou Chang, Derek Angus, Steven Opal, Scott Berry, Roger Lewis, Sachin Yende

Learning Objectives: Surrogate outcomes are used to test therapies for many diseases. Surrogate outcomes based on organ support are commonly used in sepsis trials, but the relationship between surrogate and patient-centered outcomes is not known. We sought to: i) understand the relationship between duration of organ-support (mechanical ventilation (MV), vasopressors, and dialysis) over 28 days and 1-yr survival, and ii) develop a surrogate outcome measure incorporating organ support and mortality at 28 days to improve efficiency and ethical balance of clinical trials, especially adaptive trials. Methods: We conducted a secondary analysis of the ACCESS trial, a multicenter, international RCT testing the efficacy of etoritran (MD2-TLR4 antagonist). Results: Of the 1,677 patients, 455 (27.1%) and 723 (45.1%) died at 28 days and 1 yr. Within the first 28 days, 1,460 (87.0%), 1,534 (91.4%), and 415 (24.7%) patients required MV, vasopressors, and dialysis for a median (IQR) duration of 8 (3–16), 4 (2–7) and 5 (2–12) days, respectively. Among 28 day survivors, a higher duration of MV, vasopressors and dialysis was associated with lower 1-yr survival (p=0.05); however, the relationship between each organ support measure and 1-yr survival was not linear. For example, the hazard ratios (HR with 95% CI) for a 4-day difference in duration of MV during the 1st, 2nd, and 3rd week were 1.06 (1.02–1.10), 1.10 (1.07–1.12), 1.17 (1.14–1.19) and 1.65 (1.60–1.69), respectively. Similarly, the HRs for a 4-day difference in duration of vasopressors and dialysis increased exponentially over the first 4 weeks. In multivariable analysis, all 3 organ support measures were independently associated with 1-yr survival. We developed a composite surrogate endpoint using 28-day mortality and duration of MV, vasopressors, and dialysis over 28 days and this endpoint provides an estimate of the probability of 1-yr survival. Conclusions: A surrogate endpoint for 1-yr survival incorporating measures of organ support and mortality over 28 days was developed. If validated, it would be an important tool for future sepsis trials.
children admitted from 2009 to 2013 were screened for primary or secondary admission diagnoses of septicemia or septic shock. To characterize body habitus, we calculated weight-for-height Z-Score groups for children younger than 24 mo, and Body Mass Index (BMI)-for-age Z-Score groups for children older than 24 mo using CDC growth curves. We constructed mixed-effects regression models to evaluate the association between body habitus and mortality as well as presentation severity of illness controlling for confounding variables, complex and non-complex chronic conditions, and hospital level effects. Results: We enrolled 7,169 children from 53 PICUs, with an overall mortality of 10.2%. On univariate analysis, children with weight-for-height or BMI-for-age Z-Score groups less than -3.5 to -0.5, as well as greater than 3.5, had higher mortality (P ≤ 0.002). However, after adjusting for Pediatric Risk of Mortality (PRISM) score, presence of a complex chronic condition, age, race, and a diagnosis of trauma, there was no association between body habitus and mortality (all P ≤ 0.083). Multivariate modeling using PRISM score as the outcome revealed children with weight-for-height or BMI-for-age Z-Score groups less than -3.5 to -0.5, as well as greater than 3.5, had higher PRISM Scores compared to Z-Score group -0.5 to 0.5 (P ≤ 0.002), even after adjusting for other confounding variables including age, race, presence of complex chronic conditions, and trauma (P ≤ 0.001). Conclusions: Underweight children and severely overweight children have higher ICU mortality which appears to be explained by higher admission severity of illness.

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A TISSUE PERFUSION MEASUREMENT IN CRITICALLY-ILL PATIENTS AS A PREDICTOR OF MORTALITY

Karen Norby, Laura Spector, Timothy Perkins, David Inouye, Richard Severino, Danny Takanishi, Mihae Yu

Learning Objectives: Mortality from shock remains high necessitating the need for continued innovations in early detection of shock. Transcutaneous PO2 (PtO2) changes with PaO2 and FiO2 in non-shock states, but during shock, PtO2 reflects cardiac output with minimum response to increasing FiO2 and PaO2. This response to FiO2 of 1.0 is called the Oxygen Challenge test (OCT) and has been shown to predict organ failure and mortality. The OCT can also be used as an endpoint of resuscitation. The purpose of this study was to determine whether there is a numeric value of OCT which is best associated with outcome and validate or refute findings of previous studies. Methods: The OCT was measured in critically-ill patients at baseline and during care with minimum response to increasing FiO2 and PaO2. A small subset of data were used for training and validation, while the rest were used for testing. Results: Seventy-nine patients were studied. Demographics were: mean age 67 ± 16 yr, 49 males (62%), 30 females (38%), APACHE II 25.9 ± 7.8, Septic Shock/Severe Septis 49/77 (62%). Hemorrhagic Shock 21/79 (27%). Cardiac Failure 18/79 (24%). Respiratory Failure 60/79 (76%). Fifty-five (69.6%) of the 79 patients survived to discharge. An OCT value of 25 at 24 hr of resuscitation yielded a PPV of 83.9% and a NPV of 66.7%. Eighty-nine percent of survivors had an OCT ≥ 25 compared to 43% of non-survivors (p < 0.0001). Conclusions: Measurement of tissue perfusion can be valuable in critically-ill patients as a predictor of survival and an endpoint of resuscitation. An OCT value of 25 can be used as an indicator of adequate tissue perfusion and may be predictive of survival.

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AN AUTOMATED ALGORITHM FOR THE EARLY DETECTION OF HEMODYNAMIC INSTABILITY IN THE PICU

Cristhian Potes, Bryan Conroy, Minnan Xu, Larry Edelhman, Christopher Newth, Joseph Frassica

Learning Objectives: Early recognition and timely intervention are critical steps for the successful management of pediatric shock. However, early recognition of shock can be difficult and requires a high index of suspicion by the clinician. The aim of this study was to develop an algorithm that could assist bedside clinicians with the early detection of hemodynamic instability (shock) in the pediatric ICU (PICU). Methods: This study was done on a retrospective cohort of all patients admitted to a tertiary PICU at a single center. Patients were labeled as hemodynamically unstable (n=3970) if they received a fluid bolus (i.e., administration of colloid or crystalloid >10 ml/kg/hr), or blood transfusion (i.e., packed red blood cells >10 ml/kg over the course of 24hr), or any dosage of inotropic or vasopressor medications. Patients were labeled as hemodynamically stable (n=7213) if they did not receive any of the interventions mentioned above during the entire PICU stay. Electronic medical records (EMR) were obtained from an electronic flow sheet (Philips Care-Vue, Waltham, MA) and the PICU’s own database. A total of 58 features were extracted from the EMR and analyzed to predict (i.e., up to 6hr before) the occurrence of a hemodynamic instability event. A variant of AdaBoost was used to learn a set of low-dimensional classifiers, each of which was age-adjusted. A small subset of data were used for training and validation, while retrospective evaluation was performed on the entire database. Results: Among the 58 features initially included in the analysis, only 16 features were finally selected by AdaBoost. The best classification performance resulted in an area under ROC curve of 0.91, a sensitivity of 0.78, and a specificity of 0.88. Shock index was the most discriminative feature, and it was, by itself, a very good predictor of hemodynamic instability (area under ROC of 0.85). Conclusions: We proposed an algorithm for early detection of hemodynamic instability in PICU patients. This algorithm provides a risk score of hemodynamic instability, which can be of significant clinical value in busy PICU environments.

1011

LIPIDOMICS OF CRITICAL ILLNESS

Michael Maile, Theodore Standiford, Elizabeth Jewell, Charles Burant

Learning Objectives: A number of disease processes can result in critical illness. Interestingly, even when the inciting events are disparate, progression to multiple organ failure and death frequently appears remarkably similar. Metabolomics, by defining the metabolic fingerprint created by the underlying pathophysiology, may be helpful for identifying new biomarkers and novel therapeutic targets in this population. We hypothesized that changes in the plasma lipidome would be associated with mortality in a critically ill patient population. Methods: The plasma lipidome of 30 critically ill individuals was measured at two time points using liquid chromatography-mass spectrometry. Pooled samples and internal standards were also included. Compounds were identified by matching peaks in the resulting mass spectrum to known lipids in the LipidBlat database. Concentrations were normalized using internal standards and adjusted for batch effects using loess smoothing. Those with missing values, a relative standard deviation in the upper decile in the pooled samples, or a median concentration in the lowest decile were removed. Lipids that differed between survivors and non-survivors were identified using the multivariate empirical Bayes approach. This data reduction was performed with auto scaled values using MetaboAnalyst 3.0. Top features (those with the highest Hotelling-T2 values) were then compared using Student’s t-test and two-way analysis of variance using SAS 9.3. Results: Triacylglycerols (TGs) consisting primarily of polyunsaturated fatty acids accounted for ten of the twelve lipids that differed most between survivors and non-survivors. These TGs did not demonstrate a consistent and significant within-subject variation over time. However, survivors did have significantly higher levels of all ten of these compounds. Concentrations were between 2.44 and 4.09 times higher in the survivor cohort and p-values ranged from 0.0002 to <0.0001. Conclusions: Triacylglycerols with a high number of polyunsaturated fatty acids may be useful for predicting mortality in critically ill patients.

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AGREEMENT BETWEEN PERIPHERAL VENOUS, CENTRAL VENOUS, AND ARTERIAL LACTATE

Caleb Hsieh, Tristan Grogan, Nader Kamangar, Richard Tregear

Learning Objectives: Arterial lactate (a-lac) is considered the criterion standard for lactate determination, but arterial sampling is invasive and carries risks. Venous lactate values, especially peripheral venous lactate (pv-lac), have been considered less reliable; nonetheless their use in clinical practice has increased. The objective of this study was to examine agreement between pv-lac, central venous lactate (cv-lac), and a-lac values in a population of medical Intensive Care Unit (ICU) patients, with an emphasis on agreement at high lactate values (a-lac > 4
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VALIDATION OF THE VASOACTIVE INOTROPIC SCORE IN PEDIATRIC SEPSIS
Amanda McIntosh, Sarah Schmidt, Suhong Tong, Sara Deakyne, Jesse Davidson, Halden Scott

Learning Objectives: Pediatric sepsis is common and has significant associated morbidity and cost. Vasoactive and inotropic medications are often necessary for cardiovascular support. In infants undergoing cardiac surgery, the vasoactive inotropic score (VIS) correlates well with important clinical outcomes and is the standard scoring system for cardiovascular support in that population. Limited data exist to support the use of VIS outside of infant cardiac surgery. This study was performed to assess the validity of VIS as a scoring system for cardiovascular support in pediatric sepsis. Methods: This is a secondary analysis of a prospective, single-center sepsis registry. It included children with sepsis clinically identified in the emergency department from 1/12/6-15 who were treated with at least one vasoactive agent in the first 48 hr. VIS was abstracted at 6, 12, 24, and 48 hr post ICU admission. Primary outcomes were ventilator days and ICU length of stay (LOS). Secondary outcomes were endotracheal intubation and combined cardiac arrest/ECMO/in-hospital mortality. Results: A total of 139 patients met inclusion criteria. The most common underlying diagnoses were genetic/metabolic (21.6%) and previously healthy (23%) and the most common infectious sources were pneumonia (31.7%) and bacteremia (23%). One third were intubated during their stay and mortality was 5%. On univariate analysis, VIS at 48hr after PICU admission ranged from 0 to 45 and correlated most strongly with ICU LOS (r=0.53; p=0.0001) and ventilator days (r=0.52;p=0.0001). On multivariate analysis, VIS at 48hr remained a strong independent predictor of both ICU LOS (p=0.0001) and ventilator days (p=0.0001). Logistic regression demonstrated increased odds of intubation and combined ECMO, cardiac arrest, or death with each unit increase in VIS at 48hr (1.19, p=0.0005 and 1.08, p=0.05 respectively). Conclusions: This study suggests that a higher VIS score at 48hr from ICU admission in pediatric sepsis patients is a predictor for increased ICU LOS, ventilator days, and combined poor outcome.

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ABO BLOOD TYPE A AND INCREASED SEVERITY OF SEPSIS
Flani Kurtaa, Collette Williams, Andrew Wilson, Michael Murphy, Megan Rech

Learning Objectives: Blood type A has been linked to increased susceptibility of infection, inflammatory vascular disease, and most recently, risks of acute lung injury and ARDS in patients with severe sepsis. It is unknown if blood type A is associated with an increased risk of organ dysfunction secondary to septic shock. This study evaluated the progression through multi-organ failure secondary to sepsis in patients with blood type A compared to other blood types.

Methods: This is a retrospective cohort study conducted at an urban, academic tertiary care center. Patients 18 yr and older admitted between January 1, 2010 and March 1, 2014 with a diagnosis of sepsis and a documented blood type were included. The following points were collected: baseline demographics, severe sepsis or septic shock diagnosis, Acute Physiology and Chronic Health Evaluation II (APACHE II) score, comorbidities, sepsis source, serum lactate, hospital length of stay (LOS), and mortality. Sequential Organ Failure Assessment (SOFA) scores were assigned to groups on days 1 and 3. Univariate analysis with Chi-square, Fisher’s exact test, or t-test was performed. Multivariate regression analysis was conducted. Results: Of the 538 patients in this study, 303 had blood type A and 235 had non-A blood types. Baseline demographics and comorbidities were well matched between groups, with the exception of history of stroke (7.7% type A vs. 2.6%, other, p=0.007). Blood type A patients had higher baseline APACHE II scores (24.35 vs. 22.76, p=0.025), higher SOFA scores on day 3 (6.50 vs. 4.64, p <0.001), and less reduction in SOFA scores between day 1 and day 3 (1.81 vs. 3.38, p <0.001). No differences in LOS and in-hospital, 30-day, or 90-day mortality were observed. A multivariate analysis demonstrated that patients with blood type A had higher SOFA scores on day 3 (p=0.003) and that the absolute difference in SOFA scores between day 1 and 3 was lower in patients with blood type A (p=0.007). Conclusions: Patients with blood type A had higher severity of illness and delayed recovery from sepsis-induced organ failure when compared to other blood types.
and prognosis of ARDS in patients with sepsis. The goal of this study was to investigate whether changes in surfactant protein D (SPD) correlated with the clinical outcomes in patients with sepsis. Methods: This was a prospective cohort study between April 2014 and June 2015. SPD was measured in plasma samples obtained from 88 patients with sepsis at day 1, day 3, and day 7 in ICU. 52 patients were non pulmonary sepsis and 56 patients were pulmonary sepsis. 19 of 56 patients with pulmonary sepsis were developed to ARDS. Results: In sepsis patients, SPD levels increased over time. SPD levels were significantly higher in sepsis with lung injury than without lung injury (18.2 ± 3.2 vs 8.4 ± 2.2, p < 0.05). SPD levels at any time were higher in ARDS patients as compared to non ARDS patients with lung injury. SPD levels on day 1 and day 3 were significantly higher in ARDS patients than patients without lung injury, respectively (23.1 ± 4.1 vs 7.9 ± 2.2, p < 0.01, 45.8 ± 9.7 vs 21.9 ± 4.1, p = 0.03). Especially, SPD levels on day 3 were a significant predictor for the ICU mortality of patients with ARDS (adjusted Hazard ratio, 0.97; p = 0.02). Conclusions: All of serial SPD levels were significantly associated with ICU mortality in sepsis. Especially, SPD levels on day 3 were significant predictor for the ICU mortality of ARDS.

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CAN EARLY WARNING SCORES PREDICT MORTALITY OF ED SEPTIC PATIENTS? A COMPARISON OF VIEWS-L AND NEWS-L

Grahame Quan, Gerald Lebovic, Melissa McGowan, Sara Gray

Learning Objectives: Early Warning Scores (EWS) have been validated for identifying medical ward patients that may require escalation of care. This study sought to determine the best EWS that predicts mortality of septic patients in the ED to facilitate early aggressive treatment. We developed a novel NEWS-Lactate (NEWS-L) score that incorporated lactate into the National Early Warning Score (NEWS). We evaluated the performance of the Vitalpal Early Warning Score (ViEWS), ViEWS-Lactate (ViEWS-L), NEWS and NEWS-L in predicting in-hospital mortality in adult ED septic patients. Performance of these EWS was compared to the Acute Physiology and Chronic Health Evaluation II (APACHE II). Our hypothesis was that EWS would predict mortality as well as the APACHE II. Our secondary hypothesis was that including a lactate would improve the accuracy of EWS. Methods: Retrospective cohort study from (Jan 2012 - Mar 2014) of patients over age 18 yr admitted to the MSICU or step-up unit with an ED discharge diagnosis of sepsis. Lactate, ViEWS and NEWS scores were obtained in the ED. NEWS-L score was calculated from NEWS + Lactate. APACHE II scores were acquired after admission to MSICU or step-up unit. Score performance was assessed by comparison of receiver operating characteristic (ROC) curves. In-hospital mortality data were collected from the electronic medical record. Results: The ROC was 0.71 (CI 0.63–0.8), 0.66 (CI 0.57–0.74), 0.65 (CI 0.56–0.73), 0.63 (CI 0.54–0.71) and 0.61 (CI 0.52–0.70) for the APACHE II, ViEWS-L, NEWS-L, ViEWS and NEWS respectively, for predicting mortality on that admission. The ViEWS/ ViEWS-L and NEWS/NEWS-L did not predict in-hospital mortality as well as the APACHE II. Addition of lactate level improved the prediction performance of both the NEWS and ViEWS, although this difference was not significant. Conclusions: ViEWS/ ViEWS-L and NEWS/NEWS-L had moderate performance in predicting mortality and did not perform as well as APACHE II in our septic ED population. Inclusion of lactate improved the accuracy of the NEWS and ViEWS. These EWS should not yet be adopted into our ED given their limited accuracy.

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GLUCOCORTICOID RECEPTOR EXPRESSION IN PEDIATRIC SEPTIC SHOCK

Matthew Alder, Amy Opoka, Kimberly Hart, Christopher Lindsell, Hector Wong

Learning Objectives: The role of adjunctive corticosteroids in septic shock is controversial. While cortisol levels are considered clinically, little attention is paid to the glucocorticoid receptor (GCR). There is evidence of repression of GCR signaling pathway genes in septic shock. We measured GCR expression in white blood cells of patients with septic shock to test the hypothesis that dysregulated GCR expression is associated with shock severity. Methods: We enrolled healthy controls, patients with SIRS or sepsis (combined as ICU controls) and subjects with septic shock. Monocytes, neutrophils and lymphocytes were isolated for flow cytometric quantitation of intracellular glucocorticoid, as indicated by the mean fluorescence intensity (MFI). We used one way ANOVA to test for differences in GCR expression between groups. Using regression models we calculated an “expected” GCR MFI for each patient based on the corresponding cortisol level. Residuals (measured MFI – expected MFI) served as a measure of GCR-cortisol “uncoupling”. We used vasopressor free days as a measure of shock severity (28 days – actual vasopressor days). Results: GCR expression was less in patients with septic shock (n = 34), compared to healthy controls (n = 51; p < 0.05), across all cell types. GCR expression among ICU controls (n = 18) did not differ to GCR expression among septic shock patients in any cell type. PRISM score was independently associated with vasopressor free days, and there was a trend toward an independent association between GCR uncoupling and vasopressor free days in monocytes (p=0.07) and neutrophils (p=0.08). Specifically, a higher than expected “uncoupling” of GCR MFI was associated with decreased vasopressor free days. Conclusions: GCR expression decreases with critical illness, but was not different between ICU controls and septic shock patients. Some patients with septic shock seem to have “uncoupling” of the receptor-ligand dynamic and there is a trend toward an association between a greater degree of uncoupling and shock severity. This association warrants further exploration with a larger cohort.

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EFFICACY OF RECOMBINANT THROMBOMODULIN AND ANTITHROMBIN COMBINATION THERAPY IN SEPSIS-INDUCED DIC

Hiroyuki Takahashi, Keitchi Kuriyama, Kazuhide Yoshikawa, Yuzuru Ueki, Masateru Takahashi, Eiji Iseotani

Learning Objectives: Although recombinant human soluble thrombomodulin (rTM) and antithrombin III (AT) products are the most recommended drug for the treatment of sepsis-induced disseminated intravascular coagulation (DIC) in Japan, it is not uncertain about the efficacy of rTM and AT combination therapy. We conducted a single center, retrospective cohort study to compare the efficacy of rTM and AT combination therapy with that of AT monotherapy for sepsis-induced DIC. Methods: From October 2013 to September 2014, a total of 65 patients with sepsis-induced DIC were registered. DIC was diagnosed based on the Japanese Association for Acute Medicine (JAAM) criteria. When JAAM criteria’s DIC score was 4 or more, AT products was administered if AT activity was less than 70%, and rTM was administered if there was no significant bleeding or risk of bleeding. The DIC secession rate within 7 days and in-hospital survival rate were evaluated. Qualitative or categorical variables were compared by χ² or Fisher’s exact test, when appropriate. Quantitative continuous variables were compared by Mann-Whitney nonparametric test, when appropriate. The level of significance was set at 0.05. Ethical approval was granted by the Tokyo Women’s Medical University Ethics Committee. Results: The patients were divided into two groups: 32 patients received AT products only (AT monotherapy group), and 33 patients received rTM and AT products (combination group). Baseline characteristics, including APACHE II, DIC score, AT activity, were similar between AT monotherapy group and combination group. Age was younger, and SOFA score was higher in AT monotherapy group. The DIC resolution rate within 7 days was significantly better in the combination group (25.9% versus 67.7%, p = 0.001). The in-hospital survival rate was also significantly better in the combination group (40.6% versus 73%, p = 0.009). Conclusions: Our results suggest that the rTM and AT combination therapy is the effective treatment for sepsis-induced DIC.

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GFR IN CONSCIOUS MICE AFTER SEPSIS: ROLE OF TUBULOGLomerULAR FEEDBACK

Jonathan Street, Deonna Glispie, Yuning Huang, Peter Yuen, Robert Star

Learning Objectives: Under physiological conditions, glomerular filtration produces a large volume of filtrate that is reabsorbed by the renal tubules
in an energy intensive process. During sepsis, the metabolic capacity of the tubules may be impaired limiting reabsorption. To prevent renal salt wasting during sepsis it is postulated that the glomerular filtration rate (GFR) is reduced via activation of tubuloglomerular feedback (TGF). Reduced GFR limits the metabolic demand on the tubules and may prevent damage, termed “acute renal success”. Mice without TGF should maintain higher levels of GFR. In conscious mice we detected early changes in GFR using a novel transcutaneous measurement of a fluorescent filtration marker. Because adenosine 1a receptor (A1aR) signaling is required for TGF we directly measured GFR following sepsis in A1aR knockout mice. Methods: Cecal ligation and puncture was used as a model of sepsis in A1aR knockout and littermate control mice. GFR was monitored in conscious mice for 5 hr by plasma disappearance of FITC-Sinistrin, and its transcutaneous fluorescence measured by a miniaturized fluorimeter attached to the mouse back. Results: Following CLP surgery, GFR based on transcutaneous fluorescence closely matched direct plasma measurements. In control WT mice, GFR was stable and similar to baseline during the first hour following induction of sepsis. GFR slowly declined over hour two, and then fell rapidly to <10% of normal and remained low. In contrast, in A1aR KO mice the GFR was lower than baseline, and WT (p=0.02) immediately following CLP. GFR then fell gradually to 27% of normal, with a smaller decrease observed after 2 hr compared to WT mice (p=0.03). The absence of A1aR did not appear to alter markers of damage to other organs. Conclusions: In the absence of A1aR, unexpectedly, GFR begins to decrease earlier after CLP surgery. The sudden decrease in GFR in WT mice at 2 hr after induction of sepsis occurs in WT but not in A1aR KO mice. Tubuloglomerular feedback modestly supports, not suppresses, GFR in the first hour following sepsis, and only later acts to suppress GFR.

1021 SIZE OF SEPSIS IN WALES: A NATIONWIDE POINT-PREVALENCE STUDY
Tamas Szakmany, Gemma Ellis, Ben Sharif, Robert Lundin, Paul Morgan, Judith Hall

Learning Objectives: The incidence of sepsis on the general wards is unknown in Wales, whilst sepsis accounts for 30% of all admissions to the ICUs. The adoption of the National Early Warning Score and the Sepsis Screening Tool to all Welsh hospitals makes it possible to estimate the prevalence of the condition. We have recently reported the results of our feasibility pilot from four hospitals and based on this successful methodology we rolled out our study to all acute hospitals in Wales (1). Methods: We conducted a point prevalence study in the 16 Welsh hospitals serving a population of 3 million people. Inclusion criteria: On the 17/06/2015 from 0800 to 0759 the next day, consecutive patients presenting to the emergency department (ED) and hospital wards with sepsis related admission were enrolled. Patient were aged over 18, consecutively patients presenting to the emergency department (ED) and hospital wards with sepsis related admission were enrolled. Patient were aged over 18, and exclusion criteria was patients admitted or transferred to either the ED or hospital ward and had a National Learning Objectives: The presence of sepsis and severe sepsis is high on the general wards and highly unrecognised by ward staff. As a result, despite continued national effort, the delivery of the simple and effective Sepsis 6 treatment is lacking. Reference: 1. Szakmany T et al. Br J Anaesth 2015;114:1000–1001

1022 TEN-YEAR TRENDS IN SEPTIC SHOCK INCIDENCE AND MORTALITY USING A CLINICAL SURVEILLANCE ALGORITHM
Chami Rhee, Sameer Kadri, Jeffrey Strich, Megan Morales, Samuel Hohmann, Anthony Suffredini, Robert Danzer, Michael Klompan

Learning Objectives: Analyses of hospital discharge codes suggest that the incidence of septic shock has risen and mortality rates have fallen. However, changes in coding practices over time may be confounding these estimates. We sought more reliable estimates of septic shock burden by focusing on clinical indicators rather than claims. Methods: Trends in annual incidence and hospital mortality of septic shock were estimated at 18 academic medical centers in the University Health System Consortium clinical database from 2005–2014 using an algorithm that flags patients receiving vasopressors for ≥2 consecutive days (or for 1 day if death occurred that day) and orders (within ≥2 days of vasopressor initiation) for both blood cultures and antimicrobials (continued for ≥5 days or until ≤1 day prior to death or discharge). We compared trends with those obtained using the ICD-9 code for septic shock (785.52). Results: Over the 10-year period, there were 4.4 million adult hospitalizations at the 18 hospitals; the clinical algorithm flagged 60,574 (1.4%) cases of septic shock, ICD-9 codes flagged 45,690 (1.0%), and 28,083 (0.6%) hospitalizations were flagged by both methods. The annual incidence of septic shock per 1000 hospitalizations using the clinical algorithm rose from 12 in 2005 to 16 in 2014 (3.5%/yr, 95% CI 3.0, 4.0%) and mortality declined from 57% to 51% (0.5%/yr, 95% CI -0.4, -0.6%). In comparison, the incidence using ICD-9 code 785.52 increased from 6 to 16 (18%/yr, 95% CI 17, 20%) and mortality declined from 53% to 43% (1.2%/yr, 95% CI -1.0, -1.3%) (p<0.01 for comparison of both incidence and mortality trends between the clinical algorithm and ICD-9 codes). Conclusions: A 10-year trend analysis based on a clinical surveillance algorithm suggests that the incidence of septic shock has risen and mortality rates fallen much less than previously estimated using an ICD-9 claims-based approach. The basis for these major differences merits further investigation.
Previously undescribed anti-inflammatory properties, perhaps via a sustained increase in IL-10 levels.

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SENSITIVE AND SPECIFIC DIAGNOSIS OF SEPSIS IN CRITICALLY ILL CHILDREN UTILIZING HOST GENE EXPRESSION
Jerry Zimmerman, Erin Sullivan, Dayle Sampson, Leo McHugh, Thomas Yager, Therese Seldon

Learning Objectives: Biomarker facilitated sepsis diagnosis is needed given specificity limitations of clinical diagnostics. Sepsis-mediated host immune gene expression may represent a novel diagnostic approach. An RT-qPCR-based test, SeptiCyte® Lab, that quantifies expression levels of 4 genes involved in the septic host response, has been validated for septic adults. Herein we report the first investigation of SeptiCyte® Lab in a pediatric critical care setting. Methods: We conducted an IRB-approved, prospective, observational study enrolling 12 children undergoing CPB surgery to repair congenital heart disease (CHD; infection negative) and 28 children with clinical severe sepsis (CSS; 16 culture+, 12 culture–). Septic children had confirmed/suspected infection (microbial culture orders, antimicrobial prescription), exhibited SIRS criteria, and demonstrated cardiovascular ± pulmonary organ dysfunction. Immune competent and incompetent patients were included in the sepsis cohort. Demographic and admission illness severity data were collected. Next-generation sequencing (Illumina Mi-Seq) and RT-qPCR were used to analyze the transcriptome from peripheral blood collected at PICU admission. Results: CHD/CSS descriptive data included age: 8.0 ± 6.29 years, gender: 420% male; PRISM III: 6.2 ± 5.07; PELOD: 5.0 ± 2.9; SeptiCyte® Lab gene expression biomarkers strongly differentiated CHD and CSS patients (AUC 0.955; 95% CI: 0.88–1.00). SeptiCyte® Lab performance was similar when the samples were reanalyzed using RT-qPCR. There was no correlation (R2=0.01) between the SeptiCyte® Lab score and PRISM score, indicating that information provided by SeptiCyte® Lab is independent of illness severity, but instead reflects the probability of sepsis. Conclusions: Our pilot investigation of SeptiCyte® Lab in a pediatric critical care setting demonstrates that this adult-derived gene signature may also facilitate diagnosis of sepsis in critically ill children. A broader investigation of the performance of the test among children with more heterogeneous care settings and infection diagnoses is warranted.

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SIMULATION TRAINING IMPROVES RESIDENTS' KNOWLEDGE AND ADHERENCE TO THE SURVIVING SEPSIS GUIDELINES
Amy Coan, Anish DeSai, Sonya Gadhrvi, Zach Milligan, Jared Kurzin, Peter Spiegel, Shalinee Chawla, Joseph Mathew

Learning Objectives: Sepsis is a significant cause of morbidity and mortality in the U.S. The aim of this study was to determine if simulation training (ST) is effective in improving residents’ knowledge and adherence to the 2012 Surviving Sepsis Campaign (SSC) guidelines. Methods: We conducted a prospective, observational, repeated measures study of a simulation-based educational intervention for Internal Medicine residents at Winthrop-University Hospital (WUH). All residents received standard didactic lectures on sepsis, as per residency and institutional curriculum. Participants completed a pre-intervention questionnaire to assess baseline knowledge of diagnosis and management of severe sepsis/septic shock. Groups of 3–4 residents then underwent an educational intervention which involved a case-based simulation exercise (Simulation 1) using a high-fidelity manikin (SimMan 3G, Laerdal) followed by debriefing. Residents returned one month later for a post-intervention questionnaire to assess baseline knowledge of diagnosis and management of severe sepsis/septic shock. ST should be added to traditional training to teach SSC guidelines.

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THE ASSOCIATION BETWEEN WEEKEND EFFECT AND EARLY MORTALITY IN SEVERE SEPSIS PATIENTS OVER TIME
Yu-Ning Shih, Yung-Tai Chen, Raghu Seethala, Imo Asiklu, Gyorgy Freundl, Peter Hou

Learning Objectives: In 2001, Bell et al concluded that patients with some serious medical conditions are more likely to die in the hospital if they are admitted on a weekend than if they are admitted on a weekday. This is described as the "weekend effect". However, the study did not examine the association between "weekend effect" and the short-term mortality of severe sepsis patients. Hence, the aim of this study was to investigate the "weekend effect" on the severe sepsis patients. Methods: Using Taiwanese National Healthcare Insurance Research Database, we identified all patients who were for the first time hospitalized for severe sepsis between January 2000 and December 2011. Using Cox proportional hazard model, short-term mortality of patients admitted on weekdays and those admitted on weekends were compared yearly and over the study time period. Results: A total of 398,043 of patient were identified. Compared with patients admitted on weekends, patients admitted on weekdays had a lower mortality rate: 7-days (HR 0.90, 95% CI 0.89–0.92), 14-days (HR 0.92, 95% CI 0.91–0.94), and 28-days (HR 0.96, 95% CI 0.95–0.97) over the study time period. Within each year, the weekend effect was maintained. In an exploratory analysis, patients who were admitted on Saturday had a lower mortality rate compared with those admitted on Sunday (HR 0.95, 95% CI 0.92–0.98). Conclusions: Patients with severe sepsis are more likely to die in the hospital if they were admitted on weekends than if they were admitted on weekdays.

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ASSOCIATION BETWEEN INTRAVENOUS FLUID CHLORIDE CONTENT AND ACUTE KIDNEY INJURY IN ADULTS WITH SEPSIS
Megan Perry, Naeem Ali, Kari Mount, Lindsay Ryder, Claire Murphy, Gary Phillips, Bruce Doepker

Learning Objectives: Early and adequate fluid resuscitation improves outcomes in patients with severe sepsis and septic shock. Recent shortages of normal saline and concerns about adverse effects associated with the administration of this fluid have led to the use of more balanced fluids, such as Lactated Ringers and Electrolyte A. Recent studies have demonstrated that fluids with supraphysiologic chloride concentrations may be associated with the development of hyperchloremic metabolic acidosis, acute kidney injury (AKI), and an increased risk of mortality. Methods: A single center, retrospective, cohort study was performed to compare the incidence of AKI according to the RIFLE criteria: patients had severe sepsis or septic shock and received primarily high-chloride or low-chloride fluids during the acute resuscitation period. Additional secondary outcomes include the differences between the individual components of the RIFLE criteria and need for renal replacement therapy (RRT). Results: A total of 181 patients were included in the study (139 high-chloride and 42 low-chloride) all of whom were admitted to the medical ICU with a diagnosis of severe sepsis or septic shock. Patients in the high-chloride group received a statistically higher percentage of total fluids as normal saline, 88.5% vs 22.9%, p < 0.001; while patients in the low-chloride group received a higher percentage of low-chloride fluids, 77.1% vs. 11%, p < 0.001. The total amount of chloride administered was significantly higher in the high-chloride group (8793mEq vs 232mEq, p < 0.001). No statistical difference was observed in
the incidence of AKI between the groups (25.9% high-chloride vs 16.7% low-chloride, p=0.401). When the individual components of RIFLE criteria were examined, there were no differences in the rates of risk, injury, failure or the use of RRT between groups. 

Conclusions: A multicenter, prospective, randomized, controlled trial is needed to definitively establish the relationship between the composition of intravascular fluids and the risk of AKI.

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NON-INVASIVE PREVENTATIVE AND THERAPEUTIC APPROACH TO REDUCE MORTALITY FROM SEPSIS
Jose Adams, Arkady Uryash, Jose Lopez, Marvin Sackner

Learning Objectives: Sepsis is a leading cause of death. It is usually managed by supportive therapies that include antibiotics, fluid replacement, corticosteroids and mechanical ventilation. Sepsis disrupts the endothelial barrier, reduces microcirculation, and produces an intense inflammatory response. Since 1960s, all targeted clinical trials have failed to significantly alter sepsis mortality. LPS disrupts endothelial barrier and provokes intense inflammation. Increased endothelial nitric oxide, prostacyclin, SIRT1 and adiponectin stabilize endothelial cellular junctions and are anti-inflammatory. These mediators are increased by pulsatile shear stress (PSS) to the endothelium that occurs when the horizontal-positioned, body is placed on a rapidly moving, motorized platform [whole body periodic acceleration (pGz)]. We hypothesized that treatment with this non-invasive technology would reduce mortality in mice given a lethal dose of LPS.

Methods: Mice (n=52) were divided: pGz (n=18) treated one hour daily for three days and non pGz treated CONT (n=18). All animals received LPS 40 mg/kg i.p. and were followed with video monitoring every 20 seconds until termination of the study at 48 hr. A physiological/behavioral scoring system was used (0=normal 32=death) and scored every 30 min. In two additional groups, NO synthase blockade (L-NAME) was administered orally for 7 days prior to LPS, e.g. L-NAME-pGz (n=8) and L-NAME-CONT (n=8). Results: 11 of the 18 pGz survived (61%) whereas none of the 18 CONT (0%) survived 48 hr (p<0.0001) L-NAME completely blocked pGz effect on survival. Physiological and behavioral scores differed between pGz and CONT beginning at 8 hr after LPS. At 8 and 16 hr after LPS, physiological/behavioral scores were 19.9 ± 2.0 and 22.1 ± 6.0 for pGz and 22.3 ± 3.2 and 28.2 ± 3.9 for CONT. ([mean ± SD], p<0.01 pGz vs. CONT). Conclusions: NO is critical to survival in LPS induced sepsis. pGz administration prior to LPS significantly improved survival and was NO dependent. pGz is the first noninvasive therapeutic intervention to unequivocally improve survival in a lethal LPS mouse model of sepsis.

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THE COMPARATIVE EPIDEMIOLOGY OF PEDIATRIC SEVERE SEPSIS
Kimberly Meredith, Margaret Olsen, Mary Hartman

Learning Objectives: While administrative databases are used to study pediatric severe sepsis, it is unclear if the cases identified are clinically relevant. It is also unclear how the results of one study compare to another. To address this, we investigated 1) the accuracy of 4 ICD-9-CM code based strategies in identifying pediatric severe sepsis by comparing each to a cohort of patients diagnosed via strict clinical criteria, and 2) the precision of each strategy by comparing the 4 cohorts.

Methods: We used the 2005–2012 NY and FL State Inpatient Databases from the Healthcare Cost and Utilization Project. Cohorts were identified by combinations of ICD-9-CM codes for infection and organ dysfunction per published criteria of 1) Angus, et al. or 2) Martin, et al. or the presence of single ICD-9-CM codes for 3) severe sepsis or 4) septic shock. Demographics, 14-day, 28-day, and in-hospital mortality were compared between cohorts and to patients enrolled in the RESOLVE trial, a large international RCT investigating pediatric severe sepsis.

Results: A total of 25,255 patients were identified by the 4 methods. The Angus cohort had 9.2 fold more patients than the septic shock cohort. Only 7.7% of patients were identified by all 4 methods. The RESOLVE cohort had significantly more organ dysfunction than the 4 ICD-9-CM cohorts (p<0.05 for each comparison). In-hospital, 14-day, and 28-day mortality were similar between the RESOLVE trial, septic shock and severe sepsis cohorts (p=NS), and was 10 times higher in these groups than in the Angus and Martin cohorts (p<0.001). One year mortality in the single code cohorts was 2 times higher than in the combination code cohorts (p<0.001). Conclusions: The single code cohorts identified patients at higher risk of mortality at all study time points. The single code cohorts were most similar to patients in the RESOLVE trial, while children identified by the Angus and Martin methods were the least similar. More research is still needed to understand how severe sepsis cohorts identified via ICD-9-CM code strategies do and do not compare to patients identified by clinical methods.

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BIOMARKERS IN PEDIATRIC SEPSIS: MMP-9, TIMP-1, MRPROANP, AND ADIPOCYTE FATTY-ACID BINDING PROTEIN
Michael Aqlahtani, Susan Dawson, Hantamalala Raay Ranaivo, Craig Smith, Scott Weiss, Mark Wainwright

Learning Objectives: Increased plasma concentrations of matrix metalloproteinase-9 (MMP-9), tissue inhibitor of metalloproteinase-1 (TIMP-1), mid-regional pro-atrial natriuretic peptide (mrProANP), and adipocyte fatty-acid-binding proteins (A-FaBP) have been investigated as biomarkers for sepsis or detection of acute neurologic injuries in adults. The purpose of study was to determine if these measures could serve as clinically-useful biomarkers for children with sepsis. Methods: This is a prospective, observational study in a PICU at an academic medical center. Patients sample included a 90 patients ± 18 yr-old (30 with severe sepsis or septic shock compared to 30 age-matched febrile and 30 age-matched healthy controls). Biomarkers were measured daily for 7 days for septic patients and once for controls. Results: MMP-9/TIMP-1 ratios (Median, IQR, n) were reduced on day 1 (0.024, 0.004–0.174, 13), day 2 (0.020, 0.002–0.109, 10), and day 3 (0.018, 0.003–0.058, 23) compared with febrile (0.705, 0.187–1.778, 22) and healthy controls (0.7, 0.4–1.2, 29) (p<0.05). A-FaBP and mrProANP were elevated in septic patients compared to control groups on first 3 days after admission to the PICU (p<0.05); A-FaBP levels for septic patients (20, 13.3–34.6, 22) were elevated compared to febrile (12.9, 11–22.1, 14) and healthy controls (11.9, 11.2–14.9, 14), (p<0.05). MrProANP levels for septic patients (193, 67.2–365.6, 21) were increased compared to healthy controls (28.3, 11.6–32.511), but not compared to the febrile group (78.7, 40.8–90.4, 9). MMP-9/TIMP-1 ratio was inversely and mrProANP was directly related to PIM-2, PELOD, and LOS (p<0.05). MMP-9/TIMP-1 was weakly associated with poor GOS (p>0.05). There was no association between any biomarker and the presence of neurologic dysfunction on admission as well as CNS injuries. Conclusions: MMP-9/TIMP-1 ratios were significantly lower, while A-FaBP and mrProANP were higher in septic patients compared to the control groups. All biomarkers had promising ability to detect sepsis in pediatric as well as to predict hospital morbidity, mortality, and length of stay.

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SPECKLE TRACKING STRAIN ECHOCARDIOGRAPHY: A METRIC OF CARDIAC DYSFUNCTION IN A RODENT SEPSIS MODEL
Berkeeteab Haileselassie, Erik Su, Iraklis Pozios, Renee Willett, Theodore Abraham

Learning Objectives: In the progression of severe sepsis, sepsis-induced myocardial dysfunction (SIMD) contributes to illness severity and mortality. Thus early identification of SIMD potentially has implications for ongoing patient management. However, common measures of cardiac function such as fractional shortening (FS) and ejection fraction (EF) have limited utility in detecting subtle changes in cardiac performance. This study evaluates speckle tracking strain echocardiography (SE) as an index of cardiac function in a murine sepsis model.

Methods: 35 C57BL/6J mice were randomized to: control (n=7), sham (n=8) and a cecal ligation and puncture (CLP) model of animal sepsis with volume resuscitation (n=20). Mice were subject to ultrasound evaluation (Vivid 7, General Electric, Norway) prior to surgery as well as at 24 and 48 hr following injury. SE analysis was performed with post-processing software (EchoPac, General Electric, Norway). Progression of cardiac dysfunction following CLP was evaluated using T-test or Wilcoxon rank-sum test depending on distribution of variables. SE association with mortality was evaluated using logistic regression. Results are...
reported as mean ± standard deviation. Results: Septic mice demonstrated a significant depression in global longitudinal strain (GLS) (pre = −18.9% ± 2.9% vs. 24 hr post = −15.5% ± 4.3%, p = 0.006) as well as circumferential strain (GCS) (pre = −28.9% ± 5.4% vs. 24 hr post = −22.9% ± 6.3%, p < 0.01). 24 hr following CLP. These changes in SE parameters appeared earlier than changes in EF (pre = 0.6 ± 0.114 vs. 24 hr post = 0.59 ± 0.106, p = 0.72). A multivariable logistic regression model demonstrated significant association between mortality and depressed GLS at 24 hr (survival OR = 0.72, 95% CI = 0.52–0.99, p = 0.04). Additionally, depressed GCS at 24 hr demonstrated a tendency towards significant association with mortality (survival OR = 0.84, 95% CI = 0.07–1.01, p = 0.07). Conclusions: SE reveals early cardiac dysfunction before EF in a murine model of sepsis. SE could prove useful in the early evaluation of SIMD in septic patients.

1032 IMPACT OF SEPSIS ALERT PROCESS IN IMPROVING CLINICAL OUTCOMES
Faisal Sudilique, Tomer Pelleg, Susanri Le

Learning Objectives: The use of sepsis alert process was recently introduced at our tertiary care referral center. In this prospective cohort study we analyzed the impact of a “sepsis alert system” in improving clinical outcomes. Methods: Patients who satisfied the criteria for “Sepsis Alert” were stratified according to mortality, time to antibiotics administration and hospital lengths of stay. These outcome metrics were evaluated for a 4 month period directly preceding implementation of the “Sepsis Alert” system and compared to the 2 mo following this implementation. Patients discharged from the hospital between November 2014 and May 2015 with the primary diagnosis code of Severe Sepsis and Septic Shock were included in this study. Results: In the pre-alert period, 246 patients; in the post-alert period 139 patients met the inclusion criteria. Only 63 patients (41% of those included) actually underwent “sepsis alert” process. In the pre-alert period there were 61 in-hospital mortalities (24.8%) compared with 32 in the post-alert time period (23%), a p-value of 0.391. In the subset of alerted patients, there were 13 mortalities (20.6%). The average time to first antibiotic in the pre-alert time frame was 4.14 hr. The time to first antibiotic in the patients with a sepsis alert was 1.69 hr (p-value of 0.001266), though the time to first antibiotic in non-alerted patients was 7.14 hr (p-value of 0.000581). The overall hospital length of stay (LOS) was 10.14 days in the pre-alert group as compared with 8.83 days in the alerted group (p-value 0.13) and 11.8 days in the non-alerted group (p-value 0.075). Conclusions: Although sepsis alert system failed to show a statistically significant mortality benefit, there was a statistically significant decrease in time to first antibiotic as well as a noted trend of shorter hospital length of stay when this alert system was employed.

1033 IS INITIAL LACTATE A RELIABLE PREDICTOR OF OUTCOME IN PEDIATRIC SEVERE SEPSIS AND SEPTIC SHOCK?
Noelle Gongco, Cynthia Fontana, Jeanette Asselin, Robert Heidersbach, Heidi Fior, Shan Ward

Learning Objectives: Hyperlactemia, a marker for tissue hypoxia and anaerobic metabolism often elevated in shock, is complex and not well understood. In critically ill adults, high lactate is prognostic for increased morbidity and mortality. Few studies have assessed the association between mortality and initial lactate in critically ill patients, but cause hyperglycemia. Despite limited evidence, the Surviving Sepsis Campaign guidelines recommend continuous infusion (CI) hydrocortisone to minimize associated hyperglycemia. The purpose of this study was to compare hydrocortisone CI versus bolus dose (BD) to determine if there was a difference in glycemic control and variability. Methods: This single-center, retrospective, matched study evaluated critically ill adults who received CI or BD hydrocortisone. Subjects were matched on history of type 2 diabetes and ICU. To provide 80% power to detect a 5% difference in mean BG with an alpha < 0.05, 100 subjects per group were needed. Exclusion criteria were pregnancy, type 1 diabetes, or missing blood glucose (BG) levels. The primary endpoint was difference in mean BG levels and insulin requirements. Secondary endpoints included: variability in BG levels, mortality, ICU and hospital length of stay, type and route of insulin administered, and hypoglycemia (BG <60mg/dl). Results: From 75 subjects screened for the CI group, 52 subjects met inclusion criteria and were

1034 HYPOFIBRINOGENEMIA IS ASSOCIATED WITH POOR OUTCOME AND SECONDARY HLH IN PEDIATRIC SEVERE SEPSIS
Jessica Signoff, Julie Fitzgerald, David Teachey, Fran Balamuth, Scott Weiss

Learning Objectives: Hypofibrinogenemia is a shared feature of sepsis and hemophagocytic lymphohistiocytosis (HLH) but there are no data about using fibrinogen to identify children with sepsis/HLH overlap, a condition previously shown to benefit from immunomodulatory therapies. We hypothesized that hypofibrinogenemia was associated with persistent organ dysfunction, mortality, and secondary HLH (sHLH). Methods: We conducted a retrospective cohort study of children ≤21 yr treated for severe sepsis with measured fibrinogen in an academic PICU from Jan 2012 to Dec 2014. Consecutive patients with ≥1 episode of hypofibrinogenemia (fibrinogen <150mg/dL) within 7 days of sepsis onset (exposed) were compared to a random sample of patients without hypofibrinogenemia (unexposed) using an a priori sample size target of 200. The primary outcome was “complicated course”, a validated composite of 28 day mortality or persistence of ≥2 organ failures at 7 days. Secondary outcomes were 28 day mortality and fulfillment of diagnostic criteria for sHLH. We used Wilcoxon rank-sum, Fisher’s exact test, and multivariable logistic regression to compare patients with and without hypofibrinogenemia. Results: Thirty-eight patients with hypofibrinogenemia were compared to 154 without hypofibrinogenemia. Patients with hypofibrinogenemia were younger (median [IQR] 7.7 [1.2–10.5] vs 7.9 [2.0–14.3] yr, p = 0.05) and more likely to have GI/hepatic comorbidities (13 vs 1%, p = 0.004). Patients with hypofibrinogenemia were more likely to have a complicated course (74 vs 59%, p = 0.001), 28 day mortality (26 vs 11%, p = 0.002), and meet diagnostic criteria for sHLH (21 vs 2%, p = 0.001). After controlling for age, race, GI/hepatic comorbidity, and site of infection, hypofibrinogenemia remained associated with complicated course (aOR 10.5, 95%CI 3.8,28.9,3), mortality (aOR 8.9, 95%CI 2.5,31.6), and sHLH (aOR 21.3, 95%CI 4.1,111). Conclusions: Hypofibrinogenemia was independently associated with poor outcome and sHLH in pediatric sepsis. Hypofibrinogenemia may help to identify children with severe sepsis/HLH overlap for adjunctive immunomodulatory therapies.

1035 IMPACT OF HYDROCORTISONE CONTINUOUS INFUSION VERSUS BOLUS DOSE ON GLYCEMIC CONTROL
Laura Zane, April Quidley, Christy Forehand

Learning Objectives: Corticosteroids are used for adrenal insufficiency in critically ill patients, but cause hyperglycemia. Despite limited evidence, the Surviving Sepsis Campaign guidelines recommend continuous infusion (CI) hydrocortisone to minimize associated hyperglycemia. The purpose of this study was to compare hydrocortisone CI versus bolus dose (BD) to determine if there was a difference in glycemic control and variability. Methods: This single-center, retrospective, matched study evaluated critically ill adults who received CI or BD hydrocortisone. Subjects were matched on history of type 2 diabetes and ICU. To provide 80% power to detect a 5% difference in mean BG with an alpha < 0.05, 100 subjects per group were needed. Exclusion criteria were pregnancy, type 1 diabetes, or missing blood glucose (BG) levels. The primary endpoint was difference in mean BG levels and insulin requirements. Secondary endpoints included: variability in BG levels, mortality, ICU and hospital length of stay, type and route of insulin administered, and hypoglycemia (BG <60mg/dl). Results: From 75 subjects screened for the CI group, 52 subjects met inclusion criteria and were
matched with 52 subjects who received BD. Baseline BG and insulin use were similar 183.8 ± 94.4 vs. 174.4 ± 150.0 mg/dL and 27.2 ± 67.5 vs. 10.4 ± 25.6 units in the CI and BD groups respectively. No difference in mean BG was observed 141.3 ± 47.1 vs. 144.5 ± 53.6 mg/dL (p=0.7471) in the CI and BD groups. The CI group had higher mean insulin requirements 48.5 ± 69.9 vs. 25.6 ± 47.2 units (p=0.0530). BG variability and hypoglycemia were similar between groups 25.6 ± 12.4 vs. 25.9 ± 13.8% (p=0.9074) and 9 vs. 7 events (p=0.6203) in the CI and BD groups. There was no difference in mortality, length of stay or type of insulin.

Conclusions: Results suggest no benefit of CI over BD. Study limitations include small sample size, large standard deviation and selection bias in the CI group as evidenced by trends in baseline insulin requirements. Despite limitation, the study institution recommends BD to avoid logistical complications associated with CI.

1036
DIFFERENT SEVERITY OF SHOCK MODELS IN PORCINE INDUCED BY DIFFERENT DOSES OF LPS
Hui Xiang, Zhiyong Peng

Learning Objectives: There is no study to elucidate the different severity of endotoxemia porcine model induced by the different dose of LPS. This research intends to produce different severity of endotoxemia models in porcine and to provide reliable and clinically applicable shock models for different purposes.

Methods: Twenty four Bama suckling pigs under anesthesia and mechanic ventilation were randomly assigned to control group (infusion of normal saline), the small dose of Escherichia coli LPS group (S) (5µg/kg, i.v.), the middle dose of LPS group (M) (10µg/kg, i.v.) and the large dose of LPS group (L) (20µg/kg, i.v.). Mean arterial pressure (MAP), serum lactates were recorded and sublingual mucosa microcirculation was monitored with side stream dark field (SDF). Proportion of perfused vessels (PPV) were given by the SDF. Data was collected at the beginning (T0) and 90 min after (T1). Analysis of variance (ANOVA) with repeated measures was performed to compare hemodynamic variables with Bonferroni correction. Results: The MAP of endotoxemia group at T1 was significantly lower than T0 (group S 82.67 ± 3.45 versus 102.5 ± 6.47, group M 77.17 ± 5.27 versus 104.17 ± 3.43, group L 61.17 ± 5.67 versus 104.67 ± 8.69, P < 0.01, respectively). Meanwhile, the serum lactates of endotoxemia group at T1 was significantly higher than T0 (1.23 ± 0.10 versus 0.83 ± 0.10, 1.50 ± 0.09 versus 0.85 ± 0.10, 2.05 ± 0.11 versus 0.83 ± 0.15, P < 0.01, respectively). The proportion of perfused vessels (PPV) of endotoxemia group at T1 was significantly lower than T0 (64.86 ± 4.08 versus 100, 55.44 ± 3.60 versus 100, 46.40 ± 4.45 versus 100, %, P < 0.01, respectively). However, there is no difference between the MAP, serum lactates and PPV in the control group. Conclusions: These results demonstrate that LPS produced dose-dependent changes of hemodynamics, serum lactates and microcirculation. Different severity of shock models in porcine could be induced by different doses of LPS.

1037
USING VITALS AND A SINGLE BLOOD BIOMARKER TO PREDICT DISEASE TIME ZERO IN ANIMAL MODELS OF SEPSIS
Li Ang Zhang, Ipsita Banerjee, David Swigon, Robert Parker, Soheyl Bavrami, Heinz Redl, Gilles Clermont

Learning Objectives: Patients with sepsis arrive in the ER at various points along their disease trajectory. This changing and often unknown disease time zero contributes to the failure of sepsis treatments and the overall understanding of disease endotypes. No study has yet proposed a method to predict sepsis time zero.

Methods: This retrospective study utilized three animal models of sepsis to develop a realistic method for predicting the time of sepsis onset: baboon sepsis via E. Coli infusion (n=53), pig sepsis via peritonitis induction (n=14), and pig sepsis via LPS infusion (n=24). Variables of interest were frequently collected vital signs, arterial blood gas, blood cell count and differential, and serum lactate. Sepsis time zero was defined as the start of infection. A one-nearest-neighbor approach was developed to match time-series trajectories of an animal with unknown time zero against a trajectory database with known time zeros. Variables were searched to perform the best predictive combination of variables and a single blood-derived biomarker in an effort to minimize the measurement invasiveness of this approach. Leave-one-out cross-validation was used to calculate accuracy. Results: Variables WBC, HCO3A, HR, Temp, MAP and SatO2 offered high time zero predictive power (up to 83.0% in baboons, to within 1 hour, 89.7% in pig peritonitis, to within 2 hr, and 83.1% in pig LPS, to within 1 hour), depending on the trajectory length used. An exhaustive search revealed that variations of the vitals: MAP, Temp, HR, SatO2 and a single measurement of WBC, HCO3A, or lactate can yield prediction accuracies of 70.3–92.0%.

Conclusions: This study represents the first step towards predicting the time-of-infection in sepsis. A minimally-invasive-to-measure set of variables was proposed for use with this method to demonstrate ease of use. Promising results across multiple animal models suggest that this approach may be applicable for differing types of sepsis among multiple species.

1038
EVALUATING INITIATIVES ADVOCATING APPROPRIATE FLUID THERAPY IN SEVERE SEPSIS/SEPTIC SHOCK
Hersh Shah, Fariborz Rezai, Frances Kellnner, Eric Handler, Anish Patel, Katherine Tokarczyk, Nitin Mistry, Paul Yodice

Learning Objectives: Our objective is to assess compliance with dosage and timing of intravenous fluid (IVF) therapy in severe sepsis/septic shock patients and the effect on hospital length of stay (LOS) after education of emergency department (ED) staff of the recommended treatment protocols in the surviving sepsis guidelines (30 mL/kg within one hour of diagnosis).

Methods: Our 633-bed single center retrospective study evaluated patients 21 yr of age or older with severe sepsis/septic shock admitted to the ICU from the ED. We looked at two time frames, before (April 1 to December 31, 2012) and after (July 1 to December 31, 2014) an educational intervention from the ED pharmacist. Data included patient demographics, blood pressure, lactic acid (LA), dosage and timing of IV fluids as well as hospital LOS. Patients who qualified for this intervention had at least one of the following: LA greater than 4 mmol/L, SBP less than 90 mm Hg, or SBP lower than 40 mm Hg from baseline. Data was collected to determine whether the educational intervention would affect patients receiving adequate treatment (30 mL/kg within one hour) using Chi-square testing and if there was an effect on mean LOS.

Results: Pre-intervention, forty-five patients with severe sepsis/septic shock were admitted to the ICU from the ED. Forty-two qualified for the study and only one received adequate fluid resuscitation. Post-education, 41 patients were admitted and thirty-six qualified for the study. Of those, eighteen received adequate fluid resuscitation. Using chi-square analysis, a P value of <0.000001 and a statistically significant difference in patients receiving adequate treatment after the educational intervention was found as well as a difference in mean hospital LOS between the two groups. Conclusions: In our study, there was a significant increase in patients with severe sepsis/septic shock receiving adequate IVF therapy (30 mL/kg within one hour) after an educational intervention was performed. There was a decrease in LOS as well.

1039
MORTALITY IN SEPTIC SHOCK: NOT ALL SEPTIC SHOCK PATIENTS ARE CREATED EQUAL
Nicholas Dorin, David Tannehill, Steven Trotrier

Learning Objectives: The definition and subsequent outcomes in septic shock are critical to the management of ICU patients. Most recent studies define septic shock by refractory hypotension or hyperlactatemia (LA) associated with SIRS criteria caused by an infection. A sepsis program was developed at our institution to identify septic shock patients to improve compliance with Surviving Sepsis Campaign guidelines. The purpose of this study is to determine if there is a difference in the mortality and length of stay (LOS) in a group of septic shock patients.

Methods: Septic shock patients admitted to a 54 bed medical-surgical ICU between 5/2013 and 5/2015 were evaluated retrospectively using a sepsis department (ED) staff of the recommended treatment protocol in the surviving sepsis guidelines (30 mL/kg within one hour of diagnosis).

Results: Of the 54 patients, there was an effect on mean LOS. Results: Pre-intervention, forty-five patients with severe sepsis/septic shock were admitted to the ICU from the ED. Forty-two qualified for the study and only one received adequate fluid resuscitation. Using chi-square analysis, a P value of <0.000001 and a statistically significant difference in patients receiving adequate treatment after the educational intervention was found as well as a difference in mean hospital LOS between the two groups. Conclusions: In our study, there was a significant increase in patients with severe sepsis/septic shock receiving adequate IVF therapy (30 mL/kg within one hour) after an educational intervention was performed. There was a decrease in LOS as well.
1040 OBESITY AND ITS EFFECT ON SEPTIC POSTOPERATIVE PATIENTS
Joseph Brunangd, Matt Mathew, Hans Tregear, Stepheney Berry, James Howard, Niaman Nazir, Michael Moncure
Learning Objectives: Obesity has been observed to possibly be protective in the septic patient population and the impact on septic postoperative patients is unclear. The purpose of our study was to determine if a greater BMI correlates with increased mortality rate and length of stay. Methods: A single center, retrospective cohort of patients admitted for general surgery who later developed diagnosis categories of sepsis, severe sepsis, and septic shock at the University of Kansas Hospital from 2010 to 2013. Patients were identified by ICD-9 coding and analyzed by BMI categories for outcomes of length of stay (LOS) and mortality. Diagnosis categories were analyzed for mean BMI of mortality and survivorship. Results: A total of 405 patients were included in the study, where we found mean BMI (29.3 ± 9.06 kg/m²) statistically different between diagnoses of sepsis, severe sepsis, and septic shock (28.6 ± 8.4 kg/m², 28.5 ± 8.32 kg/m², and 31.2 ± 10.6 kg/m², p = 0.0377). Mean BMI was statistically different for survivors and non-survivors in the entire population (28.6 ± 7.81 kg/m² and 31.6 ± 12.5 kg/m², p = 0.0355). When analyzed by diagnosis, there was a difference in mean BMI of septic shock survivors and non-survivors (29.5 ± 8.25 kg/m² and 34.7 ± 13.9 kg/m², p = 0.0489). Mean LOS (30 days, p = 0.472) and mortality (21%, p = 0.226) was not significantly different when compared among BMI categories of underweight, normal, overweight, obese, severely obese, and super obese. Conclusions: In postoperative patients who become septic, obesity may be detrimental to outcomes. Our work suggests that a higher BMI correlates with a worse diagnosis category (sepsis, severe sepsis, or septic shock) and higher mortality rate in both our entire postoperative population and those who acquire septic shock.

1041 PULMONARY VASCULAR PERMEABILITY INDEX NOT PREDICTING SYSTEMIC VASCULAR PERMEABILITY IN SEPTIC SHOCK
Kanaki Shimemura, Hiroshi Rinka, Takeo Morimoto, Takaya Morooka, Kunichi Ishikawa, Akihito Fuke, Hidetaka Arimoto, Toshinori Miyachi
Learning Objectives: Transpulmonary thermodilution (TPTD) has been used for septic shock patients to manage their respiratory and circulatory statuses. The pulmonary vascular permeability index (PVPI) is measured by TPTD and a predictor of permeability of the pulmonary vascular system. However, it remains unclear whether PVPI predicts systemic vascular permeability or not. The aim of this study was to examine if the measured PVPI could predict systemic vascular permeability by using the systemic organ failure assessment (SOFA) score components. Methods: This was a single center, retrospective cohort study of 62 patients admitted to the medical ICU at Osaka City General Hospital, Japan, from April 2011 to June 2015. Patients included in this study were: 1. those who suffered septic shock but were responsive to initial 2-liter fluid resuscitation, 2. 18 yr old or older, and 3. treated with TPTD for the management of septic shock. The PICCO2 system (PULSION Medical Systems, Feldkirchen, Germany) was used for TPTD. The SOFA score and a 28-day period of ventilator-free days (VFDs) were compared with the PVPI to determine whether or not it could be a valuable predictor for systemic vascular permeability. Results: The median age was 64.5 yr, and 48 patients (77%) survived. VFDs were 20 days, and the median first-day SOFA score was 11. The 48-hour PVPI showed a correlation with the respiratory component of the 48-hour SOFA score (correlation coefficient, r = 0.53, p < 0.01). On the other hand, other components of the SOFA score had no correlation with the PVPI (r = 0.06−0.27). VFD also showed a negative correlation with the 48-hour PVPI (r = −0.48, p < 0.01). Conclusions: The PVPI was a good predictor of pulmonary vascular permeability but could not predict systemic vascular permeability.

1042 EFFECTS OF STATIN AND FIBRATE ON OUTCOMES OF SEPSIS
Yu-Hsiang Meng, Kuan-Fu Chen
Learning Objectives: Statin is known for pleiotropic effects to modulate inflammatory response. Divergent results have been reported regarding the effect on septic outcomes. As for fibrate, it has been indicated to inhibit release of inflammatory cytokines. Some animal studies have demonstrated its potential benefit to tackle infection or inflammation, while little clinical research has been published so far. Seeing that the protective role of statin remained controversial and fibrate may be a novel agent to prevent adverse events in patients with sepsis, we investigated whether prior use of each is associated with the outcomes through multilevel propensity score matching. Methods: We conducted a retrospective cohort study on patients with sepsis aged at least 18 yr visiting the emergency department (ED) at a tertiary hospital from 2006 to 2012. Every ED visit was considered a unit of analysis, and each patient a cluster. A statin or fibrate user within 30 days before ED admission was matched to a nonuser by multilevel propensity score. Covariates included age, sex, comorbidities, and prescription medications. The endpoints consisted of 28-day mortality, severe sepsis, septic shock, ICU admission, length of stay (LOS), positive blood culture, and Mortality in Emergency Department Sepsis (MEDS) score. Results: Of the 90,793 visits in 68,043 patients, 1,696 statin users were then matched to 1,696 nonusers, and 148 fibrate users to 333 nonusers. Neither statin nor fibrate therapy significantly reduced 28-day mortality (statin: aOR 1.00, 95% CI [0.98 − 1.02]; fibrate: 0.96 [0.91 − 1.00]), severe sepsis (1.01[0.97 − 1.04], 0.97 [0.88 − 1.01]), septic shock (0.99[0.97 − 1.01], 0.99[0.95 − 1.02]), ICU admission (0.99[0.96 − 1.00], 0.98[0.92 − 1.03]), or positive blood culture rate (0.98[0.96 − 1.01], 0.98[0.92 − 1.04]). Both statin and fibrate therapies decreased MEDS score (-0.55, -0.37 to -0.35, -0.57, -0.30 to -0.21), while only statin led to shorter LOS (-0.94[1.59 to -0.30], -1.07[2.41 to -0.30]). Conclusions: Statin and fibrate were associated with less severe sepsis based on MEDS score with a reduction of LOS in statin.

SHOCK INDEX AS A PREDICTOR OF ICU TRANSFER IN PATIENTS ADMITTED TO THE MEDICAL WARD WITH SEPSIS
Isaac Biney, Raka Amin, Alem Mehari
Learning Objectives: Sepsis constitutes a significant health care burden in the United States. A significant number of patients with sepsis are admitted to a non-Intensive care unit (ICU) setting. Delayed ICU consults and transfers have been associated with adverse events when critically ill patients are not promptly identified. The Shock Index (SI) has been shown to predict disease escalation in patients presenting to the emergency room with sepsis. The purpose of this study was to determine whether the SI can be used to help identify patients admitted to the medical ward who might require a higher level of care. Methods: This was a retrospective study of patients admitted to the medical ward with sepsis between April 2013 and December 2014. The shock index was calculated for each set of vitals recorded from time of admission till ICU transfer or hospital discharge using a 7 day cut-off. A sustained SI elevation (SSIE) was defined as an increase in SI of ≥ 0.15 with ≥ 2 measurements greater than 0.95. Of the 90,793 visits in 68,043 patients, 1,696 were matched to 1,696 nonusers, and 148 fibrate users to 333 nonusers. Neither statin nor fibrate therapy significantly reduced 28-day mortality (statin: aOR 1.00, 95% CI [0.98 − 1.02]; fibrate: 0.96 [0.91 − 1.00]), severe sepsis (1.01[0.97 − 1.04], 0.97 [0.88 − 1.01]), septic shock (0.99[0.97 − 1.01], 0.99[0.95 − 1.02]), ICU admission (0.99[0.96 − 1.00], 0.98[0.92 − 1.03]), or positive blood culture rate (0.98[0.96 − 1.01], 0.98[0.92 − 1.04]). Both statin and fibrate therapies decreased MEDS score (-0.55, -0.37 to -0.35, -0.57, -0.30 to -0.21), while only statin led to shorter LOS (-0.94[1.59 to -0.30], -1.07[2.41 to -0.30]). Conclusions: Statin and fibrate were associated with less severe sepsis based on MEDS score with a reduction of LOS in statin.
a SSIE had a higher mean number of organ failures (2.97±2.4 vs 1.65±1.6; p<0.001), hospital length of stay (13.6±11.2 vs 8.6±6.35, p<0.001) and had a higher mortality (10.1% vs 2.1%, p=0.012) compared to patients without a SSIE. **Conclusions:** A SSIE was associated with higher rates of ICU transfers and worse patient outcomes. The SL is a simple measure that may help identify patients with sepsis in a non-ICU setting at risk of deterioration and guide clinicians to institute early aggressive interventions when necessary.

### 1044 IMPACT OF INITIAL ANTIBIOTIC CHOICE ON OUTCOMES AMONG PATIENTS WITH SEVERE SEPSIS AND SEPTIC SHOCK

**Bristol Whiles, Amanda Deis, Patrick Miller, Steven Simpson**

**Learning Objectives:** The purpose of this study was to investigate the relationship between initial antimicrobial type(broad-spectrum vs vancomycin) and mortality in patients with severe sepsis and septic shock. **Methods:** A retrospective cohort of severe sepsis and/or septic shock admissions through the emergency department(ED) from 5/1/07-10/1/14 was identified. Patients had either an ICD-9 995.92 (275,52) diagnosis code or met standard severe sepsis criteria, including lactic acidosis or ≥ 2 organ dysfunction sites or hypotension. Additional inclusion criteria were: age ≥ 18 yr, ≥ 1 diagnosis infection, and administration of an antimicrobial. The first antimicrobial agent administered after ED triage was analyzed. **Results:** Of 7071 encounters with severe sepsis and/or septic shock, 4464 (63.1%) received a broad-spectrum antibiotic and 693 (9.8%) received vancomycin as their first antimicrobial agent. Mortality was not different between groups (7.6% vs 7.9%). The three most common broad-spectrum antimicrobials were ceftriaxone, piperacillin/tazobactam, and levofloxacin (1606, 1112, and 1019 patients, respectively). The prevalence of septic shock (25.3% vs 34.0%; P<0.0001), incidence of ICU admission (40.7% vs 48.6%; P<0.0001); hospital LOS (7.9 days vs 12 days; P<0.0001) and 30-day readmission rate (10.8% vs 25.5%; P<0.0001) were lower among patients first administered broad-spectrum antimicrobials vs vancomycin, respectively. **Conclusions:** Patients who first received vancomycin for severe sepsis had an increased prevalence of septic shock, higher ICU admission rate, longer length of hospitalization, and increased 30-day readmission rate when compared with patients administered broad-spectrum antimicrobials. These findings support the importance of administering an initial broad spectrum antimicrobial rather than a narrower spectrum. Further exploration is needed to demonstrate whether broad spectrum antibiotics appropriately covered cultured organisms in higher proportion than narrow spectrum antibiotics. Although mortality was not affected, the antibiotic choice appears to affect several important patient-centered outcomes.

### 1045 ENDOTRACHEAL TUBE COLONISATION AND VENTILATOR ASSOCIATED PNEUMONIA IN CARDIAC SURGERY PATIENTS

**Heyman Luckraz, Eshan Senanayake, Ramesh Giri, Shameer Gopal, Alan Nevill**

**Learning Objectives:** Ventilator associated pneumonia (VAP) is estimated to develop in 25% of patients after cardiac surgery. Aspiration of microbes in pooled subglottic secretions into lower respiratory tract is the commonest cause. ET tube colonization contributes to the late onset of VAP. **Methods:** A prospective cohort study conducted on patients undergoing cardiac surgery. ET tube colonization studies were performed at the time of extubation. The first and last swabs of the distal ETT tube was swabbed and sent for microbial culture (n=234). Colonization of the ETT was defined as ≥1000 colony forming units: 4.35 X10^7 and 2.16 X10^8. Colonization of the ETT was defined as any growth in the microbial culture swabs. **Results:** The VAP incidence was significantly lower in PneuX ET group - 21% (25/120) in standard ET group (p=0.03). Overall, ETT colonization was associated with VAP in only 9% (11/120) for PneuX ET as compared to 16% (19/120) of standard ETT patients (p=0.08). There was no significant difference between the two ETTs in terms of types of bacterial colonization or the mean value of the colony forming units: 4.35 X10^7 and 2.16 X10^8. Colonization of the ET (in VAP confirmed cases) was lower with PneuX tube as duration of intubation increases over 48 hr (43% vs 71%). **Conclusions:** Colonization of ET does not seem to play an important role in early VAP. There is a tendency for reduced ETT colonization in the PneuX tube as duration of intubation increases, impacting on late VAP.

### 1046 MELANOCORTIN RC AGONIST BMS-470539 ATTENUATES LPS INDUCED NEUTROPIL ACTIVATION & ACUTE LUNG INJURY

**Sanghyun Kwik**

**Learning Objectives:** Over-activation of inflammatory cells involving neutrophils are associated with multiple organ failure under conditions that sepsis and acute respiratory distress syndrome can be. **Methods:** We reviewed prospective collected data from the Pediatric Health Information System database from 2004 - 2012. Children with PSS receiving 100% balanced fluids (BF) for bolus resuscitation with balanced fluids is associated with outcomes. **Results:** We measured the levels of phosphorylation of MAPKs (p38, ERK1/2, JNK) with western blot analysis and NF-κB with EMSA. 0.5 hr after incubation period. We examined the effect of BMS-470539 (20 mg/kg, IP) on acute lung injury and mortality of mice treated with LPS (20 mg/kg, IP) to determine whether these effects of BMS-470539 also have in vivo. **Results:** BMS-470539 inhibited the production of TNF-α and attenuated phosphorylation levels of ERK1/2 and p38 but not JNK in neutrophils stimulated with LPS. BMS-470539 also attenuated the production of TNF-α and the phosphorylation of ERK1/2 in the lungs of mice administered LPS. BMS-470539 reduced the wet/dry weight ratio, histological severity, and neutrophil accumulation in the lungs and improved mortality after LPS treatment. **Conclusions:** BMS-470539 attenuated LPS-induced lung injury by suppressing TNF-α production as well as ERK1/2 and p38 activation in neutrophils stimulated with LPS.

### 1047 RESUSCITATION WITH BALANCED FLUIDS IS ASSOCIATED WITH IMPROVED SURVIVAL IN PEDIATRIC SEVERE SEPSIS

**Elizabeth Emrath, Curtis Travers, Courtney McCracken, James Forrenberry, Kiran Hebbbar**

**Learning Objectives:** Recent experience in adult sepsis has suggested that use of balanced intravenous fluid solutions for resuscitation fluid is associated with decreased acute kidney injury and improved survival. We aimed to identify the current state of resuscitation fluid use in pediatric severe sepsis (PSS) and evaluate the association of fluid choice with outcomes. **Methods:** We reviewed prospectively collected data from the Pediatric Health Information System database from 2004 - 2012. Children with PSS receiving 100% balanced fluids (BF) for bolus resuscitation fluid in the first 24 hr of treatment were compared to those receiving 100% unbalanced fluids (UF). BF were defined as crystalloids with electrolyte content similar to plasma and a higher strong ion difference (e.g. Lactated Ringer’s solution). UF were defined by a strong ion difference of zero (e.g. normal saline). Propensity score matching was performed to balance groups on baseline characteristics at a 1:6 ratio. Outcomes were compared in the matched cohort using generalized linear mixed models to account for hospital effects. **Results:** Of 32,564 PSS patients analysed, 30,166 (92.6%) received UF and 2,398 BF for resuscitation. Before propensity matching, children receiving 100% BF were younger at admission (6 vs 7 yr; p<0.001) and had a longer median ICU stay (10 vs 8 days; p<0.001), but had similar numbers of organ systems with acute dysfunction. Mortality was significantly lower with 100% BF vs 100% UF (14% vs 16%; p=0.048). The 10,724 propensity matched patients did not show a
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VITAMIN D SUPPLEMENTATION AND MORTALITY IN PATIENTS WITH SEVERE SEPSIS AND SEPTIC SHOCK
Megan Rech, Lisa Sowinski-Raff, Katie Young, Amy Kule

Learning Objectives: Vitamin D is an important immune modulator. While current literature supports that vitamin D deficiency is associated with increased mortality in septic patients, the effect of vitamin D supplementation prior to admission for sepsis is unknown. The purpose of this study is to evaluate the relationship between vitamin D supplementation prior to admission for sepsis to determine the impact on mortality. Methods: This was a retrospective cohort of patients ≥18 yr admitted from January 1, 2010 to December 31, 2013 with a diagnosis of severe sepsis or septic shock. Patients who received vitamin D supplementation for at least 7 days prior to admission were compared those who did not. Data was collected on age, race, gender, comorbidities, source of infection, APACHE II, vasopressors, hydrocortisone, mortality and length of stay. The primary outcome variable was 30 day mortality. Univariable analysis with Chi-square, Fisher’s exact test or t-test was performed. Multivariate logistic regression analysis was conducted. Results: Of the 446 patients evaluated in this study, 413 (92.6%) were included, of which 271 (65.6%) were not on vitamin D supplementation and 142 (34.4%) were on ergocalciferol or cholecalciferol. Baseline demographics were similar between groups, except supplemented patients had higher incidence of coronary artery disease (25.3% vs 41.5%, p=0.001), hypertension (42.4% vs 62%, p<0.001) and chronic kidney disease (35.8% vs 47.9%, p=0.001). Serum concentrations of 25-hydroxyvitamin D were higher in supplemented patients (21.5 vs 31.3 ng/mL, p=0.004). There was no difference in 30 day mortality (37.2% non-supplemented vs. 28.6% supplemented, p=0.082). After adjusting for confounders with multivariate logistic regression analysis, vitamin D supplementation was not associated with less 30 day mortality (p=0.113). Conclusions: Though vitamin D deficiency is associated with increased mortality in septic patients, it does not appear that vitamin D supplementation prior to admission for sepsis improves mortality.

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PATIENT UNDERSTANDING SURROUNDING SEPSIS EVALUATION (PURSE)
Chakri Molugu, Amy Hill, Jemma Hall

Learning Objectives: Sepsis causes over 37,000 deaths per annum in the UK. Patient knowledge of sepsis is often poor, with many misunderstanding the term. Few studies have looked into patient understanding and experience of sepsis. Methods: We prospectively sampled 51 inpatients meeting our criteria (as per Surviving Sepsis Guidelines), in an acute medical unit serving a large district general hospital between 1st August and 30th November 2014. Participants completed questionnaires covering domains that included illness duration prior to presentation, preadmission therapies, perceived psychological and physical well-being, and understanding of their diagnosis. Further domains probed participant understanding of sepsis and appraisal of mortality risk relative to heart disease and cancer. Results: 41% of patients (n=22), reported feeling unwell for >7 days, with only 24% of patients (n=12) seeking help within 24hr. 60% of patients attended their family doctor prior to hospital (n=30), whilst 24% self medicated (n=12). The incidence of physical debilitation was high at 99% (n=50), with 45% being diagnosed with respiratory sepsis (n=23). 57% of patients (n=19) reported psychological symptoms, of which low mood was commonest (58%). Other reported aspects included confusion (11%) and sleep deprivation (11%). Depression and fear were reported in 5% cases. 39% (n=20) understood the term “sepsis”, but only 14% (n=7) believed sepsis to be the leading cause of death, whilst 40% (n=20) believed heart disease was the most fatal, followed by cancers at 36% (n=20). Conclusions: The concept of sepsis and its mortality lacks understanding and recognition in the patient population. This may account for delays in presentation of >7 days, a factor that could change with better patient education. A high proportion of patients report psychological impact. We feel that this psychological aspect is poorly acknowledged within the medical profession, and could have on-going impact on patients’ mental health following discharge.

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PERFUSION INDEX AND MORTALITY IN THE CRITICALLY ILL
Laure Spector, Timothy Perkins, Kirsten Notby, David Inouye, Richard Severino, Danny Takanishi, Mihae Yu

Learning Objectives: Measurement of tissue perfusion may be helpful in the detection of early shock and in guiding treatment. The Perfusion Index (PI) is a ratio of pulsatile to non-pulsatile flow in peripheral tissues (Maximo Corporation, Irvine CA) and may provide a continuous, noninvasive measure of peripheral perfusion. There is paucity of published report whether PI values are associated with outcome. The aim of the current investigation was to determine if a specific value is predictive of survival. We chose the value closest to 24 hr after resuscitation based on previous studies demonstrating this time as the most predictive of outcome. Methods: Critically-ill surgical patients requiring resuscitation were enrolled in the study and PI was measured at baseline and daily while in the ICU. Patients’ predicted survival was determined by comparing their PI values at 24 hr after resuscitation to a series of reference values starting at zero and increasing in 0.2 point increments. For each reference value, predicted survival was compared to actual survival and the Positive predictive value (PPV) and Negative predictive value (NPV) were calculated. The optimal reference value was defined as the value which yields the best combination of predictive values. A chi-square test was used to determine the statistical significance of the association of the dichotomized PI value and actual survival. Results: Demographics of the 79 patients were: mean age 67 ± 16 yr, 49 males (62%), 30 females (38%), APACHE II 25.9 ± 7.8, Septic Shock/Severe Sepsis 49/79 (62%), Hemorhagic Shock 21/79 (27%), Cardiac Failure 19/79 (24%), and Respiratory Failure 60/79 (76%) (several patients had more than one diagnosis). 55 (69.6%) of the 79 patients survived to discharge. A PI value of 2.2 at 24 hr after resuscitation yielded a PPV of 80.7% and a NPV of 48%. Sixty-six percent of survivors had a PI ≥2.2 compared to 33% of non-survivors (p=0.02). Conclusions: PI values using a cutoff of 2.2 at 24 hr may be a predictor of outcome with the potential value of using it as an endpoint of resuscitation and monitoring of tissue perfusion.

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EFFICACY OF NON-WEIGHT BASED VASOPRESSOR DOSING IN CRITICALLY ILL PATIENTS WITH SEVERE SEPSIS
Chere Adams, Calvin Tucker, Bryan Allen, Michele Loudy, Sarah Hayes

Learning Objectives: In sepsis, the inability to obtain hemodynamic stability has been linked to poor outcomes. Early goal directed therapy with adequate fluid resuscitation and vasopressor agents is recommended by current guidelines. There is no specific recommendation to whether weight-based (mcg/kg/min) or non-weight based (mcg/min) vasopressor dosing should be used. An evaluation of non-weight based dosing in obese and non-obese patients with sepsis may aid in determining the impact of current dosing strategies. Methods: A single center, retrospective chart review was conducted in 186 ICU patients treated with non-weight based vasopressors (noradrenaline, dopamine, phenylephrine). Patients were grouped into obese (OB, BMI≥30) or non-obese (non-OB, BMI<30). Primary outcome was the rate of therapeutic failure (the inability to achieve goal MAP with a single agent or the inability to obtain goal MAP or death within 24 hr). Time to goal MAP and sustained MAP (>2xhr), amount of fluid boluses (ml/kg), hospital and ICU length of stay and all-cause ICU mortality were examined. Results: No significant difference was seen in therapeutic failure rates (non-OB 45% vs. OB 60%, p=0.06). The OB group was more likely to fail due to the need for a second agent (23% non-OB vs. 44% OB, p<0.01). The non-OB group reached goal MAP (58 min. vs. 121 min.., p< 0.01) and time to sustained MAP (190 min. vs. 425 min., p<0.01) earlier. No difference was seen in mortality (54% vs. 67%, p=0.07), length of stay (8.95 d vs. 11.6 d, p=0.06), length of ICU stay (4.5 d vs. 5.6 d, p=0.5) for non-OB vs. OB. Initial drip rates (non-OB 0.13 mcg/kg/min vs. OB 0.08, p=0.01) and fluid boluses (non-OB
30.1 ml/kg vs. OB 17 ml/kg, p<0.01) was lower in the OB group. In both groups, the drip rates were significantly lower in patients who failed versus those who did not. **Conclusions:** This study questions the efficacy of non-weight vasopressor dosing. Adequately dosing obese patients may result in faster attainment of goal MAP and decreased use of secondary agents. Randomized trials are needed to validate these results and examine adverse event rates.

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**GENETIC DEFICIENCY OF AMPK1 IMPAIRS ENERGY PRODUCTION AND EXACERBATES ORGAN INJURY IN SEPTIC MICE**

Yu Inata, James O’Connor, Michael O’Connor, Paul Hake, Giovanna Piraino, Basilia Zingarelli

**Learning Objectives:** AMP-activated protein kinase (AMPK) is a crucial regulator of energy homeostasis, which controls disposal of mitochondria by autophagy and mitochondrial biogenesis by activation of peroxisome proliferator-activated receptor γ coactivator 1α (PGC1α). We hypothesized that genetic deficiency in α1 subunit of AMPK exacerbates organ injury in sepsis by impairing energy homeostasis. **Methods:** C57BL/6 AMPK<sup>−/−</sup> (KO), α1<sup>−/−</sup> (HT), and α1<sup>+/+</sup> (WT) 2–3 mo old male mice were subjected to sepsis by cecal ligation and puncture (CLP). Organs were harvested at 18 hr after CLP for biochemical assays. Results: At Western blot analysis, AMPK<sub>α1</sub> and PAMPK<sub>α1</sub> in the heart and liver were undetectable in KO and decreased in HT. Since AMPK can indirectly activate SIRT1, which in turn activates PGC1α, we assessed SIRT1 and PGC1α. At baseline, SIRT1 expression in the heart was significantly lower in KO than in WT. After CLP, however, SIRT1 expression in KO increased to the higher level than WT. Notably, there was no significant difference in PGC1α expression between KO and WT after CLP. Next, tissue ATP level (nmol/mg dry weight) was measured in the liver. It was lower at baseline in KO (1.4 ± 0.1) and HT (1.5 ± 0.5) than WT (2.9 ± 0.1, P<0.05). In sepsis, ATP level decreased in all groups, but more severely in KO (0.4 ± 0.1) than WT (1.2 ± 0.2, P<0.05). We further assessed autophagosome formation by following the LC3β-I to LC3β-II conversion in the heart and liver. Interestingly, the conversion increased dramatically from baseline after CLP in KO and HT despite their lower baseline conversion levels than WT. Finally, we examined the degree of organ injury in the lung and liver. MPO activity (U/100mg tissue) in the lung increased after CLP in all three groups, but more greatly in KO (394 ± 74), than HT (245 ± 63, P<0.05) and WT (44 ± 12, P<0.05). Similar increase in MPO activity was also observed in the liver of KO mice. **Conclusions:** AMPK<sub>α1</sub> deficiency impaired energy production and exacerbated organ injury in sepsis, which could be due to impaired anti-inflammatory effect of AMPK rather than impaired AMPK-dependent metabolic pathways.

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**IMPACT OF PHARMACIST INTERVENTION ON TIMING OF APPROPRIATE ANTIMICROBIAL THERAPY IN SEPTIC SHOCK**

Melanie Laine, Jeremy Flynn, Craig Martin, Alexander Flannery

**Learning Objectives:** Current guidelines for septic shock management recommend administration of appropriate, broad spectrum antimicrobials within one hour of recognition, as this impacts mortality. At University of Kentucky HealthCare (UK), pharmacy residents are members of a multidisciplinary sepsis response team and aid in the selection of empirical antimicrobial therapy, in addition to facilitating timely administration. The purpose of this study was to determine the frequency and types of interventions pharmacists make regarding empiric antimicrobial therapy in septic shock, and their impact on successful and timely coverage of causative organisms. **Methods:** This is a retrospective cohort study of patients ≥ 18 yr of age with culture-positive septic shock and treated via the UK sepsis bundle from January 2012-June 2014. The primary endpoint was the frequency and types of pharmacist interventions and if these were associated with improved selection of empirical antimicrobial therapy (SSAT). Time to first antimicrobial and time to appropriate antimicrobial therapy were also recorded. **Results:** The final analysis included 76 patients, of which pharmacists performed interventions on 46% (n = 35). Fifty patients (66%) had SSAT when the sepsis bundle was initiated. Interventions by pharmacist responders increased the overall percentage of SSAT to 80%. Median time to first dose of antimicrobials using the pharmacist responder was 43 min, and median time to appropriate antimicrobial therapy was 1 hour, 34 min for the entire cohort. Time to appropriate antimicrobial therapy was much longer in patients that did not have SSAT on initiation, averaging 35 hr, 32 min. **Conclusions:** This study demonstrates that interventions by pharmacist responders in septic shock management are associated with improved time to SSAT. Including pharmacists in the multidisciplinary approach to septic shock treatment has the potential to improve selection and timing of empiric antimicrobial therapy.

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**LACTIC ACID IN SEPSIS AND SEPSIS RELATED DEATHS**

Tiana Endicott-Yazdani, Rachel Gardner, Avery Smith, Ginger Tsai-Nguyen, Tiffany Ynosencio, Adan Mora

**Learning Objectives:** Many institutions screen for sepsis using lactic acid and levels above 4 mmol/L are associated with worse outcomes. This study examined the lactic acid levels in sepsis related deaths. It also looked at liver compromised patients, as higher lactic acid levels can be encountered in this population. **Methods:** Data was gathered between February and March 2015 from 100 consecutive patients deemed “Code Sepsis” at Baylor University Medical Center, as defined by suspected infection, 2 positive SIRS criteria and an elevated lactic acid. Liver function compromised patients were defined as having liver disease, alcoholic cirrhosis or non-alcoholic steatohepatitis. **Results:** Of the evaluate patients, 72 survived to discharge, 9 were discharged to hospice and 19 died. Lactic acid levels for all comers ranged from 0.6–20.2 mm/l. The average level in survivors (including hospice) was 5.4 mmol/L with 56% having a lactic acid >4 mmol/L (n=40). The average of those transitioned to hospice was 5.3 mm/L with 67% having a lactic acid >4 mmol/L (n=6). The average lactic acid in non-survivors was 4.9 mmol/L with 63% having a lactic acid >4 mmol/L (n=12). 18% of those surveyed had liver function compromise. The average lactic acid level in survivors with liver function compromise was 7.5 mmol/L, while the average lactic acid level in survivors without liver function compromise was 4.5 mmol/L. The average lactic acid level in non-survivors with liver function compromise was 5.7 mmol/L, while the average lactic acid level in non-survivors without liver function compromise was 4.6 mmol/L. The pH range, when available, of survivors was 7.08–7.46; while in non-survivors it was 6.98–7.46. **Conclusions:** Admission lactic acid levels were not a predictor of death. The highest levels (20.2 mmol/L, 18.7 mmol/L and 15 mmol/L) were all in survivors. In those with liver function compromise, lactic acid levels were higher in the survivors. While helpful in screening septic patients, lactic acid levels do not seem to correlate with a diagnosis of sepsis or survival, especially in patients with liver function compromise.

1055

**CIGARETTE SMOKE REDUCES NALP3 LEVELS BY PROTEIN DESTABILIZATION**

SeungHye Han, Jake Jerome, Rama Mallampalli

**Learning Objectives:** Sepsis, a serious complication of infection, is one of the most common reasons for admissions to the ICU. Cigarette smoking has been identified as a risk factor for sepsis, but the underlying mechanism remains unclear. The inflammasome is a multi-protein complex that augments the inflammatory immune response by increasing the release of key cytokines. Specifically NALP3 inflammasomes release pro-inflammatory cytokines such as IL-1β and IL-18, which are involved in host defense against infection. We investigated whether cigarette smoke extract (CSE) affects NALP3 levels in cells, and its underlying mechanism. **Methods:** We treated human monocyte THP1 cells (total 3x10<sup>6</sup> cells) with CSE (40–200µg/mL) for 16hr. The protein levels of NALP3 were measured by immunoblotting, and mRNA levels were measured by real time PCR after reverse transcription of isolated RNA. We evaluated the binding between two proteins by co-immunoprecipitation (co-IP). **Results:** NALP3 protein levels were decreased after CSE exposure in a dose-dependent fashion in human monocyte THP1 cells. The steady-state mRNA expression of NALP3, however, increased up to 6 fold after CSE exposure, suggesting the change of protein levels is mainly mediated by post-translational regulation. It is known that NALP3 protein is degraded via the ubiquitin proteasome system. Therefore, we measured the binding between NALP3 protein and ubiquitin by co-IP both at
baseline and after CSE exposure. The NALP3-ubiquitin binding was increased by more than 50% after CSE exposure when densitometrically controlled for input loading. **Conclusions:** CSE decreases NALP3 protein levels by increasing its degradation, not by decreasing new protein synthesis. The underlying mechanism is most likely increased ubiquitin-mediated proteasomal processing. Our findings provide potential mechanistic insights for smoking-related immunosuppression, and this may uncover unique opportunities to develop therapeutic strategies to modulate cytokine signaling, and subsequently, inflammation associated with sepsis development.

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**THE EFFICACY OF THE POLIMYXIN B IMMOBILIZED FIBER COLUMN DIRECT HEMOPERFUSION FOR SEPTIC SHOCK**

Yoshiliko Nakamura, Fumiaki Kiyomi, Kota Hoshino, Reiko Ichiki, Yasumasa Kawano, Mariko Mizunuma, Hiroyasu Ishikura

**Learning Objectives:** Many patients with septic shock receive Polymyxin B immobilized fiber column direct hemoperfusion (PMX-DHP) as a rescue therapy. A purpose of this study is to clarify an effect of PMX-DHP for the prognosis of patients with septic shock. The aim of the study was to determine the effects of PMX-DHP on the prognosis of the patients with septic shock in a case-control setting. **Methods:** Data from patients admitted for severe sepsis or septic shock to Japanese ICUs were retrospectively collected from Jan 2011 to Dec 2013 through the J-SEPTIC DIC (Japanese society of education for physicians and trainees in intensive care disseminated intravascular coagulation) study data base set. We analyzed the potential benefit of PMX-DHP using a propensity score-matched (1:1) cohort analysis in septic shock patients. **Results:** Of 1754 eligible patients, 522 underwent PMX-DHP. Propensity score matching created a matched cohort of 640 patients (320 pairs with and without PMX-DHP). There was no significant difference between the two matched cohorts for the ICU mortality (PMX-DHP, 24.4% vs non-PMX-DHP, 25.9%, p=0.050). On the other hand PMX-DHP treatment was significant improvement of the hospital mortality compared with non-PMX-DHP treatment (PMX-DHP, 33.1% vs non-PMX-DHP, 43.4%, p=0.031). **Conclusions:** In this demonstration that PMX-DHP had a benefit on hospital survival when compared with conventional management (non-PMX-DHP) in matched patients of similar severity. A large multicenter prospective randomized trial is going now to confirm the efficacy of PMX-DHP treatment in septic shock.

**1057**

**IMPACT OF EDUCATIONAL INTERVENTIONS AND SIMULATION TRAINING ON MORTALITY IN A BUSY URBAN HOSPITAL**

Manideep Duttuluri, Raymonde Jean, Susannah Kuritz, James salonia, ismini kourouni, karen mckenna, Hassan Khouri

**Learning Objectives:** Severe sepsis and septic shock are common causes of mortality in critically ill patients. Our goal was to assess the change in hospital mortality among these patients at Mount Sinai St. Luke’s and Roosevelt Hospital with educational interventions. We also looked at the utilization of a sepsis protocol and the bundle adherence measures. **Methods:** This was a retrospective cohort study of patients admitted to Mount Sinai St. Luke’s and Roosevelt Hospital in New York City from January 1, 2010 to June 30, 2015. Utilization of a sepsis protocol, adherence to bundles at 3 and 6 hr and hospital mortality data were extracted from a hospital sepsis database. Hospital mortality was compared before and after the introduction of a sepsis protocol in January 2011. We also performed ongoing sepsis education for residents and the nurses from September, 2013 and introduced simulation education for residents in September 2014. Since April 1, 2014 mortality data has been reported to The Department of Health on a quarterly basis. **Results:** A total of 8428 patients diagnosed with severe sepsis or septic shock were included in the study. Hospital mortality was assessed before and after the educational interventions between January 1, 2010 and June 30, 2015. The hospital mortality rate of 25.5% did not change after the introduction of the sepsis protocol. Since reporting hospital mortality to the DOH, the rate has dropped with every subsequent quarter from 23% in Q1 to 19% in Q2, 18% in Q3, 16.8% in Q4, and 13% in Q1 2015. While protocol utilization increased, bundle adherence rates at 3 and 6 hour did not. Protocol utilization increased from 92% in Q2, 93.5% in Q3, 95.5% in Q4, to 92.5% in Q1 2015. The adherence rate to the 3 hour and 6 hour bundle was reported as 60% in Q2, 64.6% in Q3, 64.2% in Q4, 61% in Q1 2015. **Conclusions:** Hospital mortality in severe sepsis and septic shock patients decreased from 25% to 13%. Our study shows that educational interventions improved mortality outcomes.

**1058**

**OUTCOMES OF SEPSIS AND COMPLIANCE WITH SEPSIS BUNDLES IN A COMMUNITY NON-TEACHING HOSPITAL**

Marintha Groth, Maureen Chernosky, Lorraine Farrell, Marina Grennen

**Learning Objectives:** Beginning in May 2013, the NYS Department of Health (DOH) has required that hospitals implement protocols for the early recognition and treatment of patients with severe sepsis and septic shock and that adherence to these protocols be reported quarterly to the DOH as quality measures. **Methods:** All cases of severe sepsis and septic shock were reviewed for compliance with the 3 hour and the 6 hour bundles. Demographics, including age, sex, race group, ethnicity, payer, source of admission, discharge status and mortality were recorded. **Results:** From April to September 2014, there were 83 cases of severe sepsis and septic shock; the sepsis protocol was implemented in all but 1 case, with a compliance of 98.8%. This was better than the state average of 75%. Adherence to individual treatment measures was higher than state average for timely lactate measure (97.6% vs 74.9%), timely blood cultures prior to antibiotics (81.9% vs 61.2%); however, timely administration of antibiotics within 1 hr was lower than state average at 27.7% vs 41.1%, but timely administration of antibiotics within 3 hr was higher than statewide at 75.7% vs 66.3%. Compliance with the 6 hr bundle elements was as follows: timely crystalloid administration was 75.5% vs 41.6%; timely vasopressor administration was 30.8% vs 42.2% and timely re-measurement of lactate was 43.3% vs 36.9%. Our hospital ranked at the 83rd percentile in the state for the 3 hour bundle adherence percentage and 70th percentile or the 6 hour bundle adherence percentage. Overall mortality was 17.1 % compared to 30.6% state average. Source of sepsis was 45% respiratory, 31% urinary, 10% GI, 8% skin and 6% other. **Conclusions:** Our hospital performed better than the state average in adherence to most of the required tasks for the management and diagnosis of severe sepsis and septic shock. In addition, mortality rates were lower than the state average. These data confirm that compliance with sepsis bundles can improve outcomes in sepsis and septic shock. Implementation in community non-teaching hospitals is feasible.

**1059**

**IMPACT OF PRIOR ANTHYPERTENSIVE THERAPY ON OUTCOMES FOR PATIENTS WITH CIRCULATORY SHOCK**

Sarah Soloh, Issha Lat, Seth Bauer, Russel Roberts, Mitchell Daley, Robert MacLaren, Jason Poston

**Learning Objectives:** To date, there is very little literature describing the effects of prior to admission (PTA) antihypertensive (AH) therapy for patients suffering from circulatory shock syndromes. We evaluated the treatment effects and clinical outcomes for patients receiving PTA AH therapy compared with those who were not. **Methods:** A multicenter, observational, prospective study evaluated patients during the natural course of treatment during a 28-day period. Patients were included if they had circulatory shock and required initiation of vasopressors. Patients were separated into two groups based on PTA AH therapy for beta-blocker (BB) and/or ACE inhibitor (ACE-I) versus no PTA AH therapy. **Results:** A total of 80 medical and surgical ICU patients, with circulatory shock, were evaluated from 5 different sites in February 2014. Of the 80 patients, (n= 47.5%) were prescribed PTA AH therapy prior to their shock episode. There were no significant care differences between the PTA AH and no PTA AH groups for APACHE II score (mean, 26 vs 28 p=0.377), mean arterial pressure (MAP) at onset (52 vs 52 mm Hg, p=1) and MAP at 6 hr post-initiation of treatment (65 vs 62 mmHg, p=0.26), total crystalloid volume (7.25L vs 8.9L, p=0.328), central venous catheter (6.26 days vs 6.3 days, p = 0.9), norepinephrine dose day 1 (10.66mg vs 10.86mg, p=0.96) or cumulative dose (23.98 mg vs 53.29 mg,
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EMERGENCY DEPARTMENT RECOGNITION OF CRITICAL ILLNESS-RELATED CORTICOSTEROID INSUFFICIENCY
Garrett Pacheco, Cameron Hypes, Raj Joshi, Jarrod Mosier

Learning Objectives: Sepsis is the 10th leading cause of death in the United States and results in 750,000 hospitalizations annually. Severe sepsis and septic shock carry a hospital mortality rate of 25–50%, and aggressive early care in the emergency department (ED) modifies mortality more than any other point in the hospital course. While the treatment of critical illness-related corticosteroid insufficiency (CIRCI) remains controversial, some data suggest that corticosteroid administration in early septic shock improves 28-day survival. This study seeks to assess ED recognition of patients with possible CIRCI. Methods: This study is a retrospective chart review over a one-year period (December 1, 2013 – December 1, 2014) of patients identified with an admission diagnosis of severe sepsis or septic shock at a university medical center with an academic ED with an annual census of >75,000 patients. The medical record was reviewed for timing of corticosteroid administration for vasopressor refractory shock, and the indication of testing cortisol levels. Results: Over the one-year period, 47 patients had an admission diagnosis of severe sepsis or septic shock. Of these 83% (39/47) received vasopressors in the ED, primarily noradrenaline (38/39, 97%). Only 13% (6/47) received corticosteroids in the ED while 49% (23/47) received corticosteroids in the ICU. A random cortisol was drawn prior to admission to the ICU in 4% (2/47) of patients while 45% (21/47) had a random cortisol drawn once admitted to the ICU. Of those with a random cortisol drawn, the results were as follows: 22% (5/23) had a level < 10 mcg/dL, 39% (9/23) 10–20 mcg/dL and 30% (7/23) > 20 mcg/dL. Conclusions: These data suggest that CIRCI is under-recognized by emergency physicians in patients with an admission diagnosis of severe sepsis or septic shock at our institution. Of those patients where a cortisol level was checked, over 50% had values suggesting a moderate to high suspicion for CIRCI. Further research is needed in this area to improve recognition and optimal treatment of CIRCI in this high-risk patient population.

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IMPACT OF ORDER SET UTILIZATION FOR THE TREATMENT OF PATIENTS WITH SEVERE SEPSIS AND SEPTIC SHOCK
Chitamala Ike, Puneet Freibert, Karen Myers, John Sabo, Lucretia Davis, Linda Cole, Petra Grami, Greg Laine

Learning Objectives: Early protocol-driven strategies utilizing quantitative resuscitation goals have been shown to improve outcomes. The purpose of this study was to determine differences in outcomes associated with order set utilization in the management of patients with severe sepsis and septic shock. Methods: Patients were identified by an electronic severe sepsis alert and a confirmatory secondary assessment performed by the rapid response team. A retrospective review from June to September 2014 of all patients with a positive secondary screen for severe sepsis was conducted. Order set utilization, demographics, and processes of care were abstracted. The primary end point was in-hospital mortality. Incidences of organ dysfunction, duration of organ support, and resource utilization were also assessed. Acute Physiology and Chronic Health Evaluation (APACHE II) and Sequential Organ Failure Assessment (SOFA) scores were obtained at baseline, 24 and 48hr. Results: A total of 51 patients were included in the order set (OS) and 53 patients in the non-order set (NOS) groups. Patients in the OS group had lower acuity scores (median APACHE II score 16 vs. 18, p=0.02 and SOFA score 3 vs. 5, p=0.005). Predicted mortality in both groups based on SOFA score was <10%. In-hospital mortality was significantly lower in the OS group (5.9 vs. 37.7%, p=0.0001). Three-hour bundle compliance was significantly higher in the OS group (68.6 vs. 47.2%, p=0.03). Vasopressor usage (29.4% vs. 66%, p=0.0002), respiratory failure (13.7 vs. 45.3%, p=0.0005), renal failure (51 vs. 75.5%, p=0.01) and duration of renal replacement therapy (0 vs. 0.62 ± 0.30 days, p=0.04) were significantly lower in the OS group. There were no significant differences in length of stay and cost between the two groups. Conclusions: Order set utilization was associated with significant differences in mortality, bundle compliance and organ dysfunction. These findings emphasize the importance of order set utilization as a tool to foster bundle compliance in the management of patients with severe sepsis and septic shock.

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FLUID RESUSCITATION IN SEPTIC SHOCK PATIENTS PERCEIVED AT RISK FOR VOLUME OVERLOAD
Kriss Maos, Ahmed Sesay, Samantha Lee, Erica Hargreaves, Ryan Belecanch, Christian Nguyen, R. Dellinger, Christa Schorr

Learning Objectives: There are ~20 million cases a year of severe sepsis and septic shock (SS) globally. Early volume resuscitation is considered to be a mainstay therapy in the initial management of septic shock. We identified patients (pts) that might be perceived at risk for volume overload (PRVO) as those with a history of congestive heart failure (CHF) and/or end stage renal disease on hemodialysis (ESRD-HD) known at the time of presentation. We then compared 3 and 6 hour total fluid and ml/kg fluid resuscitation between PRVO and non-PRVO SS pts. Methods: A single center, retrospective study of patients presenting through the emergency department with SS from Jan 2011-Dec 2014 were analyzed for fluids administered during the first 6hr. SS was defined as patients with sepsis induced hypotension requiring vasopressors. Statistical tests used include the Mann Whitney U test and the Kruskal Wallis test to compare the continuous variables between groups. Chi Square tests were used to compare proportion of categorical variables among the groupings. Results: A total of 186 SS pts were identified of which 43 (23%) were classified as PRVO. This included past medical history of CHF (n=29, 15.5%); ESRD-HD (n=10, 5.4%) both CHF & ESRD-HD (n=4, 2.1%). There was no difference among the groups for age, gender or race. PRVO pts received less total and ml/kg fluid at 6 hr compared to non-PRVO pts (1.5L vs 3.0L, p<0.001). Only 21.9% of PRVO pts received the Surviving Sepsis Campaign Guidelines recommended initial fluid challenge for sepsis induce tissue hypoperfusion compared to 65.2% in the non-PRVO pts (p=0.001). PRVO pts received less ml/kg at 3hr (CHF 12.5ml/kg, ESRD-HD 7.4 ml/kg, Both 12.2ml/kg) compared to 29 ml/kg in non-PRVO pts (p<0.001). Conclusions: Patients perceived at risk for volume overload with septic shock receive less total fluids, less ml/kg, and less than recommended by the Surviving Sepsis Guidelines compared to those patients without a history of CHF and/or ESRD on HD. Further prospective studies are needed to determine if these patients are under-resuscitated and if so, the effect on outcome.

1063
PATIENTS’ METABOLIC PROFILE IN THE ICU
Audreil Thoof, Jean-Marie Collet, Raphael Conotte, Patrick Burton, Michael Piagnerelli

Learning Objectives: Learning Objectives: Despite improvement in management and treatment, the mortality in intensive care remains around 20 %. A better understanding of the pathophysiological disorders implied in these diseases is needed to improve the treatment. We aimed to study metabolic profile, using nuclear magnetic resonance spectroscopy, to identify potential biomarkers of patients’ outcome. Methods: Methods: Sera from adult patients during the first 24h of their admission in ICU were compared with sera from healthy volunteers. The sera were analyzed by 1H Nuclear magnetic resonance spectra and studied by multivariate analysis. Differences in metabolic profile of different type of diseases were also studied. Results: Results: 117 consecutive patients were screened, of which 111 were included in the study after informed consent signature. Mean age was 67±14, mean SOFA score was 5.5±3.2 and mean APACHE score was 20±9. We first identified a difference in metabolic profile between volunteers and ICU patients (CV-ANOVA, p=0.001). When septic shock patients were compared with non septic patients, some differences in the metabolome were observed: there was an increase in the expression of creatine, myo-inositol,
critical care, various organ dysfunction, and need for oxygen therapy and mechanical ventilation. The thoracic fluid content (TFC) and central venous pressure (CVP) were significant factors in determining the outcome. A Pearson correlation coefficient was used to assess the relationship between the two variables, with a correlation coefficient of r = .70, p < .01. The primary outcome was the overall survival rate of 93.1% (n=32). A Kaplan-Meier survival analysis revealed a significant difference between the experimental and control groups. The experimental group had a higher survival rate compared to the control group. The conclusions were that early rescue with ECMO in patients with severe sepsis and MODS in ICU in tropical countries can improve survival rates. The mortality in our case series of Scrub typhus presenting with severe sepsis and multiorgan dysfunction was much less (3.03%) than other published literature because of early initiation of Doxycycline or Azithromycin.

1064
THORACIC IMPEDANCE CARDIOGRAPHY IN MONITORING SEVERE SEPSIS RESUSCITATION
Kevin Ferguson, Mary Anne VanderGrift
Learning Objectives: The ARISE and PROCESS trials led to modifications of the Surviving Sepsis Campaign. These trials support the use of non-invasive assessment methods as an alternative to invasive monitoring. The thoracic impedance cardiography (TIC) provides a non-invasive means for monitoring resuscitation. The TIC measures and trends hemodynamic data including cardiac output, allowing oxygen transport (DO2) as a resuscitation goal. The goal of this study was to identify the incidence of Scrub typhus among severe sepsis admissions, to determine if non-invasive monitoring could be used to improve survival rates, and to assess the correlation between TFC and CVP. A Pearson correlation coefficient was used to assess the relationship between reaching 850 DO2 and ICU LOS shows no correlation between the two variables r = -.032, n =39, p = .85. A Pearson correlation coefficient to assess the relationship between reaching 850 DO2 and ICU LOS shows no correlation between the two variables r = -.174, n =39, p = .289. A Pearson correlation coefficient to assess the relationship between reaching 850 DO2 and ventilator days. There was no correlation between the two variables r = .061, n =39, p = .577. A Pearson correlation coefficient to assess the relationship between reaching TFC and CVP. There was no correlation between the two variables r = .230, n =39, p =.16. Conclusions: A DO2 goal of 850 mL/min correlates to reduced 30 day mortality but not LOS, ventilator or ICU days.

1065
SCRUB TYPHUS: AN EMERGING CAUSE OF SEVERE SEPSIS IN THE ICU AND NEED FOR ANTIBIOTIC PROTOCOL MODIFICATION
Naveen Jasmine, Vivek Pillai, Sharek Periyaveedu, Anoop WARRIER, Muhommad Yousuf
Learning Objectives: Scrub typhus is an important etiology for severe sepsis with multiorgan dysfunction (MODS) in ICU in tropical countries. Our aim was to identify the incidence of Scrub typhus among severe sepsis presenting with MODS in ICU, identify the incidence of various organ dysfunction and to determine the outcome after modifying antibiotic protocol. Hypothesis: Empirical coverage with Doxycycline or Azithromycin is warranted in severe sepsis with MODS in tropical countries. Methods: Single center, retrospective observational study utilizing data of patients admitted to Multidisciplinary ICU of a tertiary care hospital from January 1 2012 to December 31 2014, after antibiotic protocol modification in December 2011. Sepsis with MODS was diagnosed using Surviving Sepsis criteria. Scrub typhus was diagnosed by IgM ELISA with or without eschar. Results: Of the 162 patients admitted with severe sepsis with MODS over a period of 3 yr, 33 patients (20.3%) were diagnosed with Scrub Typhus. Among the 33 patients of Scrub typhus the incidence of various organ dysfunction were as follows: Hepatic dysfunction 90.9% (n=30), Respiratory failure requiring oxygen therapy 87.8% (n=29), Requiring IPPV 18.1% (n=6), Thrombocytopenia 60.6% (n=20), Acute Kidney Injury 24.2% (n=8), Requiring Hemodialysis 6.1% (n=2), Septic shock 21.2% (n=7), Meningitis 9.1% (n=3), Myocarditis 6.1% (n=2). Overall mortality was 3.03% (n=1) for Scrub typhus with MODS. Conclusions: Scrub typhus being an important etiology (20.3%) for severe sepsis with MODS in ICU in tropical countries, empirical coverage for this with Doxycycline or Azithromycin is warranted. The mortality in our case series of Scrub typhus presenting with Severe sepsis and multiorgan dysfunction was much less (3.03%) than other published literature because of early initiation of Doxycycline or Azithromycin.

1066
PREVALENCE AND CHARACTERISTICS OF EARLY SEPSIS ASSOCIATED COAGULOPATHY
James Russell, John Boyd, David Fineberg, Terry Lee, Amanda Raiford, Joel Singer, Mark Williams
Learning Objectives: The prevalence of early sepsis associated coagulopathy (SAC) varies widely according to definitions of coagulopathy used. Furthermore, the prevalence of coagulopathy may have decreased with improved sepsis recognition and treatment. Accordingly, we sought to determine prevalence and characteristics of mild, moderate and severe SAC in our ICU observational cohort. Methods: We reviewed all patients admitted to the ICU from January 1, 2011 to July 1, 2013, and included patients who met SAC inclusion criteria (Base criteria: sepsis, infection plus at least 1 new organ dysfunction, platelets < 150,000 (or a decrease of at least 30%) AND INR > 1.2 within the first three days of sepsis onset. We also used “modified Base”: sepsis, platelet criteria (as above), OR INR > 1.2 within the first three days. We defined mild (platelets 120,000 – 150,000 or INR > 1.2 – 1.5), moderate (platelets 80,000 – 119,000 or INR > 1.6 – 2), and severe SAC (platelets < 80,000 or INR >2), and assessed prevalence and baseline characteristics according to SAC severity. Results: From January 1, 2011 to July 1, 2013, of 1,977 ICU admissions, 326 (23.3%) patients had at least 1 INR and platelet count on days 0 (ICU admission) to 2 and met SAC inclusion criteria. Base SAC criteria occurred in 30.1% within 12 hr and increased to 40.5% within 24 hr. Simplified Base criteria occurred in 82.5% of patients within 12 hr of ICU admission. Severity of SAC prevalence was No SAC (7.4%), mild (35.6%), moderate (24.8%) and severe SAC (32.2%). Increase in SAC severity was associated with increased APACHE II (p< 0.001) and need for both vasopressors and mechanical ventilation (p<0.001). Using INR criteria only, no, mild, moderate and severe increase of INR occurred in 10.1%, 53.7%, 21.8%, and 14.4% respectively. Using platelet count criteria only, no, mild, moderate and severe decrease of platelet count occurred in 42.5%, 12.3%, 19.3%, and 26.1% respectively. Conclusions: SAC remains very common. As severity of SAC increases, so does APACHE II and need for vasopressors and ventilatory support. SAC remains a common and important problem.

1067
ECMO IN H1N1 PREGNANT AND POSTPARTUM WOMEN WITH ARDS: A SYSTEMATIC REVIEW AND META-ANALYSIS
Antonio Saad, Mahbubur Rahman, Mugd Costantine, Dirk Maybauer, Luis Pacheco, John Fraser, Marc Maybauer
Learning Objectives: To assess available evidence regarding the use of extracorporeal membrane oxygenation (ECMO) in pregnant and postpartum women with acute respiratory distress syndrome (ARDS) secondary to H1N1 infection. Methods: Databases from MEDLINE (U.S. National Library of Medicine, 1946 – April 01, 2015), the Cochrane Library Controlled Trials Register, ClinicalTrials.gov, and Web of Science were queried for studies on ECMO in pregnant or postpartum patients with ARDS. All relevant references in any language were reviewed. Literature for inclusion and methodological quality was reviewed based on the meta-analyses and systematic reviews of observational studies (MOOSE) guidelines. Results: Out of 266 citations, five retrospective studies (59 patients) fulfilled our inclusion criteria. No randomized controlled trials were found. The pooled estimate of the survival rate among pregnant/postpartum patients who received ECMO was 74.6% (95% confidence interval, 60.7–88.6%). Heterogeneity was not significant among studies (I-squared 2.8%; p= .391). Neonatal outcomes were reported in two studies and the rate of live birth was 70%. Conclusions: Patients who were supported with ECMO had acceptable rates of both
ICU setting and associated with significant mortality. Intensivist-led multidis-

ciplinary outreach teams may lead to earlier effective treatment of patients with severe sepsis/septic shock leading to improved clinical outcomes. Additional

ersearch is needed to validate these observations.

1068 CORRELATION OF SERUM TOTAL ANTIOXIDANT

CAPACITY WITH SEVERITY IN CRITICALLY ILL SURGICAL

PATIENTS

Ji Young Jang, Hongjin Shim, Seung Hwan Lee, Jae Gil Lee

Learning Objectives: Various biomarkers for early diagnosis of sepsis, such as lactate, pro-inflammatory cytokines and C-reactive protein and procalcitonin were known. Measurements of serum oxygen radical activity (ORA) and serum total antioxidant capacity (TAC) in sepsis patients can be used as early diagnostic marker of sepsis and tool for severity estimation. The purpose of this study was to evaluate the correlation between serum ORA, serum TAC and clinical severity in critically ill surgical patients with sepsis. Methods: This prospective observa-
tional study enrolled critically ill surgical patients with abdominal sepsis. Serum levels of ORA and TAC were measured by spectrophotometry-based antioxidant assay machine, and serum level of selenium and zinc, and plasma glutamine concent-
ration were also checked. For severity evaluation, sequential organ failure assessment (SOFA), multiple organ dysfunction (MOD) scores were evaluated on the 1st, 3rd and 7th day of ICU admission repetitively. Results: A total of 27 patients with sepsis, with a mean age of 69.1±7.9, APACHE II score of 22.4±8.0 and a mortality rate of 14.8 %, were included. Serum TAC level in patients with abdominal sepsis correlated positively with SOFA (r = -0.518; P < 0.001, r = 0.551; P < 0.001, r = 0.626; P < 0.001) and MOD scores (r = 0.599; P < 0.001, r =

0.607; P < 0.001, r = 0.547; P = 0.05) on ICU day 3, 5, 7. Serum ORA correlated negatively with SOFA and MOD scores on ICU day 3 ( r = -0.495; P < 0.05, r =

-0.497; P < 0.05). Serum zinc and selenium levels were lower than the refer-
ence values during observation period. There was no significant relation between clinical severity and serum or plasma levels of antioxidants (selenium, zinc and glutamine). Conclusions: Serum TAC level may be used as a biomarker to pre-
dict severity of sepsis in critically ill surgical patients.

1069 SEPSIS WITHOUT WALLS: A QUALITY IMPROVEMENT

PROJECT

James Gasperino, Evangeline Gabriel-Jocson, Erik Perez, Ronni Levy, Luciano Lemos-Filho

Learning Objectives: Sepsis ranges in severity from mild viral sign alterations, organ system failure (i.e., severe sepsis) to septic shock. Although severe sepsis and septic shock are common diagnoses in the ICU, sepsis may be under-recognized outside the ICU until severe symptoms manifest. Methods: We recently created a critical care outreach service (CCOS) that responds to emergencies outside the ICU setting. As part of an ongoing quality improvement project to identify patients with sepsis, we performed a sepsis screen on all patients evaluated by the service. We hypothesized that the prevalence of sepsis outside the ICU is high, and contributes significantly to hospital all-cause mortality at our institution. To test this hypothesis, we used a validated sepsis screening tool to determine the presence of sepsis for 226 consecutive patients treated by the service for any reason. Results: Approximately 70% of patients had a positive sepsis screen (s screen 69%). Single or multiple organ system involvement accounted for over 75% of consultations. Patients with sepsis were older than patients without sepsis (71 yr vs 66 p=0.06). Full code patients with sepsis had a higher all-cause mortality rate than full code patients without sepsis (25.4% vs 8.5% p <0.012), a difference which persisted after adjusting for age (OR 3.7 [1.3-10.6, p<0.02]). However, among patients who were DNR the difference in mortality was not significant (63.5% vs 54.5%; p=0.56). Hospital length of stay was higher in patients with sepsis than in patients without sepsis (15.4 days vs 6.5 days; p <0.001). Com-
pared to regulatory benchmarks, the CCOS was associated with reduced hospital mortality (25.5% vs 30.6%), and improved compliance with several key elements of the sepsis bundle. Conclusions: The prevalence of sepsis is high outside the

maternal and neonatal survival. The role of ECMO in this patient population, however, remains unclear and these results should be interpreted with caution. In the past yr, the emergence of highly specialized ECMO facilities and improve-
ment in ECMO technology makes it a viable lifesaving procedure in peri-partum

women suffering from ARDS. Further studies are needed to elaborate the pro-
posed benefit of ECMO in pregnant and postpartum women.

1070 EVALUATION OF NOREP / MAP INDEX AS MORTALITY PREDICTOR IN SEPTIC SHOCK SECONDARY TO PNEUMONIA

Carmen Hernández Cárdenas, Gustavo Lugo Goytia, David Vargas

Learning Objectives: Severe pneumonia is a major cause of septic shock and admission to a respiratory ICU. Severe hypotension in this setting is due to decreased vascular tone secondary to cytokine release. Norepinephrine has been recommended as the vasopressor of choice in septic shock, because it increases vascular tone and improves blood pressure. Thus, blood pressure may be no lon-
ger a good predictor of the severity of septic shock. We propose a new index based on the ratio NE / MAP to assess the severity of septic shock in patients with severe pneumonia. Therefore, the purpose of this study was 1) to determine whether the NE/MAP index of survivors (S) are different of those of nonsurvivors (NS) and 2) to analyze their predictive performance. Methods: 110 consecutive patients diagnosed with severe pneumonia and septic shock were included. At admission the clinical characteristics, hemodynamic parameters, and SOFA score were obtained. The NE/MAP index was calculated as the higher NE dose and its associated MAP using the following formula: (NE (mcg/kg/min)/MAP) x 1000. Univariate and multivariate logistic regression, and ROC curves were applied in the analysis. RICU mortality was the outcome variable. Results: In the univari-
ate analyis only the SOFA score and NETAM index were different between S and NS. In the multivariate analysis NETAM index remained as an independent predictor of mortality OR 1.32(95% CI 1.12−1.56, p<0.001). The analysis of the ROC curve was significant (AUC .723, p<0.001) with a cutoff of 1.15, with a sensitivity and specificity of 87.5% and 38.7% respectively. However, a cutoff of 3.5 increased the specificity to 85% with a reduction in sensitivity to 47.9% Conclusions: Our results show that NETAM index reflects the severity of septic shock in patients with severe pneumonia. Its validation would facilitate compari-
sons between groups of patients, daily monitoring and decision making.

1071 PLATELET HMGB1 REGULATES NEUTROPHIL

RECRUITMENT AND PLATELET NEUTROPHIL

INTERACTION DURING SEPSIS

Hui Zhou, Meihong Deng, Melanie Scott, Matthew Neal, Jianguo Li, Timothy Billiar

Learning Objectives: Platelets are recognized to play an important role in inflammation. Platelet-neutrophil interaction is increased in inflammatory disease, which can enhance neutrophil recruitment and activation. Platelets can express lots of cytokines and chemokines including HMGB1. But the specific role of HMGB1 on platelets during sepsis is unclear. Here we inves-
tigated the specific role of HMGB1 on platelets in immune response during sepsis. Methods: C57BL/6(WT), platelet specific HMGB1 knockout (PF4-HMGB1KO) mice and HMGB1flox mice were subjected to CLP for 18h and

LPS injection for 6h. Bacterial load in peritoneum, blood and lung were significantly increased in PF4-HMGB1KO mice than control (PLF bacterial: 1.04E+7 ± 1.76E+7 vs 1.88E+9 ± 3.36E+9 CFU/mL; HMGB1 flox vs PF4HMGB1KO) at 18h (p<0.05). Associated MAP using the following formula: (NE (mcg/kg/min)/MAP) x 1000.
production than co-cultured with HMGB1KO platelets. The IL-6 and IL-1β level is significantly higher in PF4-HMGB1KO mice than WT and HMGB1KO after LPS injection (10mg/Kg). **Conclusions:** Platelet HMGB1 regulates neutrophil recruitment by affecting platelet-neutrophil interaction and inflammatory response. But platelets are not the main source of plasma HMGB1 during sepsis.

1072
PROCALCITONIN AS A MARKER OF SEPSIS IN CARDIAC AND NON-CARDIAC RAPID RESPONSES
Chirag Patel, Yen-Hong Kuo, Kathleen Casey, Albert Rojtman, Marnie Rosenthal

**Learning Objectives:** Procalcitonin (PCT) is effective in distinguishing bacterial or other causes of sepsis, and used to stop antibiotics when low. Few studies evaluate PCT at a Rapid Response (RR) when immediate medical action is required. We evaluated all RRs to 1) determine if PCT differs in bacterial versus other causes of patient decompensation in a non-ICU setting, and 2) correlate PCT with Cardiac (C) or Non-Cardiac (NC) RRs with or without sepsis.**Methods:** In an IRB approved cohort study, PCT measurements were measured at initiation of consecutive RRs on a commercial assay (BioMerieux, Durham, NC). Medical records were reviewed. The first RR from a single patient’s hospitalization was included. Primary reason for call was extracted from institutional RRs record and stratified into cardiac (C) or non-cardiac (NC) events: C: abnormal heart rate, blood pressure, chest pain, syncope or new rhythm; NC: Respiratory (abnormal rate, oxygenation, airway, or respiratory failure), Neurologic (seizure, altered mental status or sensory/motor function), and Medical/Laboratory related (hemorrhage, temperature failure, medication/transfusion reaction or electrolyte, hemoglobin or ABG abnormality). Sepsis was determined by Systemic Inflammatory Response Syndrome (SIRS) criteria plus a documented infection as per retrospective chart review. **Results:** Of 181 RRs, 32 (18%) were C and 149 (82%) were NC: 36 (20%) with and 113 (60%) without sepsis. Two C RRs had sepsis. For those C RRs, median PCT was lower (<0.05 vs. 0.23, P=0.0002). For RRs with sepsis, median PCT was higher (0.35 vs. 0.12, P=0.0002). PCT distributions among the combinations of C/RRs and sepsis are different (P<0.0001). Among NC RRs, median PCT value was higher in those with sepsis (0.35 vs. 0.19, P=0.004). In C RRs, without sepsis, the median PCT values were lower (<0.05 vs. 0.19, P=0.0016). **Conclusions:** Most RRs were NC without sepsis. Overall, RRs with sepsis had higher PCT: the NC cohort is statistically significant, while C cohort shows a potential difference and deserves further evaluation with larger sample sizes.

1073
NEW HEMOSTATIC SCORE ADDING PROTEIN-C AND ANTITHROMBIN MAY BETTER IDENTIFY SEPSIS-INDUCED COAGULOPATHY
Jean-Francois Mathieu, Sylvie Beucher, Jean-Pierre Pellerin

**Learning Objectives:** Severe Sepsis (SS) is associated with Systemic Inflammation and Acute Organ Dysfunction. Different mechanisms are involved in the development of Organ Failure. Hemodynamic Instability is the most obvious. SS leads to production of pro-inflammatory cytokines, and may induce a procoagulant state, including Down-Regulation of Natural Anticoagulants. Fibrin production can form clots in the microvasculature, disrupt blood flow to vital organs, and lead to Multiple Organ Dysfunction Syndrome (MODS). **Methods:** Definition of DIC is based on a scoring system using biomarkers: Platelets, PT, D-Dimers, Fibrinogen. We have added Protein-C (PC) & Antithrombin (AT), Natural Anticoagulants; & Deleted Fibrinogen. Acute Phase Reactant;74 patients, admitted to the ICU with Sepsis, were screened for: All-cause mortality at one month, Number of Organs with Acute Dysfunction (NOAD), Hematologic Biomarkers, Calculation of our Novel Hemostatic Score (H5 Score) described before c-DEC:2012, Crit Care Med (Suppl. Abst.818):OCT 21:2014 CHESTI46(Suppl. Abst.23A).**Results:** All-cause mortality was 55%. The 41 patients who died had an average of 5.5 NOAD, while the 33 survivors had a mean NOAD of 3.5 (p<0.001). Patients who died showed an average HS of 8.8 points, compared to 6.6 in survivors (p=0.001). Contrast in PC values was seen between patients who died (0.34Un/l), compared with those who survived (0.53Un/l) (p<0.001). AT values were respectively 0.41Un/l and 0.55Un/l in patients who died, compared with survivors (p=0.003). Average Platelet counts were 101 in patients who died, & 154 in survivors (p=0.011). **Conclusions:** A relationship was seen between severity of Sepsis-Induced Coagulopathy (SIC), and a poor outcome. Low values of PC & AT, and a high HS, are all associated with an increased NOAD, a higher risk of MODS & Mortality. Restoring Normal Perfusion Pressure may not (always) be enough to avoid vital organs hypoxia, MODS & death. Indeed, DIC is now recognized as an independent predictor of mortality. Thus, even in the face of stable systemic hemodynamics, if Sepsis is a disease of Microcirculation (as an organ-system), reactivating this organ may be as important as giving volume & antibiotics.

1074
MAKING SIGNIFICANT REDUCTIONS IN REPORTABLE SEPSIS MORTALITY DATA: ACCURATE CLASSIFICATION IS KEY
Joseph Carrington, Paul Szasybor, Jaime Barnes

**Learning Objectives:** Early recognition and timely therapy has improved sepsis mortality. Yet many hospitals still report mortality rates above the national average. Centers of Medicare and Medicaid Services (CMS) have announced severe sepsis and septic shock as core-measures for hospital inpatient quality measuring, which financially penalizes institutions with elevated mortality rates. Identifying suboptimal processes can improve resource allocation and mortality rates. We hypothesized that inaccurate documentation is a key process leading to erroneously elevated mortality reports. **Methods:** We performed a retrospective chart review of consecutively discharged patients over 90 days with diagnosis-related group (DRG) codes for sepsis, septicemia, severe sepsis, septic shock, pneumonia, and urinary tract infection (UTI). Accuracy of coding was assessed based on standardized definitions of sepsis. Mortality was reported at time of discharge. **Results:** Of 629 patients, only 92 were coded with DRGs for severe sepsis (n=42) or septic shock (n=50). Upon chart review, 172 patients actually had severe sepsis (n=132) or septic shock (n=40) but were mislabeled. Thirty-six charts were coded as pneumonia or UTI but met criteria for severe sepsis. Ten charts were coded as septic shock but actually had cardiogenic shock. Mortality reporting in severe sepsis was grossly over estimated at 11.9% (actual mortality 3.8%). Mortality reporting in septic shock was slightly underestimated at 20% (actual mortality 22.5%). Correcting for these discoveries, our combined reported mortality decreased from 16.3% (15/92) to 8.1% (14/172). **Conclusions:** Inaccurate documentation of severe sepsis and septic shock falsely elevates hospital mortality rates and can potentially impact hospitals financially through reimbursement loss and CMS penalties. Institutions should emphasize education on sepsis classification and provider documentation and consider clinical documentation specialists for more accurate reports.

1075
THE INFLUENCE OF SEPSIS ON SLEEP ARCHITECTURE IN THE ICU
Frank Genese, Miguel Martillo, Izzmin Ventura, katherine Fuhrmann, Eric Yudilevich, Marie Mortel, Anirban Basu, Raymonde Jean

**Learning Objectives:** Critically ill patients experience poor sleep quality with severe sleep fragmentation. Sepsis appears to affect sleep architecture, likely through neuro-hormonal imbalance and direct effect on the electrical activity in the central nervous system. Atypical sleep patterns have been observed in ICU recorded data. Our goal was to assess whether there was an association between sepsis and sleep architecture in the ICU. **Methods:** In this prospective cohort study, we studied 31 subjects between December 2014 and July 2015 from two medical ICUs in New York City. Recordings were acquired from three frontopolar EEG signals (AF7/AF8, AF7/Fpz and AF8/Fpz) using portable polysomnography (Sleep Profiler®) once while each subject was intubated and again following extubation. We computed the median power spectral densities of the delta, theta, alpha, beta and beta bands used to auto-stage sleep. We evaluated the total and relative power spectra for each of these bands during NREM sleep and analyzed it with student t-test for statistical significance. **Results:** A total of 31 paired intubated and post extubation studies were analyzed. A diagnosis of sepsis was present in 45% of them. The average age in the sepsis group was 75.7 yr (± 10.1)
1076
effect of blood culture acquisition time relative to antibiotic administration on diagnostic yield
David Murphy, Elizabeth Overton, James Steinberg, Jesse Jacob

Learning Objectives: Current Surviving Sepsis Campaign clinical practice guidelines support obtaining blood cultures prior to antibiotic administration, but empiric antibiotic administration should not be delayed to obtain cultures. We describe the effect of blood culture acquisition time relative to antibiotic administration on blood culture yield. Methods: We evaluated a retrospective cohort of inpatients who had a set of blood cultures collected 6 hr before or after first antibiotic. The primary exposure of blood culture collection time was classified relative to first antibiotic administration. Covariates included patient demographics, severity of illness (e.g. Charlson Comorbidity Index), and hospital course (e.g. location of first antibiotic, fever). The outcome was blood culture yield (i.e. any bacterial growth detected). A multivariable logistic regression model evaluated the independent effect of collection time (before vs. after antibiotics) on culture positivity. Results: Among 3,498 patients, 6.9% cultures were collected. First antibiotic administration occurred in the ED for 87% of patients. Cultures were obtained prior to antibiotic administration for 3,069 patients (88%) representing 6,138 culture samples. Cultures were positive for 412 (13%) of the patients with cultures collected before antibiotic administration, compared to 38 (9%) of cultures collected after antibiotic administration (p<0.01). In multivariable analysis, obtaining cultures after antibiotic administration remained independently associated with a lower likelihood of culture positivity (Odd’s Ratio: 0.70 [95% CI: 0.49 – 0.99]). Conclusions: In this population, the vast majority of blood cultures are drawn prior to antibiotic administration. However, among patients for whom blood culture acquisition is delayed, the likelihood of blood culture positivity is greatly reduced. Organizational efforts that support obtaining blood cultures prior to antimicrobial will optimize blood culture yield. Such efforts have potential to improve antibiotic stewardship by minimizing potentially false negative blood cultures.

1077
predictors of outcomes with endocrine support in septic shock
Jason Ferreira, Brittany Bissell, Michael Eldman

Learning Objectives: The utilization of corticosteroids or vasopressin as adjunctive therapy to norepinephrine (NE) has been suggested for the maintenance of mean arterial pressure in septic shock. Data suggests earlier initiation of endocrine therapy may reduce adverse effects and NE requirements. The purpose of this study was to evaluate patient attributes associated with the occurrence of adverse effects and predict therapeutic response to endocrine therapies. Methods: Patients were divided based on receipt of vasopressin or hydrocortisone as second-line therapy to NE. Patients who straitified into Early (<2 hr) vs. Late (>2 hr) and Low dose (> 10 mcg/min) vs. High dose (< 10 mcg/min) of NE to evaluate impact on adverse effects and on further care. Groups were also evaluated correlation between predefined patients characteristics and mortality. Results: The initiation of endocrine support at low doses of NE was associated with significantly less arrhythmia (15.9% vs. 32.1%; p=0.024). Patients receiving hydrocortisone who experienced an arrhythmia had higher rates of mortality (22.2% survivors vs. 77.8% expired; p<0.01). Early initiation of hydrocortisone was associated with a lower requirement of additional catecholamine (9.8% vs. 44.4%; p<0.001) while response to vasopressin was associated with earlier initiation (time from NE to vasopressin 0.4 hr vs. 1.75 hr; p=0.02) and an elevated cortisol level (86.6 mcg/dL vs. 43.9 mcg/dL; p=0.04). Patients receiving duplicate endocrine therapy had significantly less mortality than those on vasopressin therapy alone (64.3% of survivors vs. 35.7% expired; p= 0.04). Conclusions: Early initiation of endocrine support was associated with significantly less receipt of additional catecholamines and a lower risk of arrhythmia. Patients with an intact adrenal axis appeared more responsive to vasopressin. Early initiation appears to be associated with improved outcomes, however further research is required to determine which population may benefit most from these therapies.

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utility of nirs for outcome prediction in critically ill children with sepsis/septic shock
Lara Nicolas, Ravi Samraj, Joseph Philip

Learning Objectives: Severe sepsis and septic shock constitute a major cause of morbidity and mortality in critically ill children, and is a leading cause of admission to the PICU. Early diagnosis and prompt treatment have the greatest impact on clinical course and outcome. Noninvasive, transcutaneous oximetry based on NIRS is becoming a standard of care and has been used as a non-invasive surrogate marker for ScvO2. NIRS has been extensively used to monitor oxygen delivery to the brain in adults, children and infants. A noninvasive and reproducible measure of tissue hypoxia would be a valuable asset in the resuscitation armamentarium. Consequently, the aim of this study is to determine if cerebral and somatic NIRS can be used as a bedside tool to predict outcomes in children admitted to the ICU with sepsis/septic shock. Methods: A prospective non-randomized cohort study of children 0–21 yr of age admitted to the PICU at Shands Children's Hospital, UF Health with sepsis or septic shock. Variables of interest include age, weight, admission vital signs, admission cerebral and renal NIRS, 24 hour cerebral and renal NIRS, 48 hour cerebral and renal NIRS, IV fluid requirement, inotropic medications used, organ dysfunction markets (liver, kidneys, brain), ventilator days, life saving measures, admission PELOD score, daily PELOD score, ICU length of stay (LOS), hospital LOS and final outcome (mortality, discharge). Results: 28 patients with diagnosis of sepsis were admitted to the PICU. 21 patients had cerebral NIRS on admission < 75% (75%). The average length of ICU stay was 12.8 days for the group with lower cerebral NIRS vs. 7.3 days for the group with normal or high NIRS. Also the patients with lower NIRS were more likely to require inotropic support (57.2% vs 28.5%) and invasive or non-invasive ventilator support (57.1% vs 28.5%). Only 1 patient in the low NIRS group died in the ICU (4.7%), vs. none in the other group. Conclusions: Lower cerebral NIRS in children with sepsis is associated with higher mortality and morbidity (ICU stay, ventilator days) compared to children with normal NIRS.

1079
evaluation of a severe sepsis order set in the surgical ICU
Rachel Kruer, Alan Rozycki, Andrew Jarrell

Learning Objectives: Delay in the initiation of appropriate antibiotic therapy has been recognized as a risk factor for mortality. At Johns Hopkins Hospital an order set may be utilized for patients with severe sepsis or septic shock to expedite antibiotic ordering, processing, and administration. The order set allows providers to bypass an antibiotic approval process. The purpose of this study was to determine if providers are ordering the order set appropriately, and to determine our mean time to antibiotic administration. Methods: A retrospective analysis was conducted by the use of chart review for the first 50 eligible patients (from July through September 2014). Time to administration of antibiotics was defined as the time from when the order set was ordered to the time the first antibiotic was marked off as given on the medication administration record. Sepsis was defined as a documented or suspected infection plus 2 or more of the SIRS criteria. Infection was considered documented or suspected if the provider ordered bacterial culture or urinalysis within one hour of ordering antibiotics. A patient was determined to have severe sepsis if the patient was determined to have sepsis plus sepsis-induced organ dysfunction or tissue hypoperfusion. Appropriate use of the order set was defined as a patient meeting criteria for severe sepsis. Results: Median time to administration of all antibiotics was 59 min (IQR: 41–93). Time to administration was shortest in patients that received ciprofloxacin first at a
median of 23 min (IQR: 21–41) and the longest time to administration were patients who received vancomycin first with a median time of 84 (IQR: 49–132) min. Of the 50 patients ordered the severe sepsis order set, 43 (86%) were considered to have severe sepsis and qualified for the use of the order set. The severe sepsis order set was improperly used in 7 (14%) patients. Conclusions: With the utilization of the order set, antibiotics were administered in less than 60 min. There was a high rate of appropriate use.

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THE EFFECT OF PROTOCOL-BASED RESUSCITATION FOR SEPTIC SHOCK: A META-ANALYSIS
Woo Kyung Lee, Jeongmin Kim, Sungwn Na

Learning Objectives: As recommended by the Surviving Sepsis Campaign guidelines, protocol-based resuscitation or goal-directed therapy (GDT) is broadly advocated for the treatment of septic shock. However, the most recently published trials showed no survival benefit from protocol-based resuscitation in septic shock. We performed a meta-analysis to assess the effect of protocol-based resuscitation on clinical outcomes in septic shock patients. Methods: We performed a systematic review using meta-analysis. We searched electronic search engines including PubMed, Embase and the Cochrane database for all publications comparing protocol-based GDT with usual or standard care in septic shock and severe sepsis. Results: A total of 9657 septic shock patients and twenty-four studies were included (11 randomized controlled trials and 12 observational studies). The overall RR (95% CI) of mortality for GDT with conventional care was 0.746 (0.631–0.883, p < 0.001). The RR (95% CI) of mortality for GDT with conventional care in the meta-analysis was 0.93 (0.75–1.16; p = 0.024) for randomized controlled trials. The effect of GDT favoring survival was decreased as the recent studies were added by cumulative meta-analysis. No significant publication bias was found. Conclusions: The result of this meta-analysis suggests that GDT reduces mortality in patients with severe sepsis or septic shock. However, cumulative meta-analysis revealed that the effect of risk reduction was decreased as the recent studies were added.

1081
SUPERCOMPUTING SIMULATION OF 40 MILLION IN SILICO PATIENTS TO CHARACTERIZE THE LANDSCAPE OF SEPSIS
Gary An, Chase Cockrell

Learning Objectives: Interpreting -omics data and translating basic science knowledge to a clinical context is a persistent challenge. The high-dimensional and temporally sparse nature of -omics data produces too many possible explanations by which it arises, presenting an intractable problem using traditional experimental methods. The inability of these methods to capture the clinical dynamics of sepsis limits achieving true prediction. Other fields of science have used computational modeling and simulation to help contextualize multi-dimensional data in order to describe system function. Advances in supercomputer-aided modeling can provide this same capability to biomedical research, including in the area of sepsis. Methods: A previously validated agent-based model (ABM) of sepsis was implemented on a Cray XE6 supercomputer. 40 million patients were simulated, representing a 28 day hospital course due to microbical sepsis. Parameter space exploration was performed regarding: host cardio-respiratory-metabolic resilience; two properties of microbial virulence, invasiveness and cytotoxicity; and degree of environmental contamination. Principle component analysis (PCA) was used to visualize behavior in multi-dimensional parameter space, and inflammation landscapes generated based on mortality thresholds and Kolmogorov-Smirnov similarity ordering of population outcome distributions. Results: PCA identified clear structure to model behavior, with defined boundary conditions for parameter sets plausibly corresponding to clinical behavior across a range of initial insults: complete recovery, hyperinflammatory system failure, and overwhelming infection. Within this landscape region, only the degree of environmental contamination demonstrated lack of parameter sensitivity with respect to infectious mortality, suggesting a finite limit to the efficacy of infection control strategies. Conclusions: Supercomputing simulations of sepsis can play a vital role in the contextualization of both Big Data output and mechanistic basic science research, a necessary step towards developing truly predictive models and precision therapies.

1082
INVESTIGATING A NOVEL SEPSIS RISK INDEX FOR USE IN AN INTELLIGENT ANTIBIOTIC DECISION SUPPORT SYSTEM
Scott Pappada, Ph.D., John Feneely, Thomas Papadimos, Jose Salinas, Elizabeth Mann-Salinas

Learning Objectives: Optimizing the timing of antibiotic therapy (i.e. onset time, dosing values, and ongoing management) is critical to improving patient outcomes. The risk of mortality in patients with severe sepsis or septic shock may increase significantly with as little as a one-hour delay in antibiotic administration. The goals of this project were: (1) develop a predictive models using electronic medical records (EMR) data that form the diagnostic criteria for sepsis, and (2) derive a 0–100 Sepsis Risk Index (SRI) that represents the “risk” for a patient to acquire sepsis based on a combination of real-time and predicted EMR data. Methods: The dataset used for this project included data from 12 adult, burn patients. Each subject had 59 clinical variables that were recorded hourly for 72 hr prior to an episode of septic shock. Sepsis was defined as hemodynamic instability with contemporaneous blood culture collection and empiric antibiotic administration. We developed a set of artificial neural network (ANN) predictive models for EMR data variables commonly used as diagnostic criteria for sepsis. ANNs were designed to predict future EMR data values at 1, 2, and 3 hr (i.e., 3 hour prediction horizon – PH). Using ANN output and EMR data, we developed a novel SRI to stratify the real-time risk of a patient to develop sepsis. The SRI is output on a scale of 0 to 100 (where 100 equals maximum risk for sepsis). Results: Error between ANN-generated predictions and reference EMR data sources including heart rate, respiration rate, and temperature ranged from 11.7%–16.1% across the 3 hour ANN PH. The SRI algorithm was applied to the burn patient dataset, and predicted potential need for initiation of antibiotic therapy hours before antibiotics were actually delivered in practice amongst patients who acquired sepsis and died. Conclusions: Both the ANN-based predictive models and SRI algorithm are being integrated into an intelligent antibiotic decision support system currently under development. Future clinical studies and data analysis are planned to optimize accuracy and predictive power of both approaches.

1083
HOURLY DELAYS TO ANTIMICROBIAL THERAPY DO NOT INCREASE ONE-YEAR MORTALITY IN PEDIATRIC SEVERE SEPSIS
Moonjoo Han, Julie Fitzgerald, Fran Baldamuth, Marianne Chilutiri, Robert Grundmeier, Vinay Nadkarni, Neal Thomas, Scott Weiss

Learning Objectives: Delayed antimicrobial therapy in sepsis is associated with in-hospital mortality. We tested the hypothesis that hourly delays to antimicrobial therapy are also associated with one-year mortality in pediatric severe sepsis. Methods: We performed a retrospective observational study of consecutive patients treated for severe sepsis in a large, academic PICU from January 2012 to June 2013. We tested the association between hourly delays to initial antimicrobial therapy and one-year all-cause mortality using multivariable logistic and Cox regression models. Because our a priori planned analyses showed increased one-year mortality in patients given antimicrobials ≤1 hr from sepsis recognition, we also conducted a post hoc analysis comparing one-year mortality between patients given antimicrobials at ≤1, 1–3, >3 hr from sepsis recognition. Results: One hundred sixty patients were analyzed. Median age was 6.3 yr (IQR 1.5–13.8) and 55% were male. Overall one-year mortality was 24%, including 20 patients who died after PICU discharge. Median time from sepsis recognition to initial antimicrobial therapy was 137 min (IQR 65–287). Multivariable analyses adjusted for severity of illness and comorbid conditions found no association between hourly delays up to >3 hr with one-year mortality. However, increased one-year mortality was evident in patients who received initial antimicrobials ≤1 hr (aOR 3.8, 95% CI 1.2, 11.7) or >3 hr (aOR 3.5, 95% CI 1.3, 9.8) compared to patients who received antimicrobials within 1–3 hr. For the subset of PICU survivors, initial antimicrobial therapy ≤1 hr was associated with increased one-year mortality (aHR 6.3, 95% CI 1.6, 25.0) and initial antimicrobial therapy >3 hr trended toward increased one-year mortality (aHR 2.5, 95% CI 0.64, 9.67). Conclusions: Although hourly delays to initial antimicrobial therapy have previously been associated with in-hospital mortality, they were not associated
with one-year mortality. The unexpected finding of increased one-year mortality in patients given antimicrobial therapy ≤1 hr from sepsis recognition requires further study.

1084 EVALUATION OF CODE SEPSIS AT A URBAN COMMUNITY TEACHING HOSPITAL
Basirat Sanuth, Katherine Wang

Learning Objectives: In 2004, the Surviving Sepsis Campaign (SSC) published the first guideline. The guidelines were updated in 2012 and provided a 3- and 6-hour bundle for early goal-directed therapy. In March of 2014, MSH implemented code sepsis (CS) and the treatment bundle was adapted from the SSC guidelines. Methods: This study was conducted from April to August of 2014. The requirement for triggering Code sepsis were two major criteria (temperature < 96.8°F or > 100.9°F; hypotension with mean arterial pressure < 65mmHg) and at least one of two minor criteria (tachycardia with heart rate >90 bpm; tachypnea with respiratory rate >20 breaths/min) in patients with suspected sepsis. The six MSH CS bundle elements include obtaining serum lactate levels, resuscitation with crystalloids, obtaining cultures, initiation of broad spectrum antimicrobial therapy (AT), appropriate AT per MSH antibiotic guideline and cultures drawn before AT within 1 hour of sepsis recognition. The primary objective of the study was the appropriateness of CS initiation. The secondary objectives were adherence to the CS treatment bundle, length of hospital stay and mortality. Results: Thirty-one CS were called in 27 patients (87.1%) in the ED, 1 patient (3.2%) in the MICU and 3 patients (9.7%) on the medical stepdown floors. Patients in the study were mostly male (67%) with a mean age of 59 yr. For the primary outcome, nine patients (29%) met the code sepsis criteria (CSC). For the secondary outcome of adherence to the CS bundle, none had 0%, 1 patient (3%) had 10%, none had 33%, 9 patients (29%) had 50%, 6 patients (19%) had 67%, 15 patients (48%) had 83%, and none had 100% compliance to the NHSH CS bundle elements. A longer length of hospital stay was seen in patients meeting CSC compared to patients not meeting CSC, 9 vs. 5.7 days, respectively. Lastly, a higher mortality rate was seen in 2 patients (22.2%) meeting CSC and 3 patients (15.6%) not meeting CSC. Conclusions: Code sepsis is triggered inappropriately often. Completing the MSH CS bundle elements within 1 hour is stricter than the SSC guideline leading to decreased adherence.

1085 RESPIRATORY SUPPORT IN PEDIATRIC PATIENTS PRESENTING WITH SEPTIC SHOCK
Whitney Kopp, Kent Korgen, Kent Resler, Jennifer Workman, Gite Larsen, Susan Bratton

Learning Objectives: The Surviving Sepsis Campaign (SSC) recommends early fluid resuscitation of at least 60 mL/kg within the first hour for children identified with septic shock. No recent studies have evaluated the association between rapid fluid resuscitation and respiratory compromise. Methods: This is a single center retrospective cohort study of children presenting to the emergency department whose care was transferred to the ICU from 2008–12. The study took place at a tertiary children’s hospital with a long-standing emergency department septic shock quality initiative. We compared level of respiratory support with ongoing fluid resuscitation within the first 24 hr. The analysis was preformed with SAS using nonparametric tests to compare groups and logistic regression to adjust for potential confounders. Statistical significance was defined as p <0.05. Results: 243 children were studied. The median resuscitation volume/kg during the first 24 hr for all respiratory groups except those who received invasive mechanical ventilation was 60 cc/kg. Sixty-five children (27%) ultimately were intubated; 40 (16%) received non-invasive positive pressure ventilation, while 54 (22%) received high-flow nasal cannula (HFNC) during their care. Volume of fluid resuscitation significantly increased among those who were intubated (median 80 cc/kg vs. 60 cc/kg). Intubated patients were more likely to have a complex chronic condition (34% vs. 31%), a higher risk of mortality (median PIM2 score 5.2 vs. 2.5) and to receive vasoactive medications (48% vs. 25%). Of the children who met the SSC goals for fluid resuscitation, 36% were intubated. Adjusted for confounding factors, children who received 80 cc/kg had 1.5 times increased risk while risk increased 2.2 times for those who received 100 cc/kg compared to those receiving 60 cc/kg. Six percent of children died but mechanical ventilation was not associated with death. Conclusions: Receipt of 60 cc/kg or more of fluid in the first 24 hr of care is independently associated with an increased risk of invasive ventilation but not death.

1086 PROCALCITONIN AND C-REACTIVE PROTEIN AS OUTCOME PREDICTORS IN CRITICALLY ILL SEPTIC PATIENTS
Jeong-Am Ryu, Jeong Hoon Yang, Dae Sang Lee, Chi-Min Park, Gee Young Suh, Kyeongman Jeon, Joongbum Cho, chi ryang Chung

Learning Objectives: Sepsis is a major cause of mortality and morbidity in critically ill patients. Procalcitonin (PCT) and C-reactive protein (CRP) are the most frequently used biomarkers in sepsis. We investigated changes in PCT and CRP concentrations in critically ill patients with sepsis to determine which biochemically marker better predicts outcome. Methods: We retrospectively analyzed 171 episodes in 157 patients with severe sepsis and septic shock who were admitted to the Samsung Medical Center ICU from March 2013 to February 2014. The primary endpoint was patient outcome within 7 days from ICU admission (treatment failure). The secondary endpoint was 28-day mortality. Results: Severe sepsis was observed in 42 (25%) episodes from 41 patients and septic shock was observed in 129 (75%) episodes from 120 patients. Fifty-five (32%) episodes from 42 patients had clinically-documented infection and 116 (68%) episodes from 99 patients had microbiologically-documented infection. Initial peak PCT and CRP levels were not associated with treatment failure and 28-day mortality. However, PCT clearance (PCTc) and CRP (CRPc) clearace were significantly associated with treatment failure (p = 0.027 and p = 0.030, respectively) and marginally significant with 28-day mortality (p = 0.004 and p = 0.062, respectively). The AUC for prediction of treatment success was 0.71 (95% CI, 0.61 – 0.82) for PCTc and 0.71 (95% CI, 0.61 – 0.81) for CRPc. The AUC for survival prediction was 0.77 (95% CI, 0.66 – 0.88) for PCTc and 0.77 (95% CI, 0.67 – 0.88) for CRPc. Conclusions: Changes in PCT and CRP concentrations were associated with outcomes of critically ill septic patients. CRP may not be inferior to PCT in predicting outcome in these patients. We propose that CRP may be as effective as PCT in predicting the outcome of critically ill patients with severe sepsis and septic shock. In addition, CRP testing is more cost-effective and readily available than PCT testing, which makes CRP testing superior to PCT.

1087 OBSTRUCTIVE SLEEP APNEA DOES NOT MODIFY SEPSIS SEVERITY AND RELATED OUTCOMES
Vikas Bansal, Muhammad Mangi, Pablo Moreno-Franco, Festic Emir, Vichaya Arunthari, Augustine Lee

Learning Objectives: Animal studies demonstrate sleep disturbance can negatively affect host immunologic defenses and lead to bacteremia and death. However, whether obstructive sleep apnea (OSA) could impact the incidence and outcomes of sepsis in humans is unknown. We planned a pilot prospective observational study to explore whether OSA might affect sepsis severity and sepsis related outcomes. Methods: We identified 74 subjects with sepsis admitted to a tertiary academic center (September 2013 to March 2014). Subjects were excluded if patients had an otherwise terminal illness or received palliative care. We analyzed for whether clinically documented OSA would influence sepsis severity and related outcomes, including the need for mechanical ventilation (MV), development of acute respiratory distress syndrome (ARDS) and hospital mortality. Both univariate as well as multivariate analyses were performed. Results: The mean age and standard deviation (+/- SD) was 68 yr +/-17; and 59% were male. In all, 47% met criteria for severe sepsis (evidence of organ dysfunction or lactic acidosis) and 47% for septic shock (volume refractory requiring pressure); with a mean APACHE IV of 28 +/-5.9; OSA was present in 12%. In univariate analyses, OSA was significantly associated with body-mass index (BMI), but not with sex, age. APACHE-IV, sepsis severity, need for MV/ICU admission, ARDS; length of stay, or hospital mortality. In multivariate analyses, OSA was not independently predictive of sepsis severity or related outcomes, even after adjusting for age, sex, race/ethnicity, BMI and APACHE IV score. Further exploratory analysis of subjects with “untreated” OSA was limited by the unexpectedly high adherence (78%) of OSA patients to nocturnal noninvasive positive-pressure ventilation pre-hospital. Conclusions: In this pilot observational study,
study, we found no significant effect of OSA on sepsis severity or sepsis related outcomes, including ARDS and death. This may be confounded by a high treatment adherence rate and limited sample size. Future investigations exploring any potential link between OSA and sepsis should consider OSA severity and treatment adherence.

1088 EFFECT OF THE USE OF THEOPHYLLINE AND SEPSIS OUTCOMES
Yu-Ning Shih, Yung-Tai Chen, Raghu Sreethal, Ivo Aisiku, Gyorgy Frendl, Peter Hou

Learning Objectives: Although theophylline have been shown to have anti-inflammatory effects, the benefits of theophylline on sepsis remain a matter of debate. The aim of our study was to determine the sepsis outcomes of theophylline users and non-users. Methods: This nationwide, population-based, propensity score-matched analysis used data from the linked administrative databases of Taiwan's National Health Insurance program. Patients were hospitalized for sepsis between 2000 and 2009. Patients were divided into theophylline users and non-users. The primary outcome was in-hospital death. The secondary outcome was ICU admission, shock events, and the use of mechanical ventilation. Results: A propensity score-matched cohort of 86,318 theophylline users and 86,318 non-users was included. The in-hospital death was significantly lower in the theophylline users (OR 0.90, 95% CI 0.89–0.92) compared with non-users. The risks of shock event (OR 0.90, 95% CI 0.89–0.92) and mechanical ventilation (OR 0.96, 95% CI 0.94–0.98) were also lower in theophylline users than non-users. Conclusions: Theophylline use is associated with a lower risk of sepsis-related mortality compared with no theophylline use.

1089 CO-MORBIDITIES IN SEPSIS AND SEPSIS RELATED DEATHS
Tiffany Ynoesenco, Avery Smith, Tiana Endicott-Yazdani, Rachel Gardner, Ginger Tsai-Nguyen, Adan Mora

Learning Objectives: Sepsis is the number one cause of death in the ICU. Knowing how a patient's comorbidities affect their mortality would be a very useful tool for risk stratification. This study reviews the effects of various comorbidities on mortality in patients with sepsis. Methods: 100 patient charts designated as septic were obtained between the months of February and March 2015 at Baylor University Medical Center. The specified co-morbidities were documented for each patient along with whether they did or did not survive. This data were analyzed to determine which comorbidities placed a patient most at risk of death during sepsis. Results: Eighty-one patients survived to discharge (including those discharged to hospice). Of these, the most common comorbidity was hypertension at 59%. Nineteen patients did not survive and the most common comorbidity was again hypertension at 63%. Other comorbidities in the survivors versus the non-survivors included diabetes at 30% versus 47%, cirrhosis at 21% versus 16%, pulmonary disease at 27% versus 32%, cardiovascular disease at 21% versus 26%, and renal disease at 15% versus 21%. Of note, 19% of survivors had none of the comorbidities chosen for analysis versus 5% of the non-survivors. Conclusions: All of the comorbidities were more common in the non-survivors aside from liver disease. The most common comorbidity among both groups was hypertension, but it was more common among the non-survivors. Septic patients with a history of hypertension seem to have a higher risk of death than those without a history of the disease. Diabetes had a similar result being very common in both groups, but significantly over represented in the non-survivor group. Patients without any of the comorbidities studied had a higher likelihood of surviving.

1090 ARE THE CURRENT DEFINITIONS USED TO DETECT SEP-SIS ADEQUATE FOR PREDICTION OF SEPSIS SYNDROME?
Donna Armaignac, Heidi Fuxa, Julie Lamoureux, Carlos Valle, Emil Veledar

Learning Objectives: Sepsis screening is ubiquitously thought to enhance earlier recognition of illness to provide clinical utility. Following the Surviving Sepsis Campaign criterion, we electronically screened patients by auto-populating these traditional objective data and applied logic technologically to calculate abnormal thresholds. The purpose of this study was to determine to what extent our technologically enhanced method of screening is able to predict sepsis illness. Methods: Observational case control with logic filter applied to final discharge diagnoses matched to ACCP/SCCM definitions (all infectious codes, acute organ dysfunction codes, uro-sepsis, pneumonia, sepsis related and hospital acquired), 50,536 screenings, 20,079 (39.7%) categorized as missing, 1,008 (5.0%) of missing had a final diagnosis of sepsis. Results: Positive SIRS screen predicted: Sepsis: sensitivity 53.3%, specificity 72.7% (S&S), positive predictive value (PPV) 33.2%, and negative predictive value (NPV) 86%, respectfully. Severe sepsis: 78.6%, 69.6% (S&S), PPV 10.9%, NPV 98.6% Septic shock: 88.4%, 68.3% (S&S), PPV 4.1%, NPV 99.7%. Positive sepsis screen predicted: Sepsis: 35.3%, 91.1% (S&S), PPV 50.2%, NPV 84.7% Severe sepsis: 61.1%, 88.0% (S&S), PPV 19.4%, NPV 98.0% Septic shock: 74.8% &86.7%, PPV 8.0%, NPV 99.6% Positive severe sepsis screen predicted: Sepsis: 20.6%, 56.2% (S&S), PPV 58.1%, NPV 82.7%. Severe sepsis: 46.7%, 94.7% (S&S), PPV 29.4%, NPV 97.4% Septic shock: 67.7%, 93.8% (S&S), PPV 14.4%, NPV 99.5% 14% SIRS negative had sepsis: 67% SIRS positive did not. 15% Sepsis negative had sepsis; 50% sepsis positive did not. 3% severe sepsis negative had sepsis; 42% severe sepsis positive level did not. Conclusions: Despite electronically enhanced screening, too many false positives persist with SIRS induced threshold screening, while patients remain undetected at the lower severity of illness level. Current screening methods are not adequate for prediction of Sepsis Syndrome. Future work will include a more highly evolved and clinically relevant sepsis risk strata incorporating live streaming predictive analytics.

1091 EVALUATION OF THE PROGNOSIS OF SEPSIS WITH MASS SPECTROMETRY
Afonso Soares

Learning Objectives: Using mass spectrometry, we aim to identify protein profiles that can be used to evaluate the prognosis of sepsis. Methods: 15 patients were included in the study: 10 patients with diagnosis of sepsis who exhibited different outcomes after treatment (5 cases who survived: SS-I, SS-II, S-III, SS-IV, SS-V; 5 non-survivors: SNS-I, SNS II, SNS-III, SNS-IV, SNS-V) and 5 patients without sepsis (controls: C-I, C-II, C-III, C-IV, C-V). Plasma samples from SS and SNS patients were collected at three different periods of evolution: Phase I: 1–2 days after diagnosis; Phase II: 3–5 days of evolution; Phase III: 7 days of evolution. In patients without sepsis (C), the samples were collected within 12–24 hr of the evolution. In total, 100 µg of protein of each sample was subjected to tryptic digestion. Peptides were fractionated and analyzed using a nano-LC coupled to an LTQ-Orbitrap. After processing and “label-free” quantitation, MS/MS spectra were confronted with the NextProt database. The STRING 9.1 was used for interactions and functional annotation. Results: The average number of proteins identified in each condition studied was 298. The areas of the SS and SNS phases and C spectra were compared. Several proteins were identified as differential: haptoglobin, serum amyloid A protein, apolipoprotein A-II, fibrinogen, prothrombin, thrombopsonid, fibronectin, kiniginin, hemopexin, zinc finger protein, and complement C3 and C4. The quantification data of these proteins revealed differences in expression between the sepsis survivors and non-survivors as well as their phases and controls. The set of identified proteins was subjected to an interaction interface for the classification of biological processes related to these proteins, revealing a large number of pathways that are involved in sepsis. Conclusions: By using a systems biology analysis of protein abundance changes measured by quantitative mass spectrometry followed by bioinformatics analysis, we identified a network of molecular pathways that are altered in SS and SNS patients. These data improve our knowledge in the stratification of sepsis.

1092 DEVELOPMENT AND UTILIZATION OF A SEPTIC SHOCK TRACKING TOOL ENHANCES BUNDLE COMPLIANCE
Katherine Walter, Kari Stephens, Paul Rose, Ann Popkess

Learning Objectives: The Surviving Sepsis Campaign three and six-hour bundles for the treatment of patients with septic shock is beneficial. To enhance bundle...
learning that the barriers to implementation of these guidelines. Further studies are needed to better understand the mortality in patients with sepsis who received rhTM. Additionally, SOFA and respiratory component of the SOFA score were lower in the survivor than non-survivor at day 7. In the coagulation tests, PT ratio, fibrinogen level and D-dimer level were not significant different between the survivors and the non-survivors. Conclusions: The results of this study provide an evidence that DIC influence the mortality in patients with sepsis who received rhTM. This is a retrospective chart review of adult patients at SSM Health DePaul Hospital who presented to the emergency department with septic shock, manually tracked time sensitive treatments, activated a code sepsis team, and total 6-hour bundle compliance.

1093 TIMING OF EMERGENCY DEPARTMENT ADMINISTRATION OF FLUIDS AND ANTIBIOTICS IN PEDIATRIC SEPTIC SHOCK

Apurva Bolli, Gina Neto, Katie O'Hearn, Deepthi Reddy, Kusum Menon

Learning Objectives: Timely administration of fluid and antibiotic therapy to children with suspected severe sepsis or septic shock shown to improve outcomes as per the 2008 Surviving Sepsis Guidelines. However, there is limited data on the rate of adherence to these guidelines in pediatrics. Our objective was to determine the rate of adherence to the 2008 fluid and antibiotic recommendations in the pediatric emergency department setting. Methods: We conducted a single centre, retrospective chart review in a tertiary care academic children’s hospital. We used broad ICD9 codes to identify potential cases who presented to the Emergency Department with severe sepsis or septic shock from January 2011 to December 2012. Final eligibility was determined using the following inclusion criteria: age 2 mo to 17 yr inclusive and at least two of the age adjusted SIRS criteria as per the 2010 International pediatric sepsis consensus conference. Results: A total of 77 patients were included. The median age was 12 mo (IQR 2.0, 126.0), 16 patients (20.8%) were admitted to the PICU, 5 patients (6.5%) received vasopressors and there were no deaths. 42 patients (54.5%) received fluid boluses with 18 (42.9%) receiving 20cc/kg, 9 (21.4%) receiving 40 cc/kg and 15 (35.7%) receiving 60 cc/kg. Median time to fluid administration was 140 min (IQR 97.5, 204.5), 240 min (IQR 172.5, 327.5) and 111 min (64.0, 310.0) respectively. 70 patients received antibiotics in the emergency department; median time to administration of the first antibiotic was 155 min (IQR 90.0, 260.0). The median time to intravenous access was 49 min (IQR 17.0, 109.0) and increasing time to IV access was correlated with younger age (P = 0.025). Conclusions: We found that the median time to fluid resuscitation and antibiotic administration were well over the 60 min recommended by the 2008 Surviving Sepsis Guidelines. Furthermore the time to establishing intravenous access was also well over the 5 minute limit referred to in the same guidelines. Further studies are needed to better understand the barriers to implementation of these guidelines.

1094 THROMBOMODULIN IMPROVES MORTALITY IN PATIENTS WITH SEPSIS ESPECIALLY FOR SEVERE COAGULOPATHY

Takahiro Kato, Katuhiiko Matsuzura, Takashi Nakagawa, Yasuo Miki

Learning Objectives: Several single center small-scale trials have shown that Recombinant human soluble thrombomodulin (rhTM) reduced the 28-day mortality in sepsis patients. However any factors that affect the efficacy of rhTM for patients with sepsis-induced DIC have not been known. The purpose of this study was to explore any factors that affect the efficacy of rhTM treated with rhTM. Methods: This is a retrospective cohort study. All patients included in this study were diagnosed with sepsis and were treated with rhTM. Logistic regression analysis was conducted to find any covariates influence mortality. Analyzed data were age, sequential organ failure assessment (SOFA) score, shock, renal replacement therapy (RRT), acute physiologic and chronic health evaluation II score and DIC. Results: Seventy-seven sepsis patients were included. The 90-day mortality was 29.9 % (23/77). DIC and high SOFA score were associated with a higher mortality rate. DIC significantly associated with low mortality (odds ratio, 0.225; 95% CI, 0.06-0.72). There was a significant reduction of mortality in the patients with DIC compared with patients without DIC (p = 0.028 by log-rank test). SOFA and respiratory component of the SOFA score were lower in the survivor than non-survivor at day 7. In the coagulation tests, PT ratio, fibrinogen level and D-dimer level were not significant different between the survivors and the non-survivors. Conclusions: The results of this study provide an evidence that DIC influence the mortality in patients with sepsis who received rhTM. This is a retrospective chart review of adult patients at SSM Health DePaul Hospital who presented to the emergency department with septic shock, manually tracked time sensitive treatments, activated a code sepsis team, and total 6-hour bundle compliance.

1095 SHOCK INDEX AS A PROGNOSTIC MARKER IN SEPSIS

Apurva Gandhi, Rajeshkumar Patel, Navin Victor

Learning Objectives: Severe sepsis poses substantial clinical, financial, and logistical challenges. When identified early in the emergency department and its severe form is treated aggressively with the protocol care bundle improvements in mortality are significant. Shock index may be a valuable tool for the early recognition and evaluation of critical illness in the Emergency department as well as a means to track progress of resuscitation. The shock index is a bedside assessment defined as heart rate divided by systolic blood pressure, with a normal range of 0.5 to 0.7 in healthy adults. A SI ≥ 1.0 has been associated with poorer outcomes in acute circulatory failure. Methods: A retrospective chart review was conducted of patient admitted to Abington Memorial Hospital within last 3 yr. A total of 72 patients qualified based on inclusion and exclusion criteria outlined in the proposal. SI was calculated upon 0, 4, and 6hr. Lactic acid levels within the first 24–48 hr whenever available were obtained. Chi square and Analysis of variance were used to explore relationship between mean shock index & actual mortality, mean shock index & lactic acid accumulation. Results: Based on prior reference study mean shock index > 1.4 was used as a cut off to compare with actual mortality. Chi Square analysis revealed mean shock index > 1.4 there was an association with Increased mortality but it was not statistically significant (P = 0.065). But there was statistically significant difference in mean shock index for the actual mortality, SI 1.2 ± 0.39 for the patients to who died versus 1.03 ± 0.27 for the patient who survived (P = 0.020). Negative predictive value of shock index was found to have at 91 % and no linear correlation with lactic acid was noted. Conclusions: Our study indicates that shock index can be used as a quick and cheap bedside assessment tool to triage patient and intervene if needed. Lactic acid does not linearly correlate with shock index but continues to remains a marker of morbidity in sepsis. Prospective, randomized controlled trials should be held to replicate the results obtained from this study.
important and requires a robust outcome measure, ideally using routinely collected data. No such measure currently exists for sepsis. Administrative data to monitor sepsis epidemiology has reported a dramatic rise in sepsis incidence as diagnosis coding has become more inclusive. This rise in case ascertainment and the corresponding relative risk reduction of 19.9% in sepsis mortality in Scotland may be due to sampling bias and underscores the need for more reliable surveillance methods. We hypothesized that blood culture sampling, may be a good proxy indicator for sepsis, as all patients with sepsis should have a blood culture taken. Methods: Hospital laboratories in NHS Scotland provided data on all blood cultures obtained from adult inpatients (n=215,791) in acute hospitals 2011–2013. Automated blood culture data were linked to inpatient hospital records to produce data on adult inpatients that died within 30 days of date of blood culture. Results: The unadjusted crude 30-day mortality rate was aggregated monthly and ranged from 13.5% in January 2011 to 10.5% in December 2013. The numbers of patients with blood cultures taken rose across Scotland from a median of 7505 patients per month in 2011 (pre-sepsis collaborative) to 8563 patients per month 2012–2013 (during the collaborative) although there was regional variation. This dataset will capture patients with sepsis but also includes patients with a blood culture taken for reasons other than sepsis. Conclusions: There is no reliable, validated measure for sepsis associated mortality currently available from routinely collected data. This study demonstrates that mortality among patients with a blood culture taken is feasible as a potential proxy outcome measure for sepsis mortality, however, this requires further validation.

1097 POLYMYXIN B HEMOPERFUSION IN SEPTIC PATIENTS: AN UPDATED META-ANALYSIS
Seigo Unshidani, Akira Kuriyama

Learning Objectives: A previous systematic review and meta-analysis suggested that polymyxin B (PMB) hemoperfusion in septic patients might have a favorable effect on mortality. However, there has been no updated review on this topic since 2007, and some randomized trials have been published recently. Herein, we updated a meta-analysis on the efficacy of PMX hemoperfusion in septic patients. Methods: PubMed, the Cochrane Central Register of Controlled Trials, and Web of Science were searched without language restrictions. Randomized, parallel-group, trials that compared PMX hemoperfusion and usual care in septic patients were included. Our primary outcome was mortality. We focused on the 28-day mortality, and we extracted the data on mortality nearest to the day 28, when the detailed information was available regarding mortality. Data were pooled using the random effects model. Results: Ten trials with 647 participants were included. Compared with usual care, PMX hemoperfusion was associated with a reduced mortality (RR 0.58; 95% CI 0.44 to 0.77; Q= 17.63; I2= 49%; p=0.09). Conclusions: Our updated meta-analysis suggested that PMX hemoperfusion might reduce mortality in septic patients, compared with usual care. However, most studies included in this review were small in size. Larger trials as well as cost-effective analysis are needed.

1098 FLUID ADMINISTRATION IN COMMUNITY ACQUIRED SEPSIS: EXAMINATION OF A LARGE ADMINISTRATIVE DATABASE
Edward Bittner, Walter Linde-Zwirble, Douglas Hanell, Jennifer Sahatjian

Learning Objectives: Fluid therapy is a cornerstone in the management of sepsis. Early titrated fluid administration impacts organ function and outcome. Guidelines from the Surviving Sepsis campaign recommend a minimum initial fluid administration of 30cc/kg in patients with sepsis-induced tissue hypoperfusion. This study used the Premier administrative database containing 17% of US hospital discharges to examine variation in fluid administration practices and compliance with recommended fluid guidelines in community acquired sepsis. Methods: The study population consisted of patients aged 18 or older who were admitted to the ICU with a diagnosis of community acquired sepsis in septic shock who were medically managed during the year 2013. Fluid administration patterns were analyzed by hospital characteristics (size, teaching vs. nonteaching, urban vs. rural) and extent of organ dysfunction and support. Results: 30,663 patients were analyzed. 49.9 % were female and mean age was 67.8 ± 15.1 yr. Patients were grouped into quartiles based on fluid administration. The quartile boundaries were 1110 ml, 3000 ml and 5276 ml respectively during the first 24 hr. Assuming an average body weight of 86.1kg for males and 74kg for females in the US, 47.4 % of patients received less than 30cc/kg within the first 24 hr. Using a more conservative average adult weight of 60kg (1800 cc fluid bolus at 30cc/kg), 39% did not meet the sepsis guidelines in the first 24 hr. There were no significant differences in fluid administration across hospital types or by the extent of organ dysfunction and support. Conclusions: Results provide new insight into fluid administration in the management of community acquired sepsis presenting in septic shock across US hospitals. While there is considerable homogeneity in fluid administration by hospital type, a substantial proportion of patients receive less initial fluid administration than recommended by consensus guidelines. Further studies are needed to determine the reasons for this discrepancy and to examine the impact and implications of current fluid management in septic patients.

1099 ORGANISM IDENTIFICATION IN SEPSIS AND SEPSIS RELATED DEATHS
Ginger Tsi-Thai, Tiana Endicott-Yazdani, Avery Smith, Rachel Gardner, Tiffany Ynosencio, Adan Mora

Learning Objectives: One of the most critical aspects in the treatment of sepsis is organism identification. This study reviews causative organisms in sepsis and sepsis related deaths at a major institution. Methods: 100 patient charts with the diagnosis of sepsis were obtained during the period of February to March of 2015. The data were analyzed between survivors and non-survivors which included patients who died or went to hospice. Organism identification, peak white blood cell count and peak bandemia were also used to categorize patients. Results: Of those evaluated, 72% of patients survived to discharge and an organism was able to be identified in 42%. E. Coli (20%), MSSA (13%), and Flu (10%) were the top 3 most common organisms. In survivors, peak WBC was 15.1 and peak bandemia was at 14%. In the non-survivor group (death & hospice), organisms were identified in 64% of the cases with peak WBC at 29.9 and peak bandemia at 21%. The 3 most common organisms in the non-surviving group included E. coli (22%), MSSA (22%), and Klebsiella (11%). Of note, 3 patients had polymicrobial organisms and all were in the non-surviving group. In total, 19 different organisms were identified. Conclusions: Organisms were more commonly identified in the non-surviving group. The non-surviving patients also had higher WBC and bandemia raising the question of whether or not individuals some of the less ill patients in the surviving group were actually septic if an organism was not identified. Although patients with polymicrobial disease were only in the non-surviving group, there was minimal difference in the identification of E. Coli and MSSA as the most common organism causing disease.

1100 M2SEWS EARLY WARNING SYSTEMS AND PROACTIVE SCREENING PROVIDES EARLY INTERVENTION AND ESCALATES CARE
Patricia McCabe, M2 Team, Rapid Team, Janet Thorne, Molade Sarumi, Andrea Ryan, Hank Rappaport

Learning Objectives: The use of Early Warning Systems to identify patients at risk for deterioration has been used for over a decade. The criteria and parameters used in these early warning systems vary by institution and area of focus; however, some parameters are common to most systems. Our hospital uses a hybrid system that includes laboratory values (WBC, Serum Lactate, Hematocrit, Blood Glucose) as well as hemodynamic parameters as part of a screening tool called the M2SEWS Early Warning System. This paper will detail the impact of having a team of Critical Care Nurses utilize the M2SEWS Early Warning System to proactively identify patients at risk for deterioration and describe various interventions that this team uses. The screening tool has improved outcomes though early identification and treatment. Methods: We developed, refined and implemented an electronic clinical decision support tool with a real-time alert and monitoring system (Amalga) on the medical/ surgical units. A review and comparison of hospital and UHC data for mortality as well as volume metrics associated with hospital and UHC data for mortality as well as volume metrics associated with emergency responses (Code Blue or Rapid Response) and proactive screening activities as reported by the critical care nursing team will be used to correlate a
causal relationship as well as identify best practices. Results: As the validity of the data from our Early Warning System has been refined, the use of proactive screening has led to a reduction in hospital mortality from 2.5 to 1.18 and a reduction in sepsis mortality from 35% to 19%. The Nurse Responder Team screens, on average, 225 patients a month. These screens result in bedside interventions that include Rapid Response calls and often movement of these at risk patients to a higher level of care. Conclusions: The development and use of a reliable early warning system with real time unit alerts combined with a dedicated critical care nursing team that use these data to identify patients at risk can significantly impact mortality and patient outcomes.

1101 EARLY SERUM PROCALCITONIN, CRP, AND BNP LEVELS IN THE EVALUATION OF PROGNOSIS ON PATIENTS WITH SEPSIS

Feihe Zhou, Kang Hongjun, Liu Hui, Pan Liang

Learning Objectives: Sepsis has still high mortality in ICUs today. Early diagnosis and evaluation would be beneficial for the treatment of sepsis. Usually, both procalcitonin (PCT) and C-reactive protein (CRP) were seen as the main markers of sepsis. It was also reported that there was a significant rise in plasma brain natriuretic peptide (BNP) levels in patients with sepsis. However, the roles of PCT, CRP and BNP in the evaluation of prognosis on patients with sepsis are not yet clear. Methods: Forty-five patients with sepsis in ICU during January 2011 to January 2015 were reviewed retrospectively. The patients consisted of 26 males and 19 females with a mean age of 47.7 yr (aged 18 to 83 yr). These patients were divided into survival group and death group. We analyzed the differences of serum PCT, CRP and BNP levels in patients of these two groups on the first day of admission. The correlations between the serum levels of PCT, CRP, BNP and APACHE II scores were also analyzed. The positive predictive values of these three biomarkers were calculated by using receiver operating characteristic curve (ROC). Results: Of 45 patients with sepsis, 36 survived and 9 died. There were significant differences in the serum levels of BNP and APACHE II score in patients between these two groups on the first day of admission, respectively (P <0.05). Furthermore, there had a significant correlation between the level of BNP and APACHE II score (r=0.3062, P=0.0408). However, there were not significant differences in the serum levels of both PCT and CRP in patients between these two groups (P>0.05), and there also had no significant correlation between the level of both PCT or CRP and APACHE II score (P>0.05). There was a significant predictive value of BNP in the sensitivity, specificity, and the area under the curve of ROC (P=0.002, AUC=0.775, 95%CI:0.626-0.886). Conclusions: The serum BNP levels in patients with sepsis of survival group compared with those in death group have a more significant improvement and a significant correlation with APACHE II score, which could be a marker in early prognosis of patients with sepsis.

1102 PROTEIN C FOR TREATMENT OF SEPSIS ASSOCIATED PURPURA FULMINANS

Brigitte Meyer, Christoph Wenisch, Doris Haider, Stephanie Neuhold, Paul Knoebel

Learning Objectives: Purpura fulminans is a rare coagulation disorder complicating shock of infectious and non-infectious origin. Mortality rate in purpura fulminans is up to 80–100% and persistent disabilities (e.g. amputation) are frequent in survivors. Protein C substitution therapy can improve coagulation.

We aimed to assess the effect of protein C therapy in adult patients with severe sepsis and purpura fulminans. Methods: A total of 5 patients with septic shock, overt coagulation disorder and purpura fulminans were treated with protein C (Ceprotin®, Baxter AG, Austria). In all patients sepsis was treated according to the surviving sepsis campaign guidelines, coagulation disorders were treated as clinically indicated. In addition protein C treatment was given as a 190 IU/kg bolus followed by 10 IU/kg/h continuous infusion. Results: All patients required vasoressor support, 3 patients needed mechanical ventilation, 3 patients had acute renal failure. Microbiological findings were neisseria meningitidis, streptococcus pneumoniae (n=2), klebsiella pneumonia, capnocytophaga canimorsus. Four patients survived to ICU discharge, 1 patient with pre-existent aplastic anemia and severe thrombocytopenia died due to refractory bleeding after sepsis resolution. In the surviving patients no severe bleeding occurred. Median duration of protein C therapy was 2 days (1 – 5 days), median total dose was 54 kU (15 – 71 kU). Heparin, prothrombin complex, antithrombin concentrates, fibrinogen concentrates and platelet concentrates were administered as clinically needed. In survivors organ function was completely restored. Three patients needed lower leg amputation. Conclusions: Protein C therapy was safe and well tolerated. Goal directed coagulation therapy and protein C substitution in addition to guideline directed sepsis therapy resulted in a favourable outcome in our case-series. However, controlled clinical trials are needed before a general recommendation on the use of protein C in adult patients with sepsis induced purpura fulminans can be made.

1103 CHANGES IN LIVER FUNCTIONS IN SEPSIS PATIENTS WITH HYPERGLYCEMIA

Zhiyun Tang, Xue-lian Liao, Wu Minming, Yan Kang

Learning Objectives: Patients with sepsis always suffer from stress hyperglycemia. Liver is an important organ in metabolism, and hyperglycemia may cause its function injury. In order to know whether high glucose in sepsis would change liver functions in sepsis patients we effect sepsis patients' treatment. Methods: This is a retrospective study to analyze patients with sepsis admitted in Intensive Care Unit during June 2014 to December 2014. According to their highest measured blood glucose on the first day they were enrolled in ICU, patients were divided into two groups as the normal glucose (NG) with highest glucose less than 10mmol/L, and the high glucose (HG) with highest glucose level more than 10mmol/L. Then used One-way ANOVA to test the differences in liver function in two groups. Results: All sixty-six patients met the enrollment, and 25 patients were in the NG group, other 41 were HG group patients. The main manifestation of liver change was elevation of hepatic enzymes: HG group and NG group had no different in aspartate aminotransferase ((122.90 ± 260.27)/µmol/L vs. (72.61 ± 146.00)/µmol/L, P=0.432) and alanine aminotransferase ((50.80 ± 98.74)/µmol/L vs. (25.77 ± 18.31)/µmol/L, P=0.323). Though direct bilirubin in two groups had no different, indirect bilirubin in HG was higher ((5.22 ± 2.48)µmol/L vs. (4.27 ± 2.45)µmol/L, P=0.038). Also, albumin in HG group ((27.39 ± 5.45) g/L) was lower than it in NG group ((31.66 ± 5.55) g/L) (p=0.024). Comparing differences in blood lipid, patients in NG group had more cholesterol ((3.53 ± 0.31)mg/dL vs. (2.36 ± 0.67)mg/dL, p=0.008) and LDL ((1.62 ± 0.34)mmol/L vs. (0.75 ± 0.54)mmol/L, P=0.014), however, triglyceride (p=0.749) and HDL (p=0.539) showed no different in two groups. Changes in coagulation system showed D-dimer in HG group (14.80 ± 11.24)µmol/L was higher than it in NG group (14.80 ± 11.24)µmol/L (P=0.749). Although direct fibrinogen in two groups had no different, indirect fibrinogen in HG was higher ((122.90 ± 260.27)/µmol/L vs. (72.61 ± 146.00)/µmol/L, P=0.432), and the liver coagulation enzyme activity showed no different between two groups. Conclusions: Hepatic enzymes and lipid levels are different in HG group than NG group. Patients in HG group had higher hepatic enzymes and lipid levels than NG group. It was also reported that there was a significant rise in plasma brain natriuretic peptide (BNP) levels in patients with sepsis. Serum levels of BNP levels in patients with sepsis would effect sepsis patients' treatment.

1104 PROPHYLACTIC INFERIOR VENA CAVA FILTERS FOR OPERATIVE PELVIC FRACTURES: A 12-YEAR EXPERIENCE

Wayne Cohen-Levy, Daniel Spielman, Jin Liu, Jimmy Chan, Dordanah Sugano, Kathleen McGuire, Milan Sen, Melvin Stone

Learning Objectives: Operative pelvic fractures are high risk for deep venous thrombosis (DVT) and early pulmonary embolism (PE); however, perioperative chemoprophylaxis for DVT/PE is problematic. For 6 yr our institution has practiced a policy of placing prophylactic IVCF (PICVF) in all pelvic fractures in need of operative fixation. The aim of this study is to review our experience with the hypothesis that there has been no significant decrease in PE rate with this policy. Methods: The trauma registry was queried for all pelvic or acetabular fractures from January 2003 to December 2014. The PICVF period was January 2009 to December 2014. DVT/PE risk factors-age, traumatic brain and spinal injury, and long bone fractures were recorded along with other standard characteristics.
The primary outcomes were DVT and PE rate in operative pelvic fractures. Six non-operative and 2 operative pelvic fractures had IVCF’s therapeutically placed after the diagnosis of DVT/PE; these patients were analyzed in the non-PIVCF cohort. Results: There was a 2.6% and 3.1% PE rate (all nonfatal) for all 231 pelvic fractures and 96 operative pelvic fractures, respectively, in the 12 year study period. The non-PIVCF and PIVCF periods had 39 and 57 operative pelvic fractures, respectively. Both cohorts were characteristic similar with no difference in DVT/PE risk factors or administration of DVT chemoprophylaxis. There was a higher median Injury Severity Score (ISS) in the PIVCF period (10 vs. 9, p=0.034). There was a significant increase in PIVCF placement in the PIVCF period (53.8% vs. 87.7%, p < 0.001) however there were no difference in PE rate (5.1% (2/39) vs. 1.8% (1/57), p=0.351) or DVT rate (10.3% (4/39) vs. 19.3% (11/57), p=0.231) between both periods, respectively. Conclusions: There was no decrease in PE rate in operative pelvic fractures with PIVCF placement; however, there was a trend towards an increase DVT rate in the PIVCF cohort as compared to the non-PIVCF cohort despite similar DVT risk profiles. PIVCF placement in pelvic fractures as indicated for operative repair alone is not warranted based on these data.

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HOSPITALIZATIONS ASSOCIATED WITH FALLS IN THE UNITED STATES: PROFILE AND OUTCOMES
Sankeerth Rampa, Wilcon Fernando, Veerajalndhar Allareddy, Nalliah Romesh, Veeranathpurush Allareddy

Learning Objectives: Accidental falls are a frequent cause of hospitalization. We examined trends in the profile and outcomes for patients hospitalized due to falls using nationally representative data. Methods: Nationwide Inpatient Sample for the yr 2004 to 2010 was used. All patients who were hospitalized due to falls were selected using External Causes of Injury codes. Hospitalization outcomes included in-hospital mortality-IHM, hospital charges-HC, and length of stay-LOS. Outcomes were stratified by demographic factors and examined by multivariable regression models. Regression estimates were adjusted by age, sex, race, insurance, number of concomitant admissions, injury type, co-morbidity and hospital teaching status/region. This study was IRB approved. Results: A total of 8,153,313 hospitalizations were attributed to falls. Two-thirds occurred among those aged 65yr or older. Females comprised 61.7% of cases. Outcomes included: IHM 217,861 patients (2.7%), HC (mean: $39,185, total $319 billion) & LOS in days (mean: 5.3, total 43.1 million). Most common injuries were fractures of neck of femur (23%), lower limb (14%), upper limb (12.4%); and intra-cranial injuries (9.6%). After adjustments for confounders, those aged>65 yr (OR=5.17, 95% CI=4.77–5.60, p<0.0001) and those aged 46 to 65yr (OR=2.22, 95% CI=2.07–2.38, p<0.0001) were more likely to die compared to those aged 18 to 45yr. Those aged>65yr (estimate=+0.08, p<0.0001; positive estimate implies higher) and 46 to 65yr (+0.07, p<0.0001) were associated with significantly higher HC compared to those aged 18 to 45yr. Those aged>65 yr (+0.245, p<0.0001) and 46 to 65yr (+0.144, p<0.0001) were also associated with significantly longer LOS compared to those aged 18 to 45yr. Conclusions: Injuries due to accidental falls needing hospitalization is anticipated to substan- tially increase in number and cost with the aging population in the U.S. Patients aged >65 yr experienced worse outcomes compared to younger age groups. Our results have important implications for identifying effective interventions that promote falls prevention among older age groups.

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SIGNIFICANT INCREASE IN PULMONARY EMBOLISM IS ASSOCIATED WITH OBESITY DESPITE CHEMICAL PROPHYLAXIS
Anthony Gielow, Indermeet Bhullar

Learning Objectives: Mechanical and chemical prophylaxis (SQ Heparin or SQ Lovenox) may decrease the rate of pulmonary embolism (PE). Currently standard dose of chemical prophylaxis is provided to all trauma patients regardless of weight and body mass index (BMI). The utility of weight adjusted chemical prophylaxis for obese patients remains controversial. The purpose of this study was to evaluate the effect of BMI on pulmonary embolism rate in patients receiving standard chemical and mechanical prophylaxis after traumatic injury. Methods: The records of adult trauma patients admitted to a Level I trauma center from 2012–2015 were retrospectively reviewed. The patients were divided into the following groups based on admission BMI: Under-weight (UW) (BMI<19), Ideal-Weight (IW) (BMI 19–24.9), Over-weight (OW) (BMI 25–29.9), and Obese (OB) (BMI ≥30). Patients not on scheduled chemical (SQ Heparin or SQ Lovenox) and mechanical prophylaxis (sequential compression devices) were excluded. Pulmonary embolism rate for the IW group was then compared to the remaining BMI groups. Statistical analysis was performed using mean, Fisher’s exact test, and Chi-square test. Results: A total of 6049 patients were identified. The groups were well matched with no significant differences between demographics and ISS. The overall pulmonary embolism rate for each BMI group was as follows: UW 0% (n=517), IW 0.04% (n=2229), OW 0.34% (n=2052), and OB 0.48% (n=1451). In comparison to IW group, the PE rate was significantly higher for the OW group (IW vs. OW, 0.04% vs. 0.34%, p=0.03) and OB group (IW vs. OB, 0.29% vs. 0.48%, p=0.008). The odds ratio for developing a PE in overweight and obese patients with (BMI≥25) was 19 times higher than for ideal and underweight patients (BMI<25). Conclusions: After traumatic injuries, despite standard mechanical and chemical prophylaxis, overweight and obese patients have a significantly higher rate of developing a PE than ideal weight and underweight patients. Weight adjusted chemical prophylaxis may need to be re-evaluated as a possible means of decreasing this complication.
EMPIRIC ANTIBiotic SELECTION FOR VENTILATOR-ASSOCIATED PNEUMONIA IN TRAUMATIZED INJURED PATIENTS
Jeffrey Simpson, Jennifer Hubbard, Phu Tran, Rachel Dirks, Melissa Reger, James Davis

Learning Objectives: Current recommendations for empiric narrow spectrum antibiotic (NSA) vs. broad spectrum antibiotic (BSA) treatment of ventilator-associated pneumonia (VAP) are based on early vs. late onset of symptoms. This recommendation has not been studied in the traumatically injured patient population, which represents a different demographic than are seen in medical and surgical intensive care settings. We hypothesize that traumatically injured patients with early VAP can be safely treated with NSA, and late VAP should be treated with BSA.

Methods: A retrospective review was performed at a Level I Trauma Center from 2011 to 2014 of traumatically injured patients with VAP. VAP was defined by clinical criteria. Patients were categorized according to early (hospital days 1–4) vs. late (hospital day > 4) onset of pneumonia. The primary outcomes were the type and sensitivity of organisms isolated on culture.

Results: 259 patients were initially identified, of which 214 met inclusion criteria. Patients were excluded for respiratory cultures obtained ≤48 hr after ICU admission, ≥3 days between 10/11 and 9/12. During this period, our urban, high-volume Level 1 trauma center changed the protocolized VTE pharmacotherapy from anti-Xa adjusted dalteparin (DALT) given daily to enoxaparin (ENOX) 30 mg every 12 hr. DALT patients were initiated on dalteparin 5000 units daily with adjustment to twice daily if 12-hour anti-Xa assay was < 0.1 IU/mL. ENOX patients did not receive anti-Xa nor were dose adjusted. The primary outcome was the overall incidence of VTE. Secondary outcomes included in-hospital death and packed red cell (pRBC) transfusion requirements after the first 2 hospital days. Results: 952 patients (DALT n = 422; ENOX n = 530) were included for analyses. Age, race, injury mechanism, median Injury Severity Score, ICU and hospital length stays were similar between groups. RAP score was higher in the ENOX group (8 [IQR 6–11] vs. 8 [IQR 6–10], p<0.016). 289 DALT patients had anti-Xa assessments with 20% being <0.1 IU/mL. VTE incidence was similar between groups (10.9% vs 13.2%, p=0.33) with similar deep vein thrombosis (9.2% vs 11%, p=0.84) above knee 6.9% vs 4.8%) and pulmonary embolism (2.4% vs 3.4%, p=0.46) rates. There was no difference in mortality (2.1% vs. 2.1%, p=0.87) and pRBC transfusion requirements after 48 hr (0 [IQR 0–1] vs. 0 units [IQR 0–2], p=0.49) between groups. Conclusions: In this preliminary work, anti-Xa adjusted dalteparin and unadjusted enoxaparin appear to provide similar VTE prevention in high-risk trauma patients. In those institutions utilizing dalteparin, equipoise with enoxaparin is present with the addition of protocolized anti-Xa assays with dose adjustments.

PROPRANOLOL DECREASES CARDiac STRESS IN SEVERELY BURNED CHILDREN
Paul Wurzer, Robert Clayton, Ludwik Branski, Clark Andersen, Lars Kamolz, Lee Woodson, Celeste Finnerty, David Herndon

Learning Objectives: Severe burn injury, covering more than 30 % of the total body surface area (TBSA), is associated with a hyperdynamic circulation attributed directly to the inflammatory response to thermal trauma. The combination of cardiac stress, increased cardiac work (CW), and greater cardiac oxygen consumption can lead to decreased contractility. Propranolol, a non-selective β-1, β-2 adrenergic receptor antagonist, is routinely used in non-burned patients to reduce cardiac stress. The aim of this study was to quantify the impact of propranolol on cardiac stress as measures by the PiCCO system (Pulse Index Continuous Cardiac Output, Pulson Medical Systems, Munich, Germany) in severely burned children. Methods: Children with burns over 30 % TBSA and up to 18 yr of age were consented to this IRB approved study. Patients were randomized to control (n=39) or propranolol (n=43). Prospectively collected hemodynamic measurements were obtained using the PiCCO system at our pediatric burn center from 2005 to 2012. Cardiac index (CI), cardiac output (CO), extravascular lung water index (ELWI), heart rate (HR), mean arterial pressure (MAP), systemic vascular resistance index (SVRI), stroke volume (SV) and CW were compared between standard of care treated patients (control; CTRL) and patients who received up to 4mg/kg/day propranolol (PPL). Mixed multiple linear regressions were applied and a 95 % level of confidence was assumed. Results: 289 DALT patients had anti-Xa assessments with 20% being <0.1 IU/mL. VTE incidence was similar between groups (10.9% vs 13.2%, p=0.33) with similar deep vein thrombosis (9.2% vs 11%, p=0.84) above knee 6.9% vs 4.8%) and pulmonary embolism (2.4% vs 3.4%, p=0.46) rates. There was no difference in mortality (2.1% vs. 2.1%, p=0.87) and pRBC transfusion requirements after 48 hr (0 [IQR 0–1] vs. 0 units [IQR 0–2], p=0.49) between groups. Conclusions: In this preliminary work, anti-Xa adjusted dalteparin and unadjusted enoxaparin appear to provide similar VTE prevention in high-risk trauma patients. In those institutions utilizing dalteparin, equipoise with enoxaparin is present with the addition of protocolized anti-Xa assays with dose adjustments.

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EPIDEMIOLOGY AND OUTCOMES OF HOSPITALIZED CHILDREN WITH ACCIDENTAL HYPOThERMIA
Abhinav Totapally, Michael Leoncio, Fernando Beltramo, Keith Meyer, Andre Raszymski, Balagangadhar Totapally

Learning Objectives: The purpose of this study was to explore the epidemiology and outcomes of hospitalized children with a diagnosis of accidental hypothermia. Methods: The 2012 Kids’ Inpatient Database, detailing discharge diagnoses in children admitted to US hospitals, was analyzed using ICD-9 codes to filter out relevant patients. Children ages 1 month to 17 yr were included in the analysis. Demographic and outcome variables in the hypothermia group were compared with the rest of the patients. In a separate analysis, children with hypothermia were matched 1:1 using a correlative propensity score utilizing gender, age, hospital region, income quartiles, race, ventilation status, coagulopathy, drowning, and APRICORN severity score and their outcomes were compared with controls. The sample data were weighted to get a national estimate. Results: Accidental hypothermia was present in 1,029 cases of 1,915,435 hospitalized children. Children with hypothermia were more likely to be Female (45.3% vs. 49.1%; p<0.05), White (51.8% vs 49.6%; p<0.05), African American (22.1% vs 18.3%; p<0.05), and Infants (32.6% vs 17.5%); they were less likely to be Hispanic (18.1% vs 22.9%; p<0.05) and teens (30% vs 37.8%). Children with hypothermia were more likely to have been admitted during fall/ winter (56.8% vs 52%; p<0.05) and in the Southern region (48.3% vs 38.4%; p<0.05). The mortality rate was higher in hypothermia patients compared to the rest of the children (8.5% vs 0.3%; p<0.05). The risk of mortality was significantly increased in children with accidental hypothermia following trauma, drowning, in those requiring mechanical ventilation, and in children with coagulopathy (p<0.001). When compared to matched-controls, hypothermia patients had a higher mortality (8.9% vs 4.4%) but a lower length of stay (8.4 vs 13.5 days) and charges ($95,405 vs $131,113) (p<0.01). Conclusions: The diagnosis of accidental hypothermia significantly increases mortality in hospitalized children. Interestingly, accidental hypothermia is more common in Southern states compared to the other areas of the US.

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VANCOMYCIN IN THE TREATMENT OF INTRAABDOMINAL INFECTIONS: STALWART OR SUPERFLUOUS?
James Sanders, Jeffrey Tesser, Billy Moore, Robert Sawyer, Therese Duane

Learning Objectives: Treatment of intraabdominal infections (IAIs) includes broad spectrum antimicrobial coverage ideally followed by culture guided de-escalation therapy. Treatment of intraabdominal infections (IAIs) includes broad spectrum antimicrobial coverage ideally followed by culture guided de-escalation therapy. Vancomycin is a non-penicillinase-resistant penicillin (n-PP) with a wide spectrum of activity against gram-positive cocci and enterococci. The use of Vancomycin in the treatment of IAI is controversial. The objective of this study was to assess the diagnostic and clinical effectiveness of Vancomycin in the management of IAI. Methods: Patients hospitalized at a tertiary care children’s hospital with a confirmed diagnosis of IAI were included. Data was collected using the hospital’s electronic medical record database. Clinical outcomes included primary treatment success (PTS), and secondary outcomes included complications, length of stay (LOS), and overall mortality. Results: A total of 32 children with positive blood cultures were identified. The median age of the patients was 3 years (range, 0–17 years) and the median white blood cell count was 16,300 cells/μL (range, 5,800–54,000 cells/μL). The median CRP was 111 mg/L (range, 5–661 mg/L). The median time to treatment was 24 hours (range, 0–48 hours). The median length of hospital stay was 5 days (range, 1–24 days). The median vancomycin dose was 80 mg/kg/day (range, 50–150 mg/kg/day). PTS was achieved in 31 children (97%). Complications were observed in 6 children (19%). The most common complication was wound infection (31%). The overall mortality was 2 children (6%). Conclusions: This study demonstrates that vancomycin is an effective treatment for IAIs in children. The use of vancomycin should be considered empirically in children with positive blood cultures.
to promote antimicrobial stewardship. Commonly this includes vancomycin to empirically cover methicillin-resistant Staphylococcus aureus (MRSA). This study assessed the impact and necessity of adding vancomycin to IAI treatment regimens.

Methods: A post hoc analysis of the Study to Optimize Peritoneal Infection Therapy (STOP-IT) trial was performed. Patients who received piperacillin/tazobactam (P/T) and/or etanepam, meropenem and imipenem were included with categorization into two groups based on presence or absence of vancomycin. Univariate and multivariate analysis compared the effect of including vancomycin on the composite outcome (recurrent IAI, surgical site infection, SSI or mortality) and individual components.

Results: The cohort included 344 patients who received P/T and/or a carbapenem with 110 (32%) of these patients receiving vancomycin. The majority of the patients received P/T (>75%). Isolation of MRSA occurred in only 8 (2.3%) patients (1 received vancomycin). Vancomycin use resulted in a different occurrence of the composite outcome, 32.7% vs. 20.9% for vancomycin and no vancomycin, respectively (p=0.02), but patients prescribed vancomycin, values represented as mean (SD), had higher APACHE II scores-31.1 (6.6) vs. 9.4 (5.7), p<0.0001; extended length of stay-12.6 (10.2) vs. 8.6 (8.0) days, p<0.001; and prolonged anti-biotic courses-9.1 (8.0) vs. 7.1 (4.9) days, p=0.02. After risk adjustment in a multivariate model, no significant difference existed for the composite outcome or the individual components: recurrent IAI (OR=1.50, p=0.23), SSI (OR=1.55, p=0.31) or mortality (OR=1.02, p=0.09) relative to vancomycin utilization.

Conclusions: This post hoc analysis reveals that addition of vancomycin occurred in nearly a third of cases, more often in sicker patients. However, no appreciable difference in recurrent IAI, SSS or mortality were demonstrated suggesting limited utility for adding vancomycin to IAI treatment regimens.

1113 HYPERTONIC SALINE AND ACUTE KIDNEY INJURY IN TRAUMATIC BRAIN INJURY
Kelly Maguigan, Susan Hamblin, Bradley Dennis, Oscar Guillamondegui

Learning Objectives: Hypertonic saline (HTS) reduces intracranial pressure in patients with traumatic brain injury (TBI). Fluids containing supraphysiologic chloride concentrations have been associated with higher rates of acute kidney injury (AKI), acidosis, and mortality compared to balanced solutions. Our objective was to determine the safety of continuous versus bolus HTS infusion in TBI patients. We hypothesized that administration of continuous infusion HTS was associated with increased AKI. Methods: This was an IRB-approved, retrospective matched cohort analysis of severe TBI patients who received at least 2 doses of HTS at a Level 1 Trauma Center from January 2008 to May 2014. Patients were divided into bolus versus continuous infusion 3% HTS cohorts. The primary outcome was the incidence of AKI defined by the RIFLE criteria. Secondary outcomes included incidence of hypernatremia, hyperchloremia, severe metabolic acidosis, and ICU mortality. Statistically, the Mann-Whitney U test was used for continuous data and the Fisher’s Exact test was used for categorical data. Results: Of the 60 patients (30 continuous and 30 bolus), baseline characteristics were similar. The median injury severity score for the bolus and continuous group was 33.5 (IQR 26–42.8) and 37 (IQR 29–45) respectively. The median Glasgow Coma Scale score was 3 for each group. The continuous group did receive significantly more HTS (1250mL vs 2595mL, p<0.001). An increased incidence of hyperchloremia was observed in the continuous group (0.77 vs 1.35 events per HTS days, p=0.006). AKI was more prevalent in the continuous group, but did not achieve statistical significance (0% vs 16.7%, p=0.052). There were no differences in hypernatremia, severe metabolic acidosis, or ICU mortality. Conclusions: A trend toward an increased rate of AKI was found in the continuous infusion HTS groups. Administration of continuous infusion HTS was associated with increased hyperchloremia but not acidosis or mortality. Our data continue to support the need for further investigation of the safety of high chloride loads in trauma patients.

1114 A RANDOMIZED TRIAL COMPARING 3% TO 23% HYPERTONIC SALINE IN PEDIATRIC TBI: A PILOT STUDY
Stacey Scott, Sara Ewert, Cynthia Greenwell, Jeffrey Tweed, Kendall Baumgartner, James Knapp, Lakshmi Raman

Learning Objectives: Traumatic Brain Injury (TBI) remains the leading cause of death and disability in children often resulting in intracranial hypertension (ICP). ICP is a major cause of morbidity and mortality in patients with brain injury from accidental or non-accidental causes. Mortality is directly correlated with the severity of ICP. Treatment of ICP has included various concentrations of 3%, 5%, 7.5% and 23% of hypertonic saline (HTS). We hypothesized that the use of 23% HTS will result in significant decrease in ICP and decrease the need for number of doses needed to treat ICP spikes. Methods: We did a prospective, double-blind randomized trial of 3% vs. 23% HTS and enrolled 10 patients into each arm (n=20) from October of 2011 to March of 2015 at a level 1 pediatric trauma center. Patients who required treatment for ICP were randomly assigned to 3% or 23% arm. Data included AIS scores, ICP readings, number of HTS doses, ventilator and ICU days among other metrics. Severity of ICP spike was defined as the difference of the ICP over time for a threshold of 20 mm of Hg. Severity of TBI was grouped by AIS head scores of less than or greater than 5. Results: 20 patients had a mean age 6.7 (SD 5.2) yr. Mean first ICP of 27 (SD 3.6). Both study arms had similar demographic make-up. In the AIS<5 group (n=10), the decrease in ICP after treatment was significantly larger among patients receiving 23% HTS (7.38 vs 4.93, p<0.05). Patients in the 23% group also required fewer doses, ventilator days, ICU days, and had fewer, less severe ICP spikes, though these were not statistically significant due to study size. Conclusions: Multiple case series both in adults and children have shown 23% can be safely and effectively used in the management of ICP from traumatic and non-traumatic causes. This is the first randomized blinded study comparing two most common HTS concentrations namely 3% and 23% used in the management of ICP. We show that in patients with AIS <5, 23% HTS was found to much more effective in decreasing ICP and may potentially shorten their ICU stay and should be the hypertonic solution of choice.

1115 THORACIC ENDOVASCULAR AORTIC REPAIR AS THE TREATMENT OF CHOICE FOR TRAUMATIC THORACIC AORTIC INJURY
MitsuNori Ikeda, Mitsuo Ohtsuki, Hiroshi Ogura, Takeshi Shimazu

Learning Objectives: Blunt thoracic aortic injury (BTAI) is a life-threatening trauma requiring urgent treatments. TEVAR has been widely adopted as an alternative repair for BTAI, but its indication including the optimal timing is still controversial. The purpose of our study was to evaluate the optimal application of TEVAR for BTAI. Methods: We retrospectively reviewed the data of 43 patients with BTAI admitted to our emergency center from January 2007 to March 2015. Patients’ demographics, location of the aortic lesions, procedure details and outcome were analyzed. Results: Mean age was 49.3±4.2 yr and 27 patients (62.8%) were male. Mean ISS was 37.0±1.3. Forty-two injuries (97.7%) were located at the aortic isthmus and pseudoaneurysm or free rupture accounted for 26 (60.5%) cases. Nonoperative management was selected in 12 (22.6%) diagnosed as minimal injuries. Thirty-one patients (72.1%) underwent TEVAR, and the timing of TEVAR was urgent (within 6h) in 8, early (within 24h) in 9 and delayed (over 24h) in 14 patients. Six patients in the urgent group had refractory shock on arrival, and 5 patients required surgical treatment for associated injuries concurrently with TEVAR. Primary technical success rate was 100%, and in-hospital mortality was 0%. Procedure-related complications occurred in 3 patients (9.7%) in the urgent group (2 endoleaks and 1 stroke) during the follow-up period between 1 and 98 (median 58.5) mo. Conclusions: In our study, the clinical outcome of TEVAR for BTAI was excellent. Urgent TEVAR would be the treatment of choice for BTAI in hemodynamically unstable patients with polytrauma.

1116 DRONABINOL FOR ACUTE PAIN MANAGEMENT IN BURN PATIENTS THAT USE MARIJUANA
Christopher Miller, Charles Foster, Scott Mueller

Learning Objectives: Patients with burn injuries experience extreme pain and often require large quantities of analgesic medications. Cannabinoids (CB) such as dronabinol have been utilized as adjunctive agents for the treatment of pain, often requiring large quantities of analgesic medications. Cannabinoids (CB) such as dronabinol have been utilized as adjunctive agents for the treatment of pain, although data for use in acute pain is limited. The objective of this study was to assess the safety and efficacy of dronabinol as adjunct therapy for acute pain management in burn patients with prior marijuana use. Methods: This retrospective,
matched-control study evaluated dronabinol as an adjunct therapy for acute pain management in burn patients that used marijuana as an outpatient. The control group was comprised of patients who did not receive dronabinol nor had a history of marijuana use. Patients were matched in a 1:1 fashion based on age, sex, weight, length of intubation, and total burn surface area. The primary outcome was the amount of opioids used per day over the first 14 days of admission. Secondary outcomes included other pharmacological interventions, mean pain scores, and length of stay. **Results:** Thirty-two patients who met inclusion criteria for the dronabinol group were matched to 32 control patients. Baseline demographics were statistically similar between groups. Mean total burn surface area was 13.3% and 12.7% in the dronabinol and control groups, respectively. The dronabinol and control groups used a median of 56.3 mg (IQR 44.8–72.7) and 43.2 mg (IQR 30.3–60) of IV morphine equivalents (EQs), respectively (p=0.02). The dronabinol group used a median of 1.58 mg (IQR 0.8–2.3) lorazepam EQs per day vs. 0.7 mg (IQR 0.4–1.5) in the control group (p=0.006). The dronabinol group used more aniotics, ketorolac, and ketamine. There were no differences in mean pain scores or length of stay. **Conclusions:** Patients in the dronabinol group required greater amounts of analgesic, anxiolytic, and anesthetic medications. Causality remains unknown. Future studies consisting entirely of patients that use marijuana are warranted to more accurately assess the benefit of cannabinoid supplementation in acute pain management.

1117

**IS INHALATION BURN INJURY AN INDEPENDENT RISK FACTOR FOR ACUTE KIDNEY INJURY: A RETROSPECTIVE STUDY**

Avinash Kumar, William Andrews, Scott Dennis, Yaping Shi, Matthew Shotwell, Blair Summitt, Jonathan Wanderer

**Learning Objectives:** Background: Emerging evidence suggests that ARDS through complex mechanisms can independently increase the risk of acute kidney injury (AKI). We seek to evaluate whether inhalation thermal injury is an independent risk factor for developing AKI (based on the AKIN definition) in the major burn population. **Methods:** This is an IRB-approved, retrospective cohort study of patients admitted to a tertiary burn ICU between 2011–13. We included adults (age > 18 yr) with major burn injury ≥ 20% TBSA and patients with confirmed inhalation injury (a major burn). AKI was defined using the AKIN serum creatinine criteria up to 5 days following admission. Patient demographics and clinical data, were compared across cohorts using the Wilcoxon rank sum test or Pearson chi-square test, as appropriate. Multiple logistic regression was used to assess the effect of inhalation injury and major burn on the incidence of AKI, adjusting for clinical and demographic confounders. **Results:** 254 patient records (90-inhalation injury and 164-major burn) were evaluated. The mean age on admission was 47 ± 19 yr and 72% of the cohort were male. There were more males in the major burn group (78% vs. 62%, p = 0.007). No other significant differences were observed in baseline demographics. The overall incidence of AKI was 28% (95% CI, 22, 33). The unadjusted odds of AKI was nearly double (OR: 1.99, 95% CI: 1.13, 3.49) in the inhalation injury cohort relative to major burn cohort. However, there was no evidence of independent inhalational injury effect after adjusting for potential confounders. In particular, total burn surface area (TBSA, p = 0.051), daily 24h fluid balance (p < 0.001) and most recent 24h albumin transfusion status (p = 0.002), were all significantly associated with AKI in the adjusted analysis. Age and PRBC transfusion status were not significant. **Conclusions:** Inhalation thermal injury is not an independent risk factor for AKI after adjustment for age, TBSA, fluid balance, albumin and PRBC transfusion status in our patient population.

1118

**IMPACT OF SEPTICEMIA ON OUTCOMES IN CHILDREN HOSPITALIZED DUE TO INTRACRANIAL INJURIES IN THE USA**

Roy Aparna, Sankeerth Rampa, Fernando Wilson, Nalliah Romesh, Veerasathan Allareddy

**Learning Objectives:** Intracranial injuries (ICI) are a major cause of morbidity & mortality. Infections, such as pneumonia, in patients with traumatic brain injury are associated with adverse outcomes. However, the incidence and outcomes of sepsis in hospitalized children with ICI has not been well described at a large population level. The objective of this study is to examine the impact of outcomes (in-hospital mortality-IHM, hospital charges-HC, and length of stay-LOS) in children hospitalized primarily due to ICI. **Methods:** Nationwide Inpatient Sample for the yr 2004 to 2010 was used. All patients aged<18 yr and who were hospitalized due to ICI were selected. In this cohort, those who developed sepsisemia were identified. The primary independent variable was occurrence of sepsisemia. The impact of sepsisemia on IHM, HC (inflation-adjusted to year 2010$), and LOS in hospital were examined by multivariable logistic and linear regression models. The confounding effects of age, sex, race, insurance status, co-morbidity burden, hospital teaching status, region and survey year were adjusted in the regression models. The study was IRB approved. **Results:** A total of 173,310 children were hospitalized with ICI. Among this cohort, a total of 1,544 children (0.9%) developed sepsisemia. The mean age of those with sepsisemia was 11.6 yr (9.5 yr for those without sepsisemia). Outcomes for those with vs without sepsisemia included: IHM rate (11% vs 4.2%), mean HC ($291,016 vs $47,587) and mean LOS (28.4d vs 4.4d). Following adjustment for confounders, those who developed sepsisemia were associated with higher HC (estimate=1.54, 95% CI=1.41–1.67, p<0.0001), and longer LOS (estimate=1.52, 95% CI=1.39–1.66, p<0.0001) when compared to their counterparts. However, differences for IHM were not statistically significant after adjusting for confounding factors. **Conclusions:** Sepsisemia occurred in 0.9% of hospitalized children with ICI, resulting in an additional 105 deaths and $376 million in HC. These results highlight the need for effective interventions to decrease the likelihood of sepsisemia for children admitted for ICI.

1119

**PREDICTORS OF CONTRAST INDUCED NEPHROPATHY IN TRAUMA PATIENTS**

John Betha, Lauren Kelsar, Damayanti Samanta, Juhon Tomangguillo Chumbe

**Learning Objectives:** Contrast-induced nephropathy (CIN) is an adverse event caused by the administration of contrast dye prior to a computed tomography scan. It is the third leading cause of acute kidney injury (AKI). Literature investigating predictors of CIN in trauma population is limited. This study aims to identify predictors of CIN in trauma patients. **Methods:** This is a retrospective study of patients admitted to a level 1 trauma center between 2007 and 2011. A total of 426 patients who had a diagnosis of AKI and received at least one dose of contrast dye were included. Patients were divided into two groups. CIN-positive group had an increase in serum creatinine ≥0.5 mg/dL or ≥25% of baseline within 48–72 hrs from contrast administration and CIN-negative group failed to meet this criteria. **Results:** Ninety-five patients (22.3%) were found to be CIN-positive. These patients were significantly older (49.76 vs. 45.66 yr, p=0.04) with a lower revised trauma score (RTS) (5.80 vs. 6.35, p<0.01). Base deficit (BD) (70.8% vs. 53.8%, p=0.00), history of heart failure (6.7% vs. 1.9%, p=0.03), use of angiotensin antagonists (17.6% vs. 9.9%, p=0.05), lack of fluid bolus (FB) administration prior to contrast (80.1% vs. 61.7%, p<0.00), multiple contrast exposures (28.4% vs. 16.0%, p=0.01), volume of contrast received (124.87 vs. 101.93, p=0.00) and the percentage of patients using nephrotoxic drugs (55.8% vs. 43.5%, p=0.03) were associated with CIN. A significantly higher percentage of these patients had a diagnosis of genitourinary (GU) (16.8% vs. 6.3%, p<0.00), gastrointestinal (27.4% vs. 16.0%, p=0.01) and arterial (10.5% vs. 4.5%, p=0.03) injuries. Logistic regression showed GU injuries to be the strongest predictor of CIN (OR=2.84, 95%CI=1.27–6.36, p=0.01) followed by BD≥2, age, RTS, and no administration of FB prior to contrast exposure. **Conclusions:** This data highlights characteristics of trauma patients who are more likely to develop CIN. Practitioners should insue that intravenous fluid therapy is maximized and excessive contrast exposure is avoided in patients presenting with these characteristics.

1120

**RACIAL DISPARITIES IN ICU RESOURCE UTILIZATION IN EMERGENCY GENERAL SURGERY**

Margaret Lauerman, Anthony Herrera, Elena Klyushnenkova, Mayur Narayan, Brandon Bruns, Ronald Tesoriero, Laura Buchanan, Jose Diaz

**Learning Objectives:** Resource use in Emergency General Surgery (EGS) is a significant portion of overall healthcare utilization. In Maryland, 26% of hospital admissions...
Outcomes Following Appendectomy in the Older Population in the USA

Veerajalandhar Allareddy, Sankeerth Rampa, Nalliah Romesh, Veeraarathupursh Allareddy

Learning Objectives: Appendicitis is relatively rare in older population. We sought to identify patient factors associated with poor outcomes in older patients (age≥65 yr) who underwent an appendectomy procedure in the USA. Methods: Nationwide Inpatient Sample for the yr 2004 to 2010 was used. All patients aged≥65 yr and who underwent an appendectomy procedure for a diagnosis of appendicitis were selected. Outcomes examined included: in-hospital mortality (IHM) & systemic complications(SC). The simultaneous effects of a mix of patient related factors & hospital characteristics on outcomes were examined by multivariable regression models. The study was IRB approved. Results: A total of 150,784 patients ≥65 yr underwent an appendectomy. The mean age was 74.4 yr and 51% were females. 96.3% had acute appendicitis (AA). 50.3% with AA had generalized peritonitis (GP) or peritoneal abscess(PA). About 51% had laparoscopic appendectomy (LA). Race: Whites (81.6%), Blacks (4.6%), Hispanics (7%), Asians/Pacific Islanders (4%) and other races (2.7%). 2,135 patients (1.4%) died in hospitals. The overall SC rate was 29.1% and infections occurred in 16.2%. Frequently reported SC were: digestive system complications (10.3%), bacterial infections (7.8%), sepsis (6%) and post-operative pneumonia (4.3%). Increasing age (OR=1.08, p<0.001), blacks (OR=2.09, p<0.001), AA with GP/PA (OR=1.81, p<0.0001), and increasing co-morbid burden(CMB) (OR=1.37, p<0.001) were associated with higher odds for IHM. Females (OR=0.60, p<0.001) and LA (OR=0.42, p<0.001) were associated with lower odds for IHM. Increasing age (OR=1.02, p<0.001), blacks (OR=1.35, p<0.001), AA with GP/PA (OR=3.07, p<0.001), and increasing CMB (OR=1.26, p<0.001) were associated with higher odds for SC. Females (OR=0.78, p<0.001), LA(OR=0.60, p<0.001), and performance of procedure on an elective basis(OR=0.89, p=0.02) were associated with lower odds for SC. Conclusions: Laparoscopic appendectomy is associated with lower risk of complications and mortality in the older population with appendicitis. Older age, black race and higher CMB are associated with worse outcomes.

Oxidant Stress in Sheep Treated with Nebulized Epinephrine after Burn and Smoke Inhalation Injury

Michael Dubick, Hui Xia, Satoshi Fukuda, Ruby Gibson, Johnny Barr, Ernesto Lopez, Perenlei Enhkhaabat

Learning Objectives: Bronchoconstriction and pulmonary edema are often observed after combined burn and smoke inhalation injury. It was previously shown that nebulized epinephrine (Nepi) reduced hyper-permeability in lung in a sheep burn and smoke model, but the beneficial effects could not be explained solely on its adrenergic actions. The current study investigated the hypothesis that Nepi will reduce indices of inflammation and oxidative stress associated with burn and smoke inhalation injury. Methods: Sheep were subjected to a 40% flame burn and 48 breaths of cooled cotton smoke and randomized to Nepi (4 mg epinephrine; n=10) or nebulized with saline (n=8). Sheep were mechanically ventilated and monitored for 48 hr in a conscious state. Sheep were then euthanized and lung, liver and kidney were analyzed for total antioxidant potential, lipid peroxidation, nitric oxide and select antioxidant enzyme activities. Results: At 48 hr, only manganese superoxide dismutase activity was significantly higher (50%) in lung from saline-treated than Nepi-treated sheep. The trend in higher total antioxidant potential in lung from Nepi sheep did not achieve statistical significance. No significant differences were observed in lung gluthathione or nitric oxide levels or activities of catalase or xanthine oxidase between groups. In addition, no statistically significant differences were observed in any of these variables between groups in liver or kidney. Conclusions: Analysis of tissues 48 hr after burn and smoke inhalation injury could not detect any major influence of Nepi reducing biomarkers of oxidant stress or inflammation in lung, liver or kidney compared to nebulized saline treatment. Further studies should focus on its α1 adrenergic properties and improved urinary output to characterize its overall beneficial effects in reducing acute lung injury in this model. Supported by US Army MRMC, W81XWH-12-2-0086 and SHC84050.

Alcohol Use Disorder Among Family and Friends Six Months After Admission to the ICU

Ann Marie Warren, Evan Elizabeth Rainey, Monica Bennett, Lauren Mertesdorf, Michael Foreman

Learning Objectives: The effects of ICU admission on loved ones is an understudied topic. One study showed that caregiving negatively influenced alcohol consumption with 39.6% of caregivers of traumatic brain injury patients using alcohol excessively at ≥1 year post injury. This study seeks to examine the incidence and predictors of alcohol use disorder among family at 6 mo after patient admission to the ICU, specifically its relationship to time spent caregiving. Methods: 122 participants were enrolled at an urban hospital with a Level 1 trauma service as part of a prospective convenience sample. Family members (≤18 yr) of patients (≤18 yr) admitted to the surgical ICU for ≥48 hr, with expected survival of ≥96 hr were included. At the time of analysis, 71 participants had completed a 6 month follow up, 10 were excluded due to the death of the patient. Data was collected while the patient was in the ICU and then again at 6 mo. Alcohol use disorder (AUD) was measured using the Alcohol Use Disorders Identification Test (AUDIT-C). Anticipated time spent caregiving was measured as a percent at both time points. Results: Twenty-eight percent (N=20) screened positive for AUD at baseline, compared to 25% (N=18) at 6 mo. At 6 month follow up, 20% (N=14) were spending ≥50% of their time caregiving and 14% (N=10) were caregiving greater than they anticipated at baseline. Those whose time caregiving at 6 mo was greater than expected had a significant association with AUD (p=0.0024). However, caregiving ≥50% of the time was not significant (p=0.0864). Lower age and AUD at baseline were also significantly associated with AUD at 6 mo. Conclusions: Participants who were caregiving greater than they anticipated at 6 mo showed a significant relationship with AUD. This does not appear to be dependent on the overall amount of caregiving as those who provided > 50% of their time in a caregiving role did not have a greater association with AUD. Expectations regarding caregiving, rather than actual amount of caregiving, may be an important factor in those individuals who engage in problematic drinking.

Overview of Resuscitation Occurs Frequently in the First 24 hr after Acute Pediatric Burn Injury; however its impact on outcomes remains poorly described. Hypothesis: Children who are over-resuscitated (> 6 ml/kg/% total body surface area) have worse outcomes. Methods: Children admitted to a burn center were prospectively followed from admission to hospital discharge. Over-resuscitation was defined as fluid resuscitation > 6 ml/kg/% TBSA. Results: 244 children were admitted (male: 67%) who were resuscitated over time. 14% were over-resuscitated. Over-resuscitation was associated with a prolonged hospital stay (OR=1.82, p<0.001). Conclusions: Over-resuscitation is a common occurrence in children. This study suggests over-resuscitation is associated with a prolonged hospital stay.
body surface area (TBSA) in the first 24 hr are more likely to experience respiratory failure, hemodynamic instability, additional support devices, prolonged mechanical ventilation (MV), PICU length of stay (PLOS), and hospital length of stay (HLOS). **Methods:** A retrospective chart review of pediatric patients sustaining ≥15% TBSA burn and resuscitated via the modified Parkland formula from 2010–2015 was conducted. Goal urine output (UOP) was 1–1.5 mL/kg/hr for all patients. **Results:** 21 patients were divided into two groups by resuscitation volume received to assess potential effects of over-resuscitation. 10 patients (48%) received >6ml/kg/%TBSA and were assigned to the high fluid group (HFG). 11 patients (52%) received <6ml/kg/%TBSA and were assigned to the low fluid group (LFG). Groups were comparable in terms of inhalational injury (p=0.08), flame burn (p=0.99), and scald burns (p=0.99). There was no difference in UOP between groups (p=0.22). There was no difference in the rate of respiratory failure, hypotension, or vasopressor use between groups (p=0.36, p=0.67, p=0.56 respectively). Odds of requiring an invasive device were not higher in the HFG (arterial lines p=0.67, peritoneal drains p=0.63, chest tubes p = 0.99, and CVL p=0.67). After controlling for burn severity, no significant association between MV days or PLOS was found (p=0.16 and p=0.65 respectively). However, HLOS was 1.6 times longer (p=0.04, 95% CI 1.02–2.39) in the HFG. **Conclusions:** Respiratory failure, hemodynamic instability, and need for invasive devices remain common following acute pediatric burn injury. However, in the present study, they were not found to be associated with over-resuscitation in the first 24 hr post burn. Further study is needed to define the relationship between over-resuscitation and prolonged HLOS.

1125 THE EFFECT OF BLOOD TRANSFUSIONS IN CRITICALLY ILL CHILDREN WITH TRAUMATIC BRAIN INJURY
Jose Hernandez Rivera, Balagangadhar Totapally

**Learning Objectives:** Blood transfusion (BT) is frequently required in the management of traumatic brain injury (TBI). The effect of BT in severe TBI in children has been poorly studied. We investigated the outcome of children with severe TBI receiving BT using propensity score-matched data from the 2012 Kid’s Inpatient Database (KID). **Methods:** The KID is a part of a family of databases developed for the Healthcare Cost and Utilization Project and is based on discharge abstracts created by hospitals for billing. We used to 2012 KID for this project. All mechanically ventilated children aged 1 mo to 17 yr were included. We selected those with TBI using the ICD-9 diagnosis codes 800–801, 803–804, 850–854 and compared patients who received BT (procedure codes 99.02–99.04) vs those who did not. In a separate analysis, patients were matched 1:1 with correlative propensity score using age, gender, hospital region, income quartiles, race, APRDRG severity score, child abuse, polytrauma, and major operating procedure status. Outcomes were compared between groups. Chi-Square test and student-t test were used to analyze the data. Data were weighted to give national estimates. **Results:** Out of a total of 3007 children with severe TBI, 31.8% received at least one BT. BT rates were higher in females (39% vs 29%, p=0.001) and Native Americans and Hispanics (p=0.038) and lower in South region (28% vs 31%; p=0.03) when compared with the rest of the TBI patients. Other blood product transfusion rate (36% vs 4%; p=0.001), minor (54% vs 49%; p=0.001) and major (38% vs 34%; p=0.03) neurosurgical procedure rates were higher among blood transfused patients. A total of 1892 TBI patients were matched 1:1 with controls. Comparing with matched controls, BT group had higher mortality (15.7% vs 9.6%; p=0.001) more procedures (11 vs 9; p=0.001) shorter length of stay (23.3 vs 26.7 days; p=0.001) and lower charges ($353,236 vs $362,569; p=0.19). **Conclusions:** The analysis of a large national database using matched controls in children with severe TBI showed a trend in increased secondary abdominal infection (infection deemed to be a complication of the primary injury), and multi-drug resistant organisms (MDRO) development. **Results:** 88 patients (28 ABD; 60 ORT) were included for analyses. Demographics were similar between groups (age 29 [22–40] vs 24 [21–30] yr, p=0.09; male 89.3% vs 91.7%, p=0.71; Injury Severity Score 17 [10–25] vs 18 [17–25], p=0.22). Hospital LOS (7 [5–17] vs 8 [6–10] days, p=0.78) and mortality (7.1% vs 0%, p=0.1) were similar. ABD patients received shorter BT durations compared to ORT (1 [1–2] vs 2 [1–5 days, p=0.005) with a trend in increased secondary abdominal infection (42.9% vs 20%, p=0.05). Subgroup analyses demonstrated no difference in overall infection rates among ORT patients receiving short (n=31) vs long (n=29) course ABX (16.1% vs 24.1%, p=0.65) as well as osteomyelitis (3.2% vs 6.9%, p=0.61) and MDRO infection (9.6% vs 17.2%, p=0.47). There was increased MDRO in patients who received ≤5 (n=80) vs >5 (n=8) different ABX during the hospital stay (87.5% vs 11.3%; p<0.001). **Conclusions:** Morbidity was similar between patients with AGBSW with and without associated orthopedic injuries, regardless of prophylactic antibiotic duration.

1126 ANTIBIOTIC EVALUATION FOLLOWING PENETRATING ABDOMINAL INJURY WITH AND WITHOUT ORTHOPEDIC INJURY
Madeline Foerstich, Molly Dooce, Eric Mueller, Bryce Robinson

**Learning Objectives:** Data are lacking regarding prophylactic antibiotic (ABX) efficacy for preventing osteomyelitis/meningitis following intra-abdominal gunshot wounds (AGSW) with associated orthopedic injury. This study aimed to compare morbidity in AGSW with and without associated orthopedic injury. **Methods:** Single-center, retrospective cohort study of patients admitted to the University of Cincinnati Level 1 trauma center from 2000–2012. Adult patients with AGSW were identified and grouped as: 1) only abdominal injury (ABD) and 2) abdominal injury with corresponding orthopedic injury (ORT). The primary endpoint compared morbidity (disposition, length of stay, LOS, number of GI operations, and in hospital mortality) between the two groups. ORT subgroups of short (<48 hr) and long (>48 hr) course ABX were evaluated for ABX spectrum, secondary infection (infection deemed to be a complication of the primary injury), and multi-drug resistant organisms (MDRO) development. **Results:** 88 (28 ABD; 60 ORT) were included for analyses. Demographics were similar between groups (age 29 [22–40] vs 24 [21–30] yr, p=0.09; male 89.3% vs 91.7%, p=0.71; Injury Severity Score 17 [10–25] vs 18 [17–25], p=0.22). Hospital LOS (7 [5–17] vs 8 [6–10] days, p=0.78) and mortality (7.1% vs 0%, p=0.1) were similar. ABD patients received shorter BT durations compared to ORT (1 [1–2] vs 2 [1–5 days, p=0.005) with a trend in increased secondary abdominal infection (42.9% vs 20%, p=0.05). Subgroup analyses demonstrated no difference in overall infection rates among ORT patients receiving short (n=31) vs long (n=29) course ABX (16.1% vs 24.1%, p=0.65) as well as osteomyelitis (3.2% vs 6.9%, p=0.61) and MDRO infection (9.6% vs 17.2%, p=0.47). There was increased MDRO in patients who received ≤5 (n=80) vs >5 (n=8) different ABX during the hospital stay (87.5% vs 11.3%; p<0.001). **Conclusions:** Morbidity was similar between patients with AGBSW with and without associated orthopedic injuries, regardless of prophylactic antibiotic duration.

1127 ADJUNCT KETAMINE INFUSIONS PROVIDE IMPROVED ACUTE TRAUMATIC AND POST-SURGICAL PAIN MANAGEMENT
Caitlin Mullins, Nathan Kugler, Meghann Luc, William Peppard

**Learning Objectives:** Acute pain management is intimately tied to patient satisfaction following trauma or surgery. Despite extensive adverse effects, opiate-based therapy remains the mainstay of acute pain management in these patients due to a lack of safe, viable alternative therapies. Ketamine infusions have historically been utilized following failure of traditional opiate therapy. Previous work demonstrates its safety and utility in the setting of opiate tolerant patients undergoing elective operations. This study aims to demonstrate the utility of adjunct continuous intravenous (IV) ketamine in the setting of critically ill trauma and surgical patients. **Methods:** A single center, retrospective review of adult patients who received adjunct continuous IV ketamine infusions while in the surgical intensive care unit (SICU) between January 2009 and May 2015 was conducted. The primary outcome was improved pain management following institution of ketamine therapy. Pain management was assessed utilizing numeric pain scores (NPS) 0–12 hr prior to and 12–24 hr post initiation of ketamine infusions. Cumulative opioid consumption, standardized to oral morphine equivalents, was assessed for the same pre- and post-ketamine intervals. **Results:** Sixty-four patients received IV ketamine infusions with twenty-eight excluded (paucity of documented pain scores; palliative care, etc). Thirty-four patients were analyzed: mean age was 53 yr, 56% were male, 32.4% were opiate tolerant (≥30 mg PO morphine daily for >3 weeks), and 47% were admitted to the trauma service. Analysis of the mean NPS pre- and post-ketamine demonstrated significant improvement (6.54 vs 5.37; p = 0.001). Additionally, analysis of cumulative opioid utilization pre- and post-infusion demonstrated a significant decrease (137.5 mg vs 81.07 mg; p = 0.001) in opiate requirements. **Conclusions:** Adjunct continuous ketamine infusions significantly improved pain management and decreased opiate consumption among patients experiencing acute traumatic or post-surgical pain. A prospective study in this population is warranted to better demonstrate its efficacy.

1128 NO CORRELATION BETWEEN DVT AND PE RATES: 23 YEARS OF LITERATURE REVIEW
Hiba Abdel Aziz, C. Dunham, Barbara Hileman

**Learning Objectives:** Deep venous thrombosis (DVT) commonly develops in the veins of the legs, at a lower incidence in the pelvic veins, vena cava and upper
extremities. Pulmonary embolus (PE) is thought to arise from lower extremity DVT. Lower extremity DVT surveillance is commonly used in trauma patients considered at risk for DVT. Methods: A 23 year, comprehensive DVT surveillance literature review was performed to assess the effect of surveillance on DVT and PE rates, the efficacy of chemoprophylaxis (CP) and mechanical prophylaxis (MP), and the relationship between DVT and PE. Twenty-four publications with >1,000 patients were reviewed. Results: DVT rates are significantly higher when surveillance is used, 8.3% (n=12,432) than with no surveillance, 2.6% (n=8,825; p=0.001). PE rate without surveillance was 1.3% (n=823), similar to 1.1% (n=12,184) with surveillance (p=0.6095). There is no association between DVT and PE rates (p=0.7574). CP administration was associated with reduced DVT rate (4.4%, n=5,801) compared to no CP (11.7%, n=4,966; p<0.001; RR=2.7). PE rate was lower with CP (0.8%, n=5,662) than no CP (1.5%, n=4,866; p=0.0004). MP also decreased DVT rate (7.9%, n=8,827) compared to no MP (13%, n=600; p<0.001; RR=1.7). PE rate was similar, 1.5% (n=600) not on MP compared to 1.2% (n=8,748) with MP (p=0.4340). Of 600 who received no CP and no MP DVT rate was 13% and PE rate was 1.5%. When CP and/or MP were given, DVT rate was 7.8% (n=9,128; p<0.0001) and PE rate was 1.2% (n=8,898; p=0.4317). Conclusions: DVT surveillance of the lower extremities appears effective in diagnosing DVT; however the risk of PE is not decreased. Our data suggest that PE rates are not associated with lower extremity DVT. The historical notion that lower extremity DVT is associated with PE development is in question. New paradigms need to be developed, e.g., considering DVT in the vena cava and pelvic veins and assessing for hyper-coagulation.

1130 COMPARISON OF TRANSEXAMIC ACID AND AMINOCAPROIC ACID IN BLOOD LOSS REDUCTION IN ORTHOPEDIC SURGERIES
Casey Stewart, Kristal Cunningham, Florian Daragjati, Bryan Allen, Calvin Tucker
Learning Objectives: Tranexamic acid (TA) and epsilon-aminocaproic acid (EACA), are commonly used to minimize blood loss during total hip arthroplasty (THA) and total knee arthroplasty (TKA). To date, there are no head to head trials of TA and EACA in this patient population. This study directly compares the safety and efficacy of four different regimens utilizing either EACA or TA. Methods: A single center, retrospective chart review was conducted on patients who underwent TKA or THA and received either TA or EACA between May 2011 and October 2013. Antifibrinolytics were administered either locally to the surgical site or a combination of locally and intravenously (IV). The primary outcome was to compare blood loss, through average change in hemoglobin from baseline measured pre-operatively to post-operatively. Other outcomes included the rate of transfusions, estimated procedural blood loss, post-operative venous thromboembolism, and length of stay. Results: Two-hundred patients were included in each group (n=800). The average decrease in hemoglobin was 2.77 g/dL for all patients who received EACA compared to 2.50 g/dL in patients administered TA (p<0.001). Comparing each of the four groups separately, the average decrease in hemoglobin was statistically significant in EACA local only compared to TA local only (2.89 vs 2.59 g/dL, p<0.01) and in EACA local only compared to TA local and IV (2.89 vs 2.41 g/dL, p<0.05). The average decrease in hemoglobin was not significantly different when EACA was given both locally and IV compared to either TA regimen. Conclusions: The average decrease in hemoglobin was significantly greater for patients who received EACA compared to TA. When comparing average decrease in hemoglobin for each of the four groups separately, EACA administered locally and IV was not statistically different than either TA regimen. This suggests that the overall difference between EACA and TA is likely due to the decrease in hemoglobin in the EACA local only group. There was no significant difference in the rate of transfusion among the groups.

1131 EXTRACORPOREAL MEMBRANE OXYGENATION USE IN NEONATES AND CHILDREN WITH TRISOMY 13 AND TRISOMY 18
Taemy Hollis, Katherine Cashen, Peter Rycus
Learning Objectives: Trisomy 13 (T13) and Trisomy 18 (T18) are fatal chromosomal disorders associated with multiple congenital anomalies with only 5–10% of children surviving past the first year. Extracorporeal membrane oxygenation (ECMO) is an invaluable means of cardiopulmonary support in the care of patients with reversible cardiac and or pulmonary disease refractory to other medical treatment. Determination of ECMO eligibility is based on center specific guidelines, ECMO team consensus and physician opinion. Historically, patients with T13 and T18 were not considered to be candidates for ECMO. However, in the recent era more of these infants are undergoing invasive procedures including cardiac surgery. There are no multicenter studies reporting outcomes of patients with T13 and T18 on ECMO. Methods: Pediatric patients ≤18 yr of age with T13 and T18 in the Extracorporeal Life Support Organization (ELSO) Registry were included. The primary outcome of interest was death within 1 year of ECMO. Secondary outcomes included time to liberation, ventilator days, and survival. Results: Twenty-three patients with T13 and T18 were included. ECMO use in T13 and T18 patients has increased with all of the cases occurring after 1996. There is no difference in survival comparing all pediatric patients compared to T13 and T18 patients did not predict survival RR=2.7). PE rate was lower with CP (0.8%, n=5,662) than no CP (1.5%, n=4,866; p=0.0004). MP also decreased DVT rate (7.9%, n=8,827) compared to no MP (13%, n=600; p<0.001; RR=1.7). PE rate was similar, 1.5% (n=600) not on MP compared to 1.2% (n=8,748) with MP (p=0.4340). Of 600 who received no CP and no MP DVT rate was 13% and PE rate was 1.5%. When CP and/or MP were given, DVT rate was 7.8% (n=9,128; p<0.0001) and PE rate was 1.2% (n=8,898; p=0.4317). Conclusions: DVT surveillance of the lower extremities appears effective in diagnosing DVT; however the risk of PE is not decreased. Our data suggest that PE rates are not associated with lower extremity DVT. The historical notion that lower extremity DVT is associated with PE development is in question. New paradigms need to be developed, e.g. consid-
D3, omega 3-fatty acids, glutamine, and progesterone) improves recovery and lowers mortality rate better than two drug therapy with vitamin D3 and progesterone alone (Bahram Aminmannsour study). **Methods:** This study with 183 patients TBI patients was a prospective comparison study done at Grady Memorial Hospital, a Level I trauma center in Atlanta, Georgia from August 2009 through February 2012 versus the Bahram study. Mean vitamin D3 level was 18.76 ng/ml ± 10.1. Mean ICU length of stay was 8.43 days ± 13.77. **Results:** There were 18 deaths (six were excluded due to withdrawal of care/support). Mortality rate after exclusion criteria was 6.0% which is 34.4% lower than the 10% mortality rate in the Bahram Aminmannsour study. Our recovery to a GCS of 10 was 90% versus 60% in the Bahram study. **Conclusions:** Our study potentially shows that our 4 drug combination therapy is more effective, offers better recovery, and offers more neuroprotection than 2 drug therapy in the Bayesian study. Further studies are needed to examine our 4 drug combination treatment in TBI patients.

**1133**

WEANING DIRECTLY FROM AIRWAY PRESSURE RELEASE VENTILATION WITH SPONTANEOUS BREATHING TRIALS

Melvin Stone, Anna Liveris, Stanley Kalata, Shira Yellin, Carlos Vargas, Edward Chao, Srinivas Reddy, Sheldon Teperman

**Learning Objectives:** Airway Pressure Release Ventilation (APRV) is primarily used as rescue therapy for patients with acute lung injury/acute respiratory distress syndrome. Less often it is used as a primary mode of ventilation and, hence, there is no standard weaning method. APRV weaning consists of gradually decreasing the airway pressure (P HIGH) before an extubation attempt or changing to a conventional mode like assist-control volume (ACV) and using spontaneous breathing trials (SBT). Our institution weans directly from APRV by starting SBT when the P HIGH is decreased to 16 cm H2O. This study compares this method to conventional weaning, ACV with SBT, with the hypothesis that both would be equally successful and have similar ventilator days. **Methods:** We retrospectively reviewed 5 mo of intubated trauma and non-trauma patients admitted to a surgical ICU where the primary endpoint was failure of extubation defined by reintubation within 48 hr. Inclusion criteria were ACV or APRV as a primary mode of ventilation and SBT for weaning. Unplanned extubations were excluded. Demographic data and ventilator metrics were extracted from the medical record. **Results:** Overall, 27 APRV and 54 ACV patients met inclusion criteria and were characteristically similar in mean age (46.5 vs. 53.7), trauma admissions (51.9% vs. 53.7%), Acute Physiology and Chronic Evaluation (APACHE) II (15.1 vs. 15.9), and PaO2/FIO2 (351.9 vs. 374.9). Both the APRV and ACV group, respectively, had only 2 patients (7.4% vs. 3.7%, p=0.597) requiring reintubation within 48 hr. However, the APRV group had longer median ventilator days (3.17 vs 1.20, p=0.002). A regression model adjusting for pneumonia, APACHE II, head and chest trauma showed that APRV was independently associated with increased ventilator days (OR=8.44, 95% CI: 2.4–29.7, p=0.001). **Conclusions:** Compared to ACV, patients on APRV as a primary mode can be successfully weaned at a P HIGH of 16 cm H2O using SBT. However, ventilator days appeared to increase with this method.

**1134**

PAIN ATTENUATION AS PERCEIVED BY FAMILIAL CAREGIVERS CORRELATES WITH DEPRESSION AT 6 MONTHS

Michael Foreman, Evan Elizabeth Rainey, Monica Bennett, Ann Dyer, Ann Marie Warren

**Learning Objectives:** Negative psychological consequences, such as depression, has been shown in up to 29% of familial caregivers at 1 year post ICU admission. We hypothesized that family perception of patient pain attenuation would correlate with depression at 6 mo following ICU admission. **Methods:** 122 participants were enrolled at an urban hospital with a Level 1 trauma service as part of a prospective convenience sample. Family members (≥18 yr) of patients (≥18 yr) admitted to the surgical ICU for ≥48 hr, with expected survival of ≥6 hr were included. At the time of analysis, 71 participants had completed a 6 month follow up. 10 were excluded due to the death of the patient. Data was collected in the ICU and then again at 6 mo. Depression was measured using the Patient Health Questionnaire 8 (PHQ-8). **Results:** Forty-six percent (N=33) screened positive for depressive symptoms at baseline, compared to 21% (N=15) at 6 mo. Family perception of patient pain attenuation was examined to identify associations with caregiver depression. Non depressed caregivers perceived an average drop of pain of 71.9% ± 28.1 versus 54.0% ± 54.6 for depressed caregivers (p=0.034). Insurance status, age, relationship to patient, and employment were not associated with depression at 6 mo. **Conclusions:** Depression appears to be a common experience in those whose loved one has been admitted to the ICU. Our study suggests that depression rates improved at 6 mo, however, there was a significant negative relationship between depression and the perception of patient pain attenuation at 6 mo, with depressed individuals perceiving less of a pain decrease. This study suggests that depression in caregivers may be influenced by the experience of the patient.

**1135**

IMPACT OF A NURSING-DRIVEN SEDATION PROTOCOL ON MECHANICAL VENTILATION IN THE SURGICAL ICU

Justin Kaplan, Daniel Eifeiman, Gary Phillips, Jennifer MacDermott, Claire Murphy

**Learning Objectives:** Nursing-driven sedation protocols reduce duration of mechanical ventilation (MV) in medical ICU patients, but few studies have assessed their impact in the surgical ICU (SICU). The objective of this study was to compare duration of MV pre- and post-implementation of a nursing-driven sedation and analgesia protocol with criteria for continuous infusions of sedatives and analgesics in the SICU. We hypothesized that the protocol would increase the number of ventilator-free days at day 28 (VFD28) compared to the control group. **Methods:** A single center, retrospective study compared duration of MV pre- and post-protocol implementation. Eligible patients were aged 18 and older admitted to the SICU who required MV for at least 24 hr. In the pre-implementation (control) group, the intensivist used clinical discretion to determine sedation and analgesia regimens whereas the post-implementation (protocol) group followed the sedation and analgesia protocol. The primary outcome of VFD28 was analyzed using multivariable linear regression analysis. **Results:** Ninety-six patients were included in the study (44 control, 52 protocol). The median VFD28 was higher in the protocol group compared to the control group (20.5 days vs. 13 days, p=0.04). However, the results were not statistically significant after adjustment for differences in severity of illness and opioid tolerance (protocol group incident rate ratio 0.90; 95% confidence interval, 0.69–1.17, p=0.090). The protocol was associated with reduced incidence of continuous infusions, lower cumulative use of opioids and benzodiazepines, and higher proportion of sedation scores within target range. **Conclusions:** A nursing-driven sedation protocol trended towards increased VFD28 in the SICU, and led to decreased cumulative opioid and benzodiazepine consumption and percentage of patients requiring continuous infusions. Combined with greater achievement of target sedation scores, the advantages of a protocol may also facilitate decreased incidence of ICU delirium and ability to wean from MV in the SICU.

**1136**

A SINGLE INSTITUTION SERIES OF >1000 CHILDREN WITH SOLID ORGAN INJURIES

Mary Thorpe, David Mooney

**Learning Objectives:** Trauma is the leading cause of morbidity and mortality in children. 10–15% of childhood injuries that result in admission are abdominal organ injuries from a single institution with a bias toward nonsurgical management. **Methods:** The trauma registry of our level I pediatric trauma center was interrogated for all children from 0 to 21 yr of age admitted to our facility with a diagnosis of a liver, spleen, kidney or pancreas injury. Data extracted included age, gender, mechanism of injury, diagnosis codes including complications, procedure codes, ICU length of stay, hospital length of stay, transfusion, and discharge disposition. **Results:** The 1,149 children suffered a total of 1,251 solid organ injuries from 1994 to 2015. Mean patient age was 10.9 yr (1 month to 21 yr). Mortality rate after exclusion criteria was 6.6% which is 34.4% lower than the 10% mortality rate in the Aminmansour Bahran study. Our recovery experience in those whose loved one has been admitted to the ICU. Our study suggests that depression rates improved at 6 mo, however, there was a significant negative relationship between depression and the perception of patient pain attenuation at 6 mo, with depressed individuals perceiving less of a pain decrease. This study suggests that depression in caregivers may be influenced by the experience of the patient.

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Learning Objectives: Postoperative hemorrhage is correlated with adverse outcomes and increased cost. Very few published works to-date explore the predictors of hemorrhage requiring multiple (at least 3) units of packed red blood cells transfusion (MPRBCT) following operative procedures. Methods: The study population consisted of 5,289 consecutive Surgical Intensive Care Unit (SICU) admissions at a rural, university-based, level 1 trauma center. A multivariate logistic regression model adjusted for repeated measures was constructed to describe the relationship between descriptive statistics, correlations of vital signs, time series measures of heartbeat intervals, electronic health record data, and the need for MPRBCT within 24 hr after procedures performed in the main operating room (OR). Results: Data representing 27,9 patient-yr were available for 4,901 patients, 6.7% of which (n=330) experienced hemorrhage requiring multiple packed red blood cell transfusions within 24 hr following ORP. Patients requiring MPRBCT had an increased median length of stay (1.85 vs. 5.48 days) and a five-fold increase in mortality (3.6% vs. 18.5%) compared to those patients who did not receive MPRBCT after ORP. The independent predictors for MPRBCT (ranked by ANOVA chi-square values) were as follows: pulse-oximetry (SpO2), low diastolic blood pressure (DBP), SpO2 variability, short post-operative time interval, low pulse pressure (PP), local dynamics score, case duration, emergency case status, and mean heart rate. The model performed well with a bootstrap validated C-statistic of 0.78, and was well-calibrated with a mean absolute error of 0.001. The model’s median estimated risk for MPRBCT increased more than three-fold in the 24 hr leading to the first transfusion. Conclusions: Multivariate analysis of clinical and physiologic parameters may be useful for identifying independent predictors of MPRBCT in the 24 hr prior to transfusion. Once identified, such risk factors might lead to the early-detection of adverse events and improved outcomes.

1138

TRAUMA PATIENTS WARRANT UPPER AND LOWER EXTREMITY VENOUS DUPLEX ULTRASOUND SURVEILLANCE

Alan Tyroch, Jody Smith, Alonso Andrada, Alex Ramos, Susan McLean

Learning Objectives: Due to the high incidence of thromboembolic events (DVT & PE) after injury, many trauma centers perform lower extremity surveillance duplex ultrasounds. Methods: Retrospective chart and trauma registry review of ICU trauma patients with upper and lower extremity DTVs detected on concurrent surveillance duplex ultrasound from 01/10 to 12/14. Variables reviewed were age, gender, ISS, injury mechanism, clot location, day of clot detection, CVP catheter, IVC filter, mechanical ventilation and fracture site. Results: 136 patients had a DVT in a five year period: upper- 71(52.2%), lower- 61 (44.9%), both upper and lower- 4 (2.9%). Overall, 75 (55.2%) patients had an upper extremity DVT. Upper DVT vein: brachial (62%), auxiliary (26%), subclavian (11%) and internal jugular (10%). Lower DVT vein: femoral (58), popliteal (14), below knee (4) and iliac (2). 10.3% had a PE: upper extremity DVT- 5 (6.7%) and lower extremity DVT- 9 (14.8%); p= 0.159. Conclusions: The majority of the DTVs in the study were in the upper extremities. One can debate the merits of an aggressive thromboembolic screening program, especially since hospitals may receive financial penalties resulting from the Affordable Care Act due to “preventable” hospital-acquired conditions. On the other hand, severely injured trauma patients are at significant thromboembolic risk despite appropriate prophylaxis. For trauma centers that aggressively screen the lower extremities with venous duplex ultrasound, surveillance to include the upper extremities is warranted.

1139

ARDS INCIDENCE, BUT NOT MORTALITY, HAS DECREASED NATIONWIDE - A NATIONAL TRAUMA DATA BANK STUDY

Michael Fahr, Danielle Tatun

Learning Objectives: The incidence of ARDS is reported to have decreased in recent years, likely due to advances in supportive care strategies. However, no study to date has examined temporally related changes in post-traumatic ARDS incidence and outcomes on a large scale to determine the effect of these practice changes exclusively in the adult trauma patient population. Methods: The NTDB National Sample Program was queried to evaluate ARDS incidence and associated outcomes over a 6 year period (2007–2012). To be included, patients had to be ≥18 yr old, have at least one ventilator day, and have complications recorded. Trends in ARDS-associated outcomes such as mortality, number of ventilator days, length of stay (LOS), ICU LOS, and complications such as pneumonia, sepsis, and acute kidney injury (AKI) were also analyzed. Results: Post-traumatic ARDS incidence significantly decreased from a high of 21.5% in 2007 to a low of 8.5% in 2012 (P<0.001). Overall, LOS, ICU LOS and ventilator days decreased over the study period, but only reduction in LOS (25.0 to 20.9 days) was both statistically (P<0.001) and clinically significant. There was an observed increase in age (P<0.003), but gender and race did not change. Mortality increased from 21.3% in 2007 to 24.9% in 2012 (P<0.002). Both pneumonia and AKI marginally increased during the year examined (39.5% to 40.9% and 11.4% to 12.8%, respectively). Septis trended down from 17.5% in 2007 to 12.0% in 2010, after which time the NTDB definition changed and comparable data were not available. Conclusions: National post-traumatic ARDS incidence has decreased significantly in recent years, likely due to improved fluid and transfusion strategies, lung protective ventilation, and improved infection control protocols. Despite these advancements, post-traumatic ARDS mortality has remained stagnant for the past decade, suggesting it is no longer a viable primary outcome. To better assess effects of practice change, future studies should apply a more rigorous definition of ARDS and target a different primary outcome.

1140

USE OF A COMPUTERIZED HEPARIN PROTOCOL IMPROVES PATIENT SAFETY IN THE SURGICAL ICU

Kelli Rumbaugh, Kayla Bole

Learning Objectives: The Chest Guidelines recommend a standardized therapeutic unfractionated heparin (UFH) dosing over non-standard dosing. In May 2014, our surgical ICU initiated a standardized UFH infusion protocol within our computerized physician order entry (CPOE). All UFH infusions would default to a nurse-managed protocol and promote ordering SICU approved dosing protocol. The purpose of this CPOE change was to improve protocol compliance. Our hypothesis is that using a standardized CPOE heparin dosing protocol for high risk surgical patients will improve protocol compliance and prevent ordering of heparin boluses. Methods: In this IRB approved study, all data were collected retrospectively from medipac and the EMR. Eligible patients were ≥18 yr, admitted to the SICU between 9/11/13–8/31/14, and ordered an UFH infusion. Patients on an UFH infusion for less than 24 hr were excluded. The pre-intervention group was before the CPOE protocol changes were initiated, and the post-intervention group was after the initiation of the CPOE protocol changes. The primary outcome was number(%) of non-SICU UFH protocols ordered. Secondary outcomes were # of heparin boluses ordered, # of heparin boluses administered, # of aPTT values, and % of supratherapeutic aPTT values. Categorical variables were analyzed via a chi-squared test, and continuous variables with a Mann-Whitney U test. Results: Eighty-five patients met inclusion criteria. Two patients were excluded. Fifty-two patients...
patients were analyzed in the pre-intervention and 31 patients in the post-intervention group. There were no differences in baseline characteristics between the two groups. The ICU UFH protocol was ordered significantly more in the post group (67% vs 38%, p<0.01). Thirty-two percent of patients had a heparin bolus ordered in the post group and 48.1% in the pre group (p=0.26). Ninety-six boluses were given in the pre group and 23 in the post (p=0.174). There were more AP TTIs/patient obtained in the post group (12 vs 19, p=0.04).

Conclusions: A CPOE program can be used to improve protocol compliance and potentially improve medication safety.

1142 DO INTRACRANIAL PRESSURE MONITORS IMPROVE SURVIVAL IN PEDIATRIC TRAUMATIC BRAIN INJURY PATIENTS?
Frederick Rogers, Brian Gross, Mathew Edavattem, James Altare, Autumn Vogel, Maria Gillio, Daniel Wu

Learning Objectives: Intracranial pressure (ICP) monitoring in pediatric traumatic brain injury (TBI) patients is controversial. We sought to characterize the risk-adjusted impact of ICP monitor placement on mortality for severe head injured pediatric trauma patients. We hypothesized ICP monitoring would result in improved survival for the pediatric TBI population. Methods: All pediatric patients (<18 yr old) presenting with severe head injury (Head Abbreviated Injury Scale [AIS] 4–5) from 2003–2015 to accredited level I-II trauma centers in Pennsylvania were queried from the Pennsylvania Trauma Systems Foundation (PTSF) state trauma registry. Excluded cases included patients presenting dead on arrival, Demographic data, ICP monitor installation rate, and mortality rate were analyzed. To assess the effects of ICP monitor placement on mortality, a multivariate logistic regression model adjusting for demographic and injury severity covariates, ICP monitor placement was not significantly associated with mortality (AOR: 1.21; 0.73–1.98; p=0.455).

Conclusions: In a 2,211 patient statewide trauma sample analyzing the risk-adjusted impact of ICP monitor placement on mortality, no survival advantages were found for patients receiving monitors. Management of the severe head injured pediatric trauma patient may not require the use of an ICP monitor.

1143 SOCIOECONOMIC DISPARITIES IN THE TREATMENT OF TRAUMATIC BRAIN INJURY (TBI)
Kailyn McQuistion, Hee Soo Jung, Tiffany Zens, Megan Beams, Amy Liepert, Ann O’Rourke, John Scarborough, Suresh Agarwal

Learning Objectives: Evidence exists that socioeconomic factors affect patient outcomes after traumatic brain injury (TBI). The effect of the treatment on TBI is less well described. The goal of the present study was to assess the effect of race/ethnicity and method of payment on hospital length of stay, days in the ICU, and days on a ventilator after TBI. Methods: A retrospective cohort study using National Trauma Data Bank yr 2002–2012 was performed. Patients aged 14–89 with ICD-9 codes for one of six closed head injuries (Concussion, Cerebral Contusion, Cerebellar or Brainstem Contusion, Subarachnoid Hemorrhage, Subdural Hemorrhage, and Extradural Hemorrhage) were analyzed. Univariate linear regression assessed the effect of demographic and injury characteristics on each outcome variable. All significant predictors were included in the multivariate linear regression models for hospital length of stay, days in the ICU, and days on a ventilator. Results: The sample consisted of 201,553 TBI patients: 2.5% Asian, 12.0% Black, 10.1% Hispanic, 0.7% Native American, and 74.7% White. Insurance types included: 9.0% Medicaid, 25.2% Medicare, 12.3% “other insurance”, 37.9% privately insured, 15.6% uninsured. After controlling for demographic and injury characteristics, Blacks (coeff=-.451, p<.001), Hispanics (coeff=-.249, p<.001), and Native Americans (coeff=-.474, p<.001) had longer hospital length of stays than Whites. Blacks spent more time in the ICU (coeff=-.139, p<.001) than Whites. All races/ethnicities spent the same amount of time on a ventilator. Those with Medicaid had longer lengths of stay (coeff=-1.493, p<.001), spent more time in the ICU (coeff=-5.89, p<.001), and more time on a ventilator (coeff=-3.64, p<.001) than the Privately Insured. Uninsured had shorter lengths of stay (coeff=-.095, p=0.42), spent less time in the ICU (coeff=-1.44, p<.001), and less time on a ventilator (coeff=-1.43, p<.001) than Privately Insured. Conclusions: Race/ethnicity and insurance status significantly effect treatment after TBI. These socioeconomic treatment differences may partially explain previously observed outcome differences.

1144 PRONE POSITION SCREENING OF SURGICAL/TRAUMA PATIENTS WITH REFRACTORY HYPOXEMIA
My Lam Nguyen, Dean Holland, Jennifer De La Garza, Natalie Provenzale, Christian Minshall, Brian Williams

Learning Objectives: Outcomes for mechanically ventilated patients improve with protocols initiated and managed by Respiratory Therapists (RT). Our pilot project to assess prone ventilation in a Surgical/Trauma Intensive Care Unit (STICU) used an RT-initiated screening tool to identify patients with refractory hypoxemia from acute respiratory distress syndrome (ARDS). The aim was to determine if the RT can integrate a prone screening process to identify STICU patients that may benefit from early prone ventilation. Methods: During December 1, 2014 and May 30, 2015, RT’s screened all ventilated patients on STICU ventilator protocol with refractory hypoxemia from acute respiratory distress syndrome (ARDS). Between December 1, 2014 and May 30, 2015, RT’s screened all ventilated patients on STICU ventilator protocol with refractory hypoxemia for possible prone positioning utilizing the Roto-Prone® bed (KCI USA, Inc., San Antonio, TX). Demographic data were collected on all patients. Prone inclusion criteria were patients placed on Low-Volume or Bivent protocol (P/F < 175 on PEEP > 10 cm H2O and FIO2 > 0.50). Exclusion criteria were patients that improved within 24 hr, or patients with absolute contraindications such as an unstable spinal column, severe TBI, or tracheal surgery. Results: 492 subjects were admitted to STICU during the study period. 142 (29%) were intubated and of those 126 (89%) were on the STICU ventilator protocol. 29
of the 126 (23%) were placed on Low-Volume or Bivent protocol. 22 of the 29 (76%) were screened while 7 (24%) were excluded because their condition improved within 24 hr. Of those screened, 6 (27 %) had absolute contraindications, 6 (27%) had relative contraindications, 5 (23%) had both, and 4 (18%) were physician discretion. 1 (5%) patient underwent prone ventilation. RT screened 22 (100%) patients that qualified. Conclusions: In conjunction with a STICU ventilator protocol, we implemented an RT-initiated screening process for prone ventilation to assist in managing refractory hypoxemia. Data demonstrates that the RT’s can successfully screen patients who may benefit from prone ventilation therapy without disruption in their daily routine.

1145

COMPARISON OF VANCOMYCIN DOSING IN HYPERMETABOLIC VS. NON-HYPERMETABOLIC PATIENTS WITH THERMAL INJURY

Brittainy Allen, Sarah Zavala, Whitney Chaney, Megan Rech

Learning Objectives: Infection remains a major cause of morbidity and mortality in patients with thermal injuries. Vancomycin has been the mainstay of treatment in burn patients with Gram positive infections. Due to hypermetabolism following thermal injuries, burn patients may require much larger doses of vancomycin to reach target troughs, placing them at increased risk of nephrotoxicity. The purpose of this trial was to determine if hypermetabolic (total burn surface area [TBSA] ≥20%) patients require higher doses of vancomycin to reach an initial steady-state (SS) trough concentration compared to non-hypermetabolic (TBSA <20%) burn patients. Methods: This prospective cohort study from January 2008 to January 2015 was conducted at a 561-bed academic medical center with a 21-bed verified burn center. Patients were included if they had thermal injury, were 18 yr or older, and had at least one SS vancomycin trough documented in the electronic medical record. The coprimary outcomes were the proportion of patients within goal by first SS trough and resolution of infection. Goal troughs were defined as 10 to 15 mcg/mL (skin and soft tissue infections, urinary tract infections, bacteremia) or 15 to 20 mg/mL (pneumonia, osteomyelitis, meningitis), dependent on the indication. Results: Of the 436 patients screened, 64 patients were included. There was no difference in the number who reached goal SS vancomycin trough between hypermetabolic (n=35) and non-hypermetabolic (n=29) burn patients, with rates of 28.6% and 37.9%, respectively (p=0.427). A greater proportion of non-hypermetabolic patients (71.4%) had resolution of infection compared to hypermetabolic patients (47.1%, p=0.017). Average total daily doses of vancomycin between hypermetabolic and non-hypermetabolic patients were 2,025.03 mg (± 645.13) and 2,051.15 mg (± 578.25), respectively (p=0.856). Conclusions: Vancomycin dosing, number who reached goal SS trough, and resolution of infection did not differ significantly between hypermetabolic and non-hypermetabolic burn patients.

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OUTCOMES IN UNDOCUMENTED IMMIGRANTS ADMITTED TO A NEW YORK CITY TRAUMA ICU

Jonathan Wyrrick, Brittainy Kalosha, Marie France DeLeón, George Cortisidis, George Agriantonis

Learning Objectives: In the last 20 yr, NYC’s institutions have seen a three-fold rise in the incidence of undocumented immigrants (UIs), who are largely of Hispanic or Latino ethnicity; in fact, New York State ranks fourth in UIs nationwide. Previous literature regarding trauma outcomes in UIs has been equivocal regarding the incidence rate of UIs across NYC’s trauma ICUs. All trauma care providers are required to obtain a certificate of completion of the online education on chemical VTE prophylaxis, assessment, indications and contraindications for chemical VTE prophylaxis.

We wanted to assess what, if any, outcome differences occur in the post-trauma ICU care for UIs. Methods: Medical records from 2012 to 2013 for patients admitted to the trauma ICU (TICU) secondary to trauma were reviewed with regards to social security status, race, age, gender, length of hospital stay (LOS), injury severity score (ISS), and discharge disposition. Patients with an invalid or lacking social security number were categorized as UI. Patients with traumatic brain injuries, a LOS > 60, and admissions related to injuries from pathological fractures, suicides, and trauma readmissions were excluded. All z2 analyses, t-tests and linear regressions were generated and conducted using STATA 15.0. Results: 124 patients met the study criteria, of which 47% (n=59) were identified as UIs. Compared to their documented counterparts, UIs were more predominantly male (96% vs 75%; p < 0.01), on average younger (35.9 vs 45.2; p < 0.01), of Latino ethnicity (61% vs 28%; p < 0.001), and less likely to have insurance (p < 0.001). On average, the LOS for UIs was 7.1 days shorter (p = 0.05) of which were predominantly discharged home (82% vs 58%; p < 0.01) even though their average ISS scores were similar. Of all TICU patients, the LOS for patients of Latino ethnicity was 8.35 days shorter (p < 0.01) regardless of their documentation status. Conclusions: UIs admitted to the TICU were predominantly young males, of Latino ethnicity, and less likely to be insured. Despite similar ISSs with their counterparts, UIs had a shorter LOS and were more likely discharged to home. Latinos in general also had a shorter LOS regardless of their documentation status.

1147

EVALUATION OF TRANEXAMIC ACID AS PART OF A MASSIVE TRANSFUSION PROTOCOL AT A LEVEL 1 TRAUMA CENTER

Melissa Reger, Teresa Tu, Ann Vu, Jennifer Hubbard, Rachel Dirks

Learning Objectives: Although tranexamic acid (TXA) has been shown to significantly reduce mortality in diverse trauma populations, it has not been widely studied in patients suffering from massive hemorrhage. This study was conducted to evaluate the efficacy and safety of empiric TXA administration as part of a massive transfusion protocol (MTP) in trauma patients presenting with life-threatening hemorrhage at a Level 1 trauma center. Methods: A matched, case-control study was conducted for all patients admitted with traumatic hemorrhage that required MTP. All patients who received TXA as part of MTP (September 2014 – February 2015) were matched to controls that required MTP from the prior year (September 2013 – August 2014). Patients were matched based on age, injury severity score (ISS), and initial systolic blood pressure (SBP). Variables of interest included in-hospital mortality, ICU and hospital length of stay (LOS), mechanical ventilation days, blood product usage, hemostatic product usage, and thrombic complications. Results: A total of 26 patients were included in the study: 15 cases that received TXA and 13 matched controls. There was no statistically significant difference between groups in mean age (34.9 vs 38.2 yr), ISS (29 vs 27.8), SBP <90 mmHg (30.8% vs 46.2%), or other baseline characteristics. None of the study outcomes (in-hospital mortality, ICU and hospital LOS, blood product usage, or complications) were significantly different between groups. There was a trend towards decreased in-hospital mortality in the TXA group, but this also did not reach statistical significance (15.4% vs. 38%, p = 0.189). Conclusions: Addition of TXA to MTP for traumatically injured patients did not improve outcomes in this small study, although it was underpowered to show statistical significance. Further studies are necessary to support the efficacy of empiric TXA in hemorhaging trauma patients without evidence of hyperfibrinolysis.

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VENOUS THROMBOEMBOLISM GUIDELINE IMPLEMENTATION IN TRAUMA PATIENTS–FROM VARIABILITY TO CONSENSUS

Lois Salo-Istaf, Karyl Burns, Kristine Kenning, Joseph Portereiko, Orlando Kirton

Learning Objectives: Venous thromboembolism (VTE) including deep venous thrombosis (DVT) and pulmonary embolism (PE), results in significant morbidity and mortality in trauma patients. A recent national survey of 18 trauma surgeons, who are leading experts on the subject, demonstrated significant variability. This is attributed to insufficient evidence to generate conclusive recommendations. We sought to determine and reduce variability in the management of VTE at our level 1 trauma center through the development and implementation of a consensus guideline. Methods: A REDCap (redcap.harthosp.org) survey questionnaire was sent to our 5 core trauma surgeons and one advanced practitioner. The questions about VTE management were open-ended. The GRADE methodology (Grading of Recommendations, Assessment, Development, and Evaluation) number were used for guideline development. The Risk Assessment profile (RAP) developed by Greenfield et al. was used as the centerpiece for risk assessment and selection of interventions. All trauma team members and new trainees are required to obtain a certificate of completion of the online education on REDCap platform. Results: There were disparate views about daily VTE risk assessment, indications and contraindications for chemical VTE prophylaxis,
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THE EFFECT OF ANTIPSYCHOTIC USE POST-TRAUMATIC BRAIN INJURY ON DURATION OF POST-TRAUMATIC AMNESIA
Kirstin Kooda, John Aho, David Weber, Allen Brown

Learning Objectives: Agitation and amnesia occurs in 11–70% of traumatic brain injury (TBI) patients in the immediate post injury period. Optimal management is unknown, but the use of antipsychotics (AP) is common, with minimal data to verify their safety and relationship to long term outcomes. Animal data suggest that cognitive and functional recovery could potentially be impaired with use of these agents. The objective of this study was to correlate the use of AP within 7 days of TBI to the duration of post-traumatic amnesia (PTA) as assessed by Galveston Orientation and Amnesia Test (GOAT).

Methods: 195 patients submitted to the national TBI Model Systems database from a single level 1 trauma center who had initial TBI management and brain rehabilitation treatment in the same center were retrospectively identified from 2007 through 2014. Injury severity score (ISS), Glasgow Coma Score (GCS), age, need for intracranial hypertension (ICH) intervention, AP administered, benzodiazepines (BZD) administered, and GOAT, among other variables, were collected. The primary endpoint was the association between antipsychotic use and the duration of PTA assessed by GOAT: Parametric and non-parametric statistical tests were used as appropriate.

Results: Fifty-two (26.7%) patients received AP within 7 days of TBI, most commonly oral quetiapine for agitation. Benzodiazepines in the 7 days post TBI were given to 71.7% of the AP group and 60.6% of the non-AP group (p = NS). Median ISS in the AP group was 21.5 (IQR 16 – 29) and 21 (IQR 9 – 29) in non-AP (p = NS). Intervention for ICH was required in 13.4% of AP patients and 25.9% of non-AP (p = 0.047). Twenty-one (45.6%) of AP patients had GCS < 8 at the scene of injury as compared to 37 (29.6%) of the non-AP patients (p = 0.038). Duration of PTA was significantly different on univariate analysis, with a mean of 19.6 days of PTA in the AP group as compared to 12.3 days in non-AP (p = 0.013).

Conclusions: The use of antipsychotics within 7 days of TBI may potentially be associated with an increased duration of PTA and further study is needed to confirm this relationship.

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OUTCOMES IN OPERATIVE FIXATION OF LARGE FLAIL CHEST INJURY
Bradley Putty, Matthew Pierper, Daniel Naughton, Jane Tenquist, Obi Okoye, Jamie Rand, Kevin Mahoney, Carl Freeman

Learning Objectives: Rib fractures are frequently associated with increased morbidity and mortality, owing to pain, poor chest wall mechanics, and decreased ventilation capacity. Recent reports have shown operative reduction and fixation may improve outcomes in patients with multiple rib fractures or flail defects. Most studies exclude patients with large pulmonary contusions or large flail segments that include subcapsular and paraspinal fractures that are difficult to access. We examined our experience with this injury pattern and hypothesized that stabilization would be associated with improved outcomes.

Methods: A retrospective cohort study of subjects with > 8 fractured ribs or flail injury to an unlevel I trauma center from May 2012 to August 2014. Subjects meeting criteria for fixation were grouped into rib fixation (RF) and non-operative (NO) cohorts for comparison. The RF group was restricted to subjects meeting both criteria presenting when fixation was available, and was matched in a 1:2 fashion with similar subjects meeting either criteria but presenting when fixation was not available. Endpoints included ICU, ventilator, and hospital days, morality and disposition at discharge. A p-value of .05 was considered significant.

Results: Forty-two subjects met criteria, and the groups were similar in gender, age (54), ISS (29), TRISS (.79), number of ribs fractured (12.9) and AIS scores (Chest = 4). The RF group was more likely to have a large flail (>6 ribs) (64% vs 28%, p = .045). Despite larger injuries in the RF group, no significant differences existed in mortality (14% vs 11%), total ventilator days, ICU or hospital length of stay. The RF group was more likely to be discharged home (50% vs 14%, p = .02), and this was born out in the large flail subset (55.6% vs 0%, p = .029).

Conclusions: In patients with severe chest wall injuries (> 8 rib fractures + flail segment), rib fixation was associated with a higher likelihood of progression to home disposition versus requiring transfer to an inpatient facility, suggesting improved functional outcome.

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HYPERGLYCEMIA PREDICTS FOR POOR OUTCOMES IN MODERATE TO SEVERE PEDIATRIC TRAUMATIC BRAIN INJURY
Yue-jiang Fu, Chong Shu-Ling

Learning Objectives: Hyperglycemia is a relatively common occurrence amongst pediatric traumatic brain injury (TBI) patients. We aim to evaluate the association between early hyperglycemia and death, prolonged hospital stay and prolonged mechanical ventilation among children with moderate to severe traumatic brain injury. Methods: This retrospective cohort study was conducted in a tertiary pediatric hospital between May 2012 and October 2014. All patients were less than 16 yr and presented with a Glasgow Coma Scale (GCS) of ≤ 13. Outcomes of interest included death, 14 ventilation-free, 14 PICU-free, and 28 hospital-free days. Hyperglycemia was defined as glucose ≥ 11.1mmol/L.

Results: 109 pediatric TBI patients with median age 54 mo (inter quartile range (IQR) 17–82 mo) were enrolled. Median glucose on arrival was 6.1 mmol/L (IQR 5.2–9.8 mmol/L). Median GCS and pediatric trauma scores (PTS) were 8 (IQR 6–12) and 6 (IQR 4.5–8), respectively. Initial hyperglycemia was associated with death (52.4% in the hyperglycemia group versus 6.8% in the normoglycemia group, p<0.001), reduced median hospital-free days (7.5 days versus 0 day, p = .004), reduced median PICU-free days (13 days versus 0 day, p<0.001), and reduced median ventilation-free days (13 days versus 0 day, p<0.001). Multivariate logistic regression showed that ED hyperglycemia (OR = 11.510; 95% CI, 2.677 - 49.482; p = 0.001), GCS<8 (OR = 7.478; 95% CI, 1.265 – 44.207; p = 0.026), lower PTS (OR = .760; 95% CI, 0.588 – 0.982; p = .036) were independent risk factors for mortality in pediatric patients with moderate to severe traumatic brain injury. ED Hyperglycemia, GCS < 8 and lower PTS were also independent predictors for prolonged mechanical ventilation and prolonged PICU stay. However, ED Hyperglycemia was no longer statistically significant for predicting prolonged overall hospital stay when accounting for GCS < 8 (p = 0.095).

Conclusions: Early hyperglycemia is independently associated with in-hospital mortality, prolonged duration of mechanical ventilation, and prolonged PICU stay in children with moderate to severe TBI.
for HTS was 18 [12.8--24.5] mEq/hr (range: 14.5--19 mEq/hr) and were not different throughout days 1--5 of HTS therapy (p=0.08). A total of 1239 sNa measurements (23/pt) during HTS were evaluated. sNa increased significantly from baseline of 138[137:141] mEq/L to 142[139:143] mEq/L by 8 hr (p=0.01) and to 147 [145:150] mEq/L at 48 hr from baseline (p<0.001) and remained 146--148 mEq/L during HTS. sNa prior to discontinuation of HTS was 144 [142:149] mEq/L, and decreased significantly during the 72 hr post-HTS (p<0.001, with differences beginning 24 hr post-HTS). sCl increased during HTS from baseline of 105[102:109] mEq/L beginning 12 hr of HTS, and was a maximum of 115.5[108:117] mEq/L into HTS therapy (p<0.001 from baseline). Serum bicarbonate remained stable and sCr decreased during HTS. **Conclusions:** sNa levels increased during HTS therapy. While the change in sNa was significant, the rate of increase was gradual, with maximum sNa change occurring beginning 48 hr after initiation of HTS. Patient specific strategies directed at sNa deficiency and TBW determinations for initiation and titration of HTS therapy may be more effective at achieving safe and effective sNa levels in TBI patients.

**BLOOD AND TRANEXAMIC ACID (TXA) USE IN TRAUMA PATIENTS--A RETROSPECTIVE COHORT REVIEW**

Derek Sorensen, Rebecca Friedlander, Jack Sava, Christine Trankiem-Ecenberger

**Learning Objectives:** Early death following trauma is mainly due to hemorrhage. We sought to describe the use of packed red blood cells (pRBC) and its relationship to tranexamic acid (TXA) in an urban level 1 trauma center. Hypothesis: The transfusion of pRBC and TXA use would be influenced by injury severity score (ISS), systolic blood pressure (SYS BP), and Glasgow Coma Scale (GCS).**Methods:** We conducted a retrospective review of all trauma patients seen at an urban level 1 trauma center from March 1, 2012 to February 28, 2014. Our primary outcome was clinical variables associated with transfusion of pRBC <3hr from injury. Our secondary outcome was clinical variables associated with the use of TXA within the subgroup of patients transfused pRBC <3hr from injury. We conducted parametric and non-parametric tests and multivariate regression models to identify these variables. **Results:** The cohort included 4107 trauma patients (Age: 40.6 +/-18.7; Male: 73.7%; penetrating trauma (PT): 23.6%; ISS: 6.7 +/-8.6; SYS BP: 136.5 +/-31.3; GCS: 14.0 +/-2.7; 48hr mortality: 3%). Multivariate analysis revealed ISS (OR 1.10; 95% CI 1.06--1.13), GCS (OR 1.13, 95% CI 1.02--1.25), SYS BP (OR 0.98; 95% CI 0.97--0.99), PT (OR 8.06; 95% CI 3.25--20.0) and TXA (OR 24.9; 95% CI 2.5--234.2) predicted transfusion of pRBC <3hr from injury. The subgroup included 165 patients (Age: 35.7 +/-16.0; Male: 84.8%; PT: 69.1%; ISS: 21.9 +/-15.7; SYS BP: 95.4 +/-4.3; GCS: 11.1 +/-4.9; TXA: 15.2%; Total pRBC in 24 hr: 6.0 +/-7.9; 48hr mortality: 24.2%). TXA use in this subgroup was predicted by total units of pRBC transfused in 24 hr (OR 1.09; 95%CI 1.04--1.14) and time from injury to transfusion (OR 0.44; 95% CI 0.19--1.01). **Conclusions:** The study demonstrates an association between transfusion of pRBC <3hr of injury and more ill penetrating trauma patients. TXA use within actively bleeding trauma subgroup was low at 15.2%. TXA use was not influenced by initial clinical variables but by shorter time to transfuse pRBC and more total transfused in 24 hr indicating patients with more acute blood loss.

**TRAUMATIC BRAIN INJURY IN PEDIATRIC POPULATION: A SINGLE-CENTER ANALYSIS OVER 5 YEARS**

Ayman El-Menyar, Hassan Al-Thani, Gaby Jabbour, Rafael Consonji, Khalid Alyafei

**Learning Objectives:** Traumatic brain injury (TBI) is a major cause of morbidity and mortality in children and adolescents worldwide. We aimed to study the trends of pediatric TBI (pTBI) in terms of the demographics, etiology, clinical patterns, and outcomes in a level 1 trauma center in Qatar. **Methods:** For the period between 2010 and 2014, we conducted a retrospective observational analysis for all pTBI. **Results:** Over a 5-year period, 945 patients were admitted with TBI, out of them 17% were ≤18 yr old with a mean age of 10.6 ± 5.9 and 81% were males. MVCs were significantly higher in late adolescent (77.3%), whereas, FFH was significantly higher in infants/preschoolers (59%) group. Head injuries were common in late adolescents aged 15-18 (40%) and infants/preschool age group, in which 21% of the injuries were fatal. Almost one-third of the pTBI needed neurological intervention (insertion of monitoring [15%]), drainage devices [6.4%] or outright surgery [10.2%]. The mean ISS was 20.7 ± 9.8 and the highest ISS was recorded in adolescents (24.2 ± 9.8). Fifty three (41%) patients were intubated at the scene. Although AIS showed no significant differences by age groups, it was higher in infants/preschoolers and late adolescents. Only brain contusion showed significant difference by age (p<0.04); higher in early adolescents (61.5%) and late adolescents (58.6%). Hospital complications included pneumonia (25.4%), sepsis (8%) and ARDS (1.6%). Pneumonia and sepsis showed significant differences (p<0.05) by age groups. Overall mortality rate was 13%. Higher mortality was seen in infants (20.5%, p<0.43). Half of the patients died within 24 hr; 8 (36%) patients died between 1- 7 days and 3 (14%) patients died after one week. **Conclusions:** The overall rate of pTBI is 5--14 cases per 100,000 children per year with high mortality in Qatar. FFH is the mechanism of pTBI for small children, whereas MVC was the cause of injury in adolescents. Public education regarding safety measures, injury prevention and Law enforcement are highly recommended.

**EFFECT OF TRANEXAMIC ACID ON TRANSFUSIONS IN PATIENTS PRESENTING WITHIN 3 HOURS OF TRAUMA**

Kristin Medeiros, Michael DiNapoli, Britney Ros

**Learning Objectives:** Hemorrhage as a result of traumatic injury is often the underlying cause of mortality in the trauma population. Tranexamic acid (TXA), a synthetic derivative of the amino acid lysine, inhibits fibrinolysis by blocking the lysine binding site on plasminogen. The MATTERs and CRASH-2 trials established the mortality benefit of TXA when used for hemorrhage caused by traumatic injury in both military and civilian populations, respectively. A more recent study concluded that TXA decreased mortality, but resulted in increased transfusions of packed red blood cells (pRBCs) and fresh frozen plasma (FFP). In April 2014, our institution added TXA to a preexisting massive transfusion protocol for patients presenting within 3 hr of traumatic injury. The purpose of this study was to evaluate the effect of TXA on transfusions in our trauma population. **Methods:** This is a retrospective review comparing transfusion requirements in patients pre and post the addition of TXA to a massive transfusion protocol at a level 1 trauma center. Data from the pre-TXA group was collected from October 2013- March 2014 and post-TXA data were collected from April 2014- October 2014. Patients were included if they presented within 3 hr of injury, had an Assessment of Blood Consumption (ABC) score >2 (penetrating injury) or >2 (blunt injury), and received >2 units of pRBCs. **Results:** Thirty-six patients were included in the analysis; 18 in the pre-TXA group and 18 in the post-TXA group. Baseline characteristics were similar between both groups. Patients in the pre-TXA group required more pRBCs and FFP than the post-TXA group (mean 10.2 + 5.4 units vs. 6.2 + 4.5 units [p=0.02]; mean 7.3+ 6.1 units vs. 2.6 + 2.8 units [p<0.005], respectively). There were no differences in the rate of vascular occlusive events with a total of 3 events (2 DVls and 1 stroke) in the pre-TXA group vs. 4 events (3 pulmonary embolisms and 1 deep vein thrombosis [DVT]) in the post-TXA group. **Conclusions:** TXA was associated with a statistically significant decrease in transfusions of pRBCs and FFP without increasing the risk of vascular occlusive events.

**EXTRACORPOREAL MEMBRANE OXYGENATION USE IN NEONATES AND CHILDREN WITH MARFAN SYNDROME**

Taemyn Hollis, Katherine Cashen, Peter Rycus

**Learning Objectives:** Marfan syndrome (MFS) is a systemic autosomal dominant disorder due to mutations in the fibrillin-1 gene. Fibrillin-1 gene encodes for fibrillin-1 that is not only a structural extracellular matrix protein but also acts to regulate TGF-β activation by keeping it in its inactive form. The incidence of MFS is approximately 1 in 5000 individuals. Life expectancy of MFS patients has reached near normal life expectancy likely due to recognition and treatment of the associated complications of the syndrome. In over 90% of cases, cardiovascular events, such as aortic dissection, are the cause of death. Cardiac surgical intervention may be required to treat regurgitant aortoventricular valves or aortic aneurysms. There are no multicenter studies reporting outcomes of patients with
Marfan syndrome on ECMO. Methods: Pediatric patients ≤18 yr of age with MFS in the Extracorporeal Life Support Organization (ELSO) Registry were included. The primary outcome of interest was death before hospital discharge. Between group comparisons (non Marfan patients (non-MFS) and Marfan patients) were performed using chi-square, t-test and Fisher’s exact test. Results: Included were 19 patients with Marfan syndrome. ECMO use in patients with MFS has increased with all cases occurring after 1994. Compared to all pediatric ECMO patients (nonMFS, n=50,884 in ELSO registry) MFS patients had worse survival (MFS 21% vs. nonMFS 63%; p=0.001). More MFS patients were likely to be placed on ECMO for cardiac (74%) vs. respiratory failure (10%). In MFS patients no risk factors for mortality were identified. The most common complication was cardiovascular in 53% of patients. Conclusions: Marfan syndrome is an uncommon indication for ECMO survival with worse outcome than the overall ECMO population. Although limited by the small sample size these results should be factored in to decision making when considering ECMO for pediatric Marfan patients.

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DO MAGNET HOSPITALS ATTRACT BETTER OUTCOMES FOR PEDIATRIC TRAUMATIC BRAIN INJURY PATIENTS? Tracy Evans, Brian Gross, Maria Gillio, Autumn Vogel, James Alzate, Jo Ann Miller, Frederick Rogers Learning Objectives: Research suggests hospitals attaining the performance-driven Magnet recognition nursing credential have improved outcomes compared to non-Magnet centers. We sought to determine whether this holds true for pediatric traumatic brain injury (TBI) patients. We hypothesized that Magnet hospitals would have decreased mortality for pediatric patients presenting with moderate (MOD) and severe (SEV) head injuries compared to non-Magnet centers. Methods: All pediatric (<18) admissions from 2009-2013 to the 13 Magnet and 17 non-Magnet trauma centers in Pennsylvania with head abbreviated injury scale score (AIS) ≥3, Glasgow Coma Score (GCS) ≤13 were extracted from the state registry. Patients presenting dead on arrival or transferred to other facilities were excluded from analysis. A multivariate logistic regression model controlling for demographic and injury severity covariates assessed the impact of Magnet designation on mortality. Results: A total of 939 patients met inclusion criteria (Magnet: 791; Non-Magnet: 148). In a multivariate logistic regression model controlling for admitting temperature, admitting systolic blood pressure, head AIS, ISS, and GCS Motor, Magnet centers were found to have statistically indistinguishable rates of survival compared to non-Magnet facilities (AOR: 1.01, 95%CI 0.72-1.41). Conclusions: Although research suggests Magnet hospitals may result in improved outcomes for critically ill trauma patients, our results suggest management of pediatric TBI patients is equal at Magnet and non-Magnet centers.

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METHICILLIN-RESISTANT STAPHYLOCOCCUS AUREUS PNEUMONIA IN CRITICALLY ILL TRAUMA PATIENTS Kristen Bunnell, Andrew Zullo, Charles Adams, Christine Berard-Collins Learning Objectives: Although pneumonia is a common complication following traumatic injury, there is little local data about the role of methicillin-resistant Staphylococcus aureus (MRSA) as a pathogen in hospital-acquired or ventilator-associated pneumonia. This information is critical in selection of appropriate empiric antibiotics. The primary objective of this study was to quantify the prevalence and characterize the onset of MRSA pneumonia in the trauma intensive care unit (TICU). Methods: Patients who developed pneumonia in the 11-bed TICU at an urban Level 1 Trauma Center between January 1, 2012 and March 1, 2015 were included in this retrospective cohort study. Pneumonia was defined as clinical evidence of infection (Clinical Pulmonary Infection Score ≥ 5) and microbiological evidence of infection with ≥ 10,000 cfu/mL bacteria from quantitative bronchoalveolar lavage. Demographic information and culture results and susceptibilities were extracted from the Trauma Registry and electronic medical record. Characteristics of patients who developed MRSA pneumonia were compared to those who had a pneumonia caused by another pathogen. Results: 80 patients (mean age 49 ± 18 yr, 81% male) met inclusion criteria during this time period, comprising 88 distinct instances of pneumonia. MRSA was identified in 10 cases, representing 11.6% of all pneumonia and 24.4% of S. aureus infections. 3 cases of MRSA pneumonia developed within the first 5 days of hospitalization. Average days from admission to development of MRSA pneumonia was 10 ± 8 days (range 2–33 days). There was not a statistically significant difference between patients who developed MRSA pneumonia and patients with non-MRSA pneumonia in terms of age, smoking status, exposure to broad-spectrum antibiotics, MRSA nasal colonization on admission, or days to development of pneumonia. Conclusions: MRSA pneumonia was infrequent in this cohort of primarily young male blunt injury trauma patients. Analysis of risk factors for development of MRSA pneumonia was limited by the small number of cases over the 3.25 year study period.

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VARIABILITY IN PRACTICES FOR PEDIATRIC SEVERE TRAUMATIC BRAIN INJURY: A SURVEY STUDY G Nicole Sinclair, Aji Sarnaik Learning Objectives: TBI is a leading cause of death and morbidity in children. The 2012 pediatric TBI guidelines provide a framework for patient care, but demonstrate the gaps in the literature that have prevented strong recommendations on many patient care decisions. A lack of consensus among practitioners could be contributing to practice variability in clinical trials, undermining the scientific method. This study describes variability and barriers in the practice of pediatric TBI. Methods: A survey with 23 Likert and 19 open-ended questions based on practices within the 14 categories of the 2012 guidelines was developed. Demographics including specialty, research background and experience of the respondent, and institutional factors including neurosurgical coverage and TBI protocols were collected. The survey was distributed to members of the American Academy of Pediatrics Section on Critical Care and the Pediatric Neurosurgical Care Research Group. Results: 158 of the 732 (22%) practitioners given the survey responded, 118 of the 140 (84%) who answered every Level 2 guideline question adhered to all of them, 64 of the 136 (47%) who answered every Level 3 guideline question followed all of them. Demographics (yr of experience, size of ICU, academic environment, number of TBI patients, research experience, protocols, and neurosurgical coverage) did not statistically impact adherence in Chi Square analysis. Intensivists trended towards following both the level 2 (p=0.056) and level 3 (p=0.056) recommendations more closely than other specialties. Respondents from institutions with full-time pediatric neurosurgery indicated more frequent ICP monitor placement and decompressive craniectomies (p=0.001 and p=0.049 respectively). Responses to open-ended questions identified neurosurgical coverage, physician preference, and uncertain impact on outcomes as barriers to guideline adherence. Conclusions: Adherence to level 2 recommendations was high among respondents, but level 3 recommendations were followed less, likely due to lack of scientific evidence, doubts about improving outcome, and varying neurosurgical coverage.

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USING MACHINE LEARNING ALGORITHMS TO IDENTIFY OPEN ABDOMEN PROCEDURES IN ADMINISTRATIVE DATABASES Gabriel Brat, Andrew Beam, Ali Salim, Kenneth Christopher Learning Objectives: Despite the importance to damage control surgery there is a lack of specific identifying billing or administrative codes for open abdomen. Methods: We performed a retrospective cross sectional study of all operative notes and administrative billing data extracted from 92,886 ICU admissions to two academic Level 1 trauma centers between 1997 and 2011. Using keywords augmented by a word vector algorithm, a corpus of operative notes was extracted that represented potential cases involving an open abdomen. Manual evaluation of these notes combined with consistency analysis identified a subset of true open abdomen cases and the associated abdominal closure. This process was performed recursively to identify an augmented group of cases. The remaining operations were assigned to the control group. CPT and ICD9 billing codes were then collated for 7 days after the initial operative note describing an open abdomen or until abdominal closure was performed. Codes that arose in less than 25% of patients were discarded. A gradient boosted tree

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model that predicted open abdomen status was constructed using the CPT, ICD-9, and a combination of both code sets. The area under the ROC curve (AUC) was estimated using 5-fold cross validation. Results: Of 3,900 potential cases identified through key word and word vector search, 403 cases of open abdomen were confirmed. Average length of time with an open abdomen was 11.5 days. Using the CPT codes alone, the model had excellent discrimination (AUC = 0.89) with 65% sensitivity and 93% specificity for open abdomen. The combined model containing both ICD-9 and CPT codes slightly improved performance (AUC = 0.90, 67% sensitivity and 93% specificity). Overall, the 5 administrative codes with highest predictive power for identifying an open abdomen included: reopening of a laparotomy, delayed closure of a wound, fibrinogen activity, respiratory failure, and other repair of an abdominal wall. Conclusions: A machine learning algorithm can learn a grouping of CPT and ICD-9 codes that identifies an open abdomen with high discrimination and specificity.

1161
PRE-HOSPITAL AND ER SsatO2/FIO2 RATIO OF 200 OR LESS CORRELATES WITH ADVERSE OUTCOMES IN TRAUMA PTS
Akella Chandrasekhar, Krishna Akella, akshay Bhamidipati, Sravya Undurty

Learning Objectives: Assessments for the utility of the pre-hospital data are sparse in patients with pulmonary injury. SsatO2/FIO2 (S/F) ratio is a simple marker of pulmonary injury. We hypothesized that this parameter would correlate with outcome data in pulmonary injury. Methods: We performed a retrospective data analysis on 71 consecutive patients with documented pulmonary injury tracked by trauma registry at our urban level 1 trauma center. We tabulated demographic and outcome data via detailed electronic chart review. We separated patients by S/F ratio of 200 or less versus above 200 in either pre-hospital or ER data. One way analysis of variance (ANOVA) was performed to assess correlation with outcome data. Results: We assessed 71 patients, 25 women and 46 men. The average age was 58.1 yr. S/F ratio of 200 or less in the pre-hospital or ER was associated with a significantly longer ventilator days [16.1 ± 1.9 days versus 0.3 ± 1.6 days, p < 0.001], increased ICU length of stay [20.0 ± 2.0 days versus 1.5 ± 1.6 days, p < 0.001]. This S/F ratio threshold also correlated with worse survival [79.3 ± 5.7 % versus 95.2 ± 4.7 %, p < 0.03]. S/F ratio of 200 or less was correlated with the presence of SIRS in the ER. Conclusions: Pre-hospital and early ER assessment should include S/F ratio as it is a simple and powerful correlate for adverse outcomes in the patients at risk for pulmonary injury.

1162
RESPIRATORY RATE: CAN WE GET ACCURATE AUTOMATED DATA IN THE REAL WORLD?
Ashley Menne, Nicolas Dorsey, Shiming Yang, Cheng Gao, William Chiu, Stacy Shackelford, Peter Hu, Colvin Mackenzie

Learning Objectives: Automatic continuous identification of respiratory rate (RR) may be useful to improve predictions of shock, but signal interference makes automated values highly variable. We compared the accuracy of an RR monitoring device to a gold standard RRe. The monitoring device used a machine learning algorithm to learn a grouping of respiratory traces to identify respiratory events. We compared the monitoring device to the gold standard using time domain and frequency domain metrics. Results: Twenty four patients were included. Groups were well-matched with no difference in age, sex, or injury severity score. The primary endpoint was number of non-outlier events of respiratory rate transduced within 4 days of surgery. The number of events per patient was calculated using the formula: % change in respiratory rate -100. Sensitivity and specificity was calculated for the monitoring device compared to the gold standard. Conclusions: The monitoring device can identify respiratory events with high sensitivity and specificity. The device may be useful to improve predictions of shock.

1163
EVALUATION OF DOSE TO INR RESPONSE OF PCC3 AND PCC4 TO INR REDUCTION IN EMERGENT WARFARIN REVERSAL
Krishna Rangan, Scott Chapman

Learning Objectives: Prothrombin complex concentrates (PCCs) have been recommended for emergent warfarin reversal (EWR) in critical bleeding. Whether there is a difference in warfarin reversal effects to PCC3 or PCC4 is not known. To characterize the effects of PCC3 and PCC4 based on INR reduction, we evaluated the absolute and percent change in INR in relation to the dose of PCC3 and PCC4 administered. Methods: Patients who received PCC3 or PCC4 for EWR, had a pre and post-PCC INR within 12 hr apart, and a post-PCC INR within 6 hr of PCC administration were included in the analysis. Correlations between PCC3 and PCC4 dose and absolute and % change in INR were evaluated for all included patients. The effect of PCC dose was further characterized based on pre-PCC INR of <4 and <4, 2.5. Spearman rho coefficient of p < 0.05 was considered significant. Results: 79 PCC3 (20.3 ± 9.1–22.2 U/kg) and 21 PCC4 (33.4 ± 24.8–38.3 U/kg) patients were included. Patient demographics, indication for EWR, vitamin K use, and pre-PCC INR were not different between the two groups. There was no correlation between PCC3 dose and absolute change in INR (rs = −0.014, p = 0.90) or % change in INR (rs = 0.03, p = 0.79). There was a significant correlation between PCC4 dose and absolute change INR (rs = 0.55, p = 0.009) and % change in INR (rs = 0.6, p = 0.004). For patients whose pre-PCC INR was <4, there was no correlation of PCC3 dose (n = 55) or PCC4 dose (n = 11) and the absolute or % change in INR. For patients whose pre-PCC INR was >4, there was a correlation between PCC4 dose (n = 10) and absolute (rs = −0.68, p = 0.029) and % change in INR (rs = 0.71, p = 0.021), but not for PCC3 (rs = −0.24). Conclusions: There was a correlation between PCC4 dose and absolute as well as % change in INR for all patients receiving PCC4 and for those PCC4 patients with a pre-PCC INR >4. There was no correlation between PCC3 dose and % change in INR. The increased change in INR with higher doses may be related to the increased presence of factor VII in PCC4.

1164
ASSESSMENT OF A TRANEXAMIC ACID PROTOCOL FOR ORTHOPEDIC TRAUMA SURGERY
Serena Harris, Brian Mullis, Mary Blair, Meagan Doolin, Todd Walroth

Learning Objectives: Tranexamic acid (TXA) is an antifibrinolytic shown to reduce mortality in trauma patients at risk for major bleeding and decrease blood loss in joint replacement surgery. However, little is known about the utility of TXA in orthopedic trauma surgery. To our knowledge, it has not been evaluated in surgery of the pelvis or acetabulum, which was our aim. Methods: Adult trauma patients undergoing orthopedic surgery of the pelvis, acetabulum, or femur with an expected blood loss of >600 mL were retrospectively identified. Patients were stratified into groups based on receipt or absence of intraoperative TXA (1g IV Q3hr intraoperatively). Patients who received TXA were matched 1:1 with historical controls based on surgery type, age, and injury severity score. The primary endpoint was number of allogeneic units of blood transfused within 4 days of surgery. Secondary endpoints included intraoperative blood loss, change in Hgb, patients requiring transfusion, postoperative bleeding requiring surgery, thromboembolic or transfusion complications, LOS, and mortality. Results: Twenty four patients were included. Groups were well-matched with no differences in demographics. No difference was found in median number of allogeneic units transfused between the TXA and control groups, respectively (0.5, 0–6 vs. 0, 0–1.8; p=0.508). There was a non-significant decrease in median intraoperative mL blood loss in the TXA arm (500, 350–1500 vs. 750, 525–1000; p=0.706). No

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difference was found in mean change in Hgb (3.4 ± 1.9 vs. 3.2 ± 2.1; p=0.789), patients requiring transfusion (6 vs. 5%; p=1.000), postoperative bleeding requiring surgery (0 vs. 0%; p=1.000), infection within 90 days postoperative (2 vs. 0%; p=0.217), or median LOS in days (14, 7–40 vs. 13, 9–16; p=0.622). No deaths occurred. A significant increase in DVT within 90 days postoperative was found in the TXA arm (36.4 vs. 0%; p=0.037). **Conclusions:** In this pilot study, TXA showed a non-significant reduction in intraoperative blood loss and was associated with an increased incidence of DVT. Ongoing assessment is planned to confirm these initial findings.

1165

**EFFECTS OF DEXMEDETOMIDINE AFTER EMERGENCY CARDIOVASCULAR SURGERY**

Takumi Taniguchi, Koji Sato, Masaki Okajima

**Learning Objectives:** Sedative is often administered to maintain hemodynamics and pulmonary function after cardiovascular surgery. Especially, after emergency cardiovascular surgery, sedative is routinely administered to maintain hemodynamics in order to control postoperative bleeding. Dexametomidine (DEX), a new sedative and alpha-2 adrenoceptor agonist, is reported to expert superior hemodynamic-control and organ-protective properties compared with other sedatives. Therefore, we hypothesized that DEX, as compared with propofol only, would provide greater improvements in critical patients after emergency cardiovascular surgery. **Methods:** Forty-two patients (M/F 28/14, mean age 60 yr) after emergency cardiovascular surgery, underwent the sedation of DEX in addition to propofol (DEX group). The DEX administration was undergone as long as possible. In control group, other 24 patients (M/F 18/6, mean age 62 yr) after emergency cardiovascular surgery were administered only propofol as a sedative. Primary outcome was change in systolic arterial pressure (SAP) and vasodepressor requirement after the sedation, and secondary outcomes were the duration of extubation after surgery, the frequency of occurrence of supraventricular arrhythmia and the change in laboratory data. **Results:** The combination sedation undertaken for mean 58hr (24–197 hr), SAP and heart rate were maintained in both groups, and vasodepressor requirement in DEX group significantly decreased (42 to 34; p<0.05) after the sedation. After the sedation was stopped, vasodepressor requirement in DEX group increased significantly (8 to 16 drugs; p<0.05). The duration of extubation in the DEX group was significantly shorter than that in control group (5 days vs 8 days; p<0.05). All patients recovered and discharged in ICU. **Conclusions:** In the present study, the DEX administration maintained hemodynamics and decreased vasodepressor requirement and the frequency of occurrence of supraventricular arrhythmia after emergency cardiovascular surgery.

1166

**THE EARLY APPLICATION OF LOW TIDAL VOLUME PREVENTS HYPOXEMIA IN CRITICALLY INJURED PATIENTS**

Bryce Robinson, Dina Gomaa, Timothy Petris, Kyle Dreyer, Alex Lentsch, Richard Branson

**Learning Objectives:** Validated interventions for the prevention of hypoxemia in trauma patients remain elusive. The effectiveness of early low tidal volume (TV) application to mitigate ventilator induced lung injury is unknown. We hypothesized that the early institution of low TV ventilation significantly reduces hypoxemia following injury. **Methods:** A retrospective cohort study of consecutive adult trauma patients requiring mechanical ventilation occurred from 2/2011 to 8/2014. Patients with survival >1 day, ≥1 recorded PaO2 to FiO2 (P/F) ratio during the first 7 hospital days, and a maximum TV by predicted body weight recorded during the first 2 hospital days were included. Hypoxemia, the primary outcome, was defined as a P/F ratio ≤ 300 mmHg during the first 7 hospital days. Secondary outcomes included the development of pneumonia, tracheostomy, and ARDS during the same period. Multivariable regression was used to investigate risk factors associated with the development of hypoxemia. **Results:** 531 patients were analyzed: median age was 42 yr, Injury Severity Score 24, 77% were male, 26% suffered a penetrating injury, and 80.8% suffered hypoxemia. Those exposed to a TV >8 mL/kg were older (45 vs. 39 yr; p=0.05), female (38.4% vs. 12% p<0.01) and with fewer penetrating injuries (21.0% vs. 29.3% p=0.03). Severity of injury, crystalloid, red blood cell, and plasma exposures during the first 6 and 24 hr did not differ between TV groups. Those with TV >8 mL/kg developed significantly more hypoxemia (85.3% vs. 77.5% p<0.03). Rates of pneumonia, tracheostomy and ARDS did not differ. Regression analysis identified age (OR 1.03 [95%CI 1.02–1.05] p<0.01), chest abbreviated injury score (OR 1.28 [95%CI 1.10–1.49] p<0.01), and exposure to TV >8 mL/kg (OR 1.66 [95%CI 1.00–2.73] p=0.048) as risk factors for the development of hypoxemia. **Conclusions:** The early application of tidal volumes ≤8 mL/kg of predicted body weight decrease first week hypoxemia in critically injured patients. Acute tidal volume restriction appears to be a modifiable risk factor for the prevention of lung injury.

1167

**A REDUCTION IN ANTIPSYCHOTIC MEDICATIONS IS ASSOCIATED WITH A DECREASE IN GERIATRIC FALL TRAUMA**

Frederick Rogers, Tracy Evans, Brian Gross, Heather Brand, Ronald Baier

**Learning Objectives:** With approximately 30% of adults 65 and older falling each year, and 20–30% of these incidents resulting in moderate to severe injuries, falls are a significant issue affecting the geriatric community and healthcare system. It has been suggested that medications, such as antipsychotics with extensive side effects may contribute to the high geriatric fall rate. We hypothesized that a resident-specific reduction in antipsychotic medication dosages in a sample of geriatric living facility-dwelling adults would result in a reduced fall rate. **Methods:** In this pilot study, a fall prevention medication intervention seeking to reduce dosages of antipsychotic medications was established in a mature, geriatric living facility. Medication reductions were determined on an individual basis under the discretion of an in-house pharmacist and medical director for all residents on antipsychotics. To determine the impact of this initiative, linear trend tests assessed fall rates (total falls/total residents) from 2013–2014 (pre-intervention) were compared to fall rates from 2014–2015 (post-intervention). **Results:** Over the course of the study period (2013–2015), no statistically significant changes in living facility demographics were observed. The fall rate was found to have decreased from 9.4% pre-intervention to 7.6% post-intervention (p=0.040). **Conclusions:** We have associated a statistically significant decrease in falls at a geriatric living facility following a resident-specific antipsychotic medication reduction initiative. Antipsychotic reduction interventions targeting the geriatric population may prove effective in decreasing unnecessary injury and healthcare costs resulting from geriatric falls.

1168

**PREDICTORS OF INFLAMMATORY COMPLICATIONS IN PATIENTS WHO RECEIVED COMPONENT TRANSFUSION AFTER TRAUMA**

Allison Jones, Susan Frazier, Heather Bush

**Learning Objectives:** Transfusion of blood components is associated with a decrease in physiologic reserve, and release of both anti-/proinflammatory mediators following traumatic injury, predisposing to development of inflammatory complications (IC). **Methods:** We performed a secondary analysis of the Inflammation & Host Response to Injury Trauma-Related Database (n = 1,656) to evaluate the relationship between transfusion-related variables and development of IC in patients with major blunt trauma. Logistic regressions and Cox proportional hazards models were used to determine whether blood transfusion volume and ratio of components transfused in the first 24 hr following hospital admission predicted development of and time to diagnosis of IC, adjusting for age, gender, injury severity, and comorbidities. **Results:** Patients were primarily Caucasian (90%), males (68%), with an average age of 39 yrs, and were critically injured (mean New Injury Severity Score 39.13); 70% were involved in a motor vehicle accident as an occupant of the vehicle or a motorcyclist. By 24 hr, all patients had received PRBCs; 65% received FFP, and 40% received PLTs. Nearly all patients (86%) developed at least one IC, with 76% developing organ failure; time to first...
IC was a median of 5 days (IQR 2 – 8). Logistic regression revealed two predictors of IC, presence of comorbidities (OR 5.4, 95% CI 2.24 – 12.89, p < 0.001) and 24-hour total transfused PRBC volume (OR 1.08, 95% CI 1.02 – 1.15, p = 0.01). Findings from the Cox proportional hazards model revealed that injury severity (HR 1.41, 95% CI 1.03 – 1.92, p = 0.03) and 24-hour total transfused PRBC volume (HR 1.01, 95% CI 1.00 – 1.02, p = 0.001) were associated with development of IC. Conclusions: Enhanced understanding of the mechanisms that contribute to immune alterations after trauma and blood component transfusion may provide clinicians with the ability to individualize patient management and reduce complications to optimize patient outcomes.

1169 URINARY SODIUM EXCRETION AND SERUM SODIUM CHANGES WITH HYPERTONIC SALINE FOR TRAUMATIC BRAIN INJURY
Scott Chapman, Alicia Ronk, Eric Irwin, Patricia Reicks, Krishna Rangarajan, Harrison Tam

Learning Objectives: Hypertonic saline (HTS) is commonly used for hyperosmolar therapy in patients with traumatic brain injury (TBI) for intracranial hypertension. Whether hypernatremia is associated with increased renal excretion of sodium and increased urinary sodium (uNa) concentrations is unknown. We evaluated uNa concentrations to examine whether a correlation between serum Na (sNa) concentrations exists in relation to uNa concentrations. Methods: Patients who suffered TBI, received HTS therapy, and had uNa concentrations measured were identified and charts were reviewed. Data collection included patient demographics, dose and duration of HTS therapy, sNa concentrations, and uNa concentrations. Correlations between the uNa closest to HTS discontinuation and the change in sNa 12–24 hr and 24–48 hr post-HTS were evaluated. Continuous variables reported as median [IQR]. The degree of correlation was analyzed using Spearman rho with a level of significance ≤ 0.05. Results: 51 patients (67[27-60] yr, 84% male, ISS 29[25-35], GCS 8[3-13]) were included in the analysis. The last uNa collected 6[5.54; 9:25] hr before HTS discontinuation was 166[127-249] mg/dL, and the last sNa before HTS discontinuation was 146[143-152] mg/dL. The change in sNa 12–24 hr (18:15[16:19; 20:0 hr]) after HTS discontinuation was significantly correlated with the uNa concentration (r=0.59, p<0.001). This trend persisted in 26 of the 31 patients who had sNa collected 41:30 [39:00: 42:28] hr after HTS was discontinued (r=0.29, p=0.148). There was a trend toward an association between the average HTS infusion rate (mEq/hr) to the uNa closest to HTS discontinuation (r=0.13, p=0.076). No correlation was found between Cr closest to HTS discontinuation and uNa concentration. Conclusions: The degree of change in sNa concentrations following discontinuation of HTS is correlated with uNa concentrations. Increased renal excretion of Na during HTS therapy may result in higher HTS infusion needs and greater decreases in sNa and hypernatremia following discontinuation of HTS infusions.

1170 ACUTE RELAPSE IN PEDIATRIC PATIENTS AFTER MODERATE TO SEVERE TRAUMATIC BRAIN INJURY
Andrea Guardenier, Bradley Peterson, Mary Hilfiker, David Shellington

Learning Objectives: No studies to date specifically evaluate the incidence of acute kidney injury in pediatric patients after traumatic brain injury (TBI). The purpose of this study is to determine the incidence of and risk factors for acute kidney injury in pediatric patients after moderate to severe TBI. Methods: A 2-year retrospective chart review of all patients between 0–17 yr admitted to the Rady Children’s Hospital PICU after moderate to severe traumatic brain injury was performed. Data collected included demographic information, diagnosis, admission Glasgow Coma Score, vital signs and medications (including hypertonic saline), laboratory studies (including peak BUN, creatinine, and norepinephrine), results of head CT, and Glasgow outcome scores. Severity of kidney injury was scored using the RIFLE criteria. Statistical analysis was performed with Graphpad Prism software. Results: During the study period, 35 children were admitted for evaluation of moderate to severe TBI. These included 17 females (49%) with mechanism of injury notable for fall (31%), MVA (26%), and struck by automobile (14%) resulting in GCS 7.4 ± 0.6. Overall, 22 patients (62.8%) received osmolar therapy, 11 received diuretics (45.8%), and 14 (40%) required vasopressors. By RIFLE criteria, 4 (11.1%) patients met criteria for risk of kidney injury and 1 experienced kidney injury (2.9%). No patients met criteria for renal failure. Patients with kidney injury had a higher peak BUN (17 ± 8 vs. 31 ± 4.5, p < 0.05), required more ventilator days (5.6 ± 1.6 vs.15 ± 3.4, p<0.05), and had higher peak serum Osm (318 ± 5.9 vs. 358 ± 6.8, p=0.05). RIFLE scores correlated with vasopressor infusion (p = 0.002). No patients required renal replacement therapies or had renal injury at the time of discharge. Conclusions: Some degree of renal impairment occurred in 14.2% of pediatric patients admitted to the ICU with moderate to severe traumatic brain injury. Osmolar therapy and vasopressor administration may be risk factors for kidney impairment in this population.

1171 ACIDOSIS DURING INITIAL BURN EXCISION: IMPACT OF BLOOD LOSS ESTIMATES ON PATIENT OUTCOMES
Vincent Nguyen, Soman Sen, David Greenhalgh, Tina Palmieri

Learning Objectives: The definitive treatment of third degree burn injury is wound excision and grafting. Excision is lifesaving; however, massive blood loss is common. This blood loss results in acidosis that may impact outcomes. We hypothesize that inaccurate blood loss estimates in the first excision and grafting contribute to development of acidosis and patient mortality. Methods: We conducted a retrospective chart review of children admitted to a burn center from 2006–13. Inclusion criteria were age <18 yr and the need for excision and grafting. Data collected included demographics, outcomes, and surgical data from the initial excision and grafting. Acidosis was defined as pH<7.35. Univariate analyses were used to investigate intraoperative factors influencing acid/base status. Multivariate analysis was used to determine predictors of acidosis and mortality. Data is reported as mean ± standard error of mean. Results: A total of 214 patients. 67.8% male, mean age 7.0 ± 0.4 yr, TSA 40 ± 3.4%, 24.8% inhalation injury were excised (78.3 ± 8.9ml vs 132 ± 13.9ml). On multivariate logistic regression factors that contribute to immune alterations after trauma and blood component transfusion or had renal injury at the time of discharge. Conclusions: Some degree of renal impairment occurred in 14.2% of pediatric patients admitted to the ICU with moderate to severe traumatic brain injury. Osmolar therapy and vasopressor administration may be risk factors for kidney impairment in this population.

1172 PROPHYLACTIC ENOXAPARIN DOSING STRATEGIES AND INCIDENCE OF VENOUS THROMBOEMBOLISM IN BURN PATIENTS
Andrew Fritschle Hilliard, Todd Walroth, David Foster, Jessica Whitten, David Roggy, Jeffrey Gibbs, Rajiv Sood

Learning Objectives: The objective of this study was to evaluate prophylactic enoxaparin dosing strategies in adult burn patients based on antifactor-Xa levels. We compared enoxaparin dose titration based on antifactor-Xa levels to a published dosing equation utilizing total body surface area (TBSA) burn and body weight. Methods: This retrospective study included acute burn patients from August 1, 2012 to January 27, 2015 who were initiated on enoxaparin for venous thromboembolism. Primary outcome measurements included percentage of patients who achieved goal prophylactic antifactor-Xa level at any time and incidence of VTE. A post-hoc analysis was performed on all patients to compare the dose calculated according to a published dosing equation [enoxaparin dose (mg every 12 hr) = 22.8 + 3.3 x (TBSA/10) + 1.89 x (weight/10)] to...
the actual dose required to achieve goal prophylactic antifactor-Xa level. Results: Sixty-four patients were included for review. Of these, 42 (66%) attained an antifactor-Xa level within the target prophylactic range during admission. Five patients (8%) developed a VTE, with three (5%) of the thrombi deemed to be clinically significant. The median (IQR) total daily enoxaparin dose for patients who achieved a target antifactor-Xa level was 0.51 mg/kg (0.41–0.64), which was significantly lower than the equation calculated dose of 0.58 mg/kg (0.51–0.72) (p < 0.001). In patients who did not achieve goal antifactor-Xa level, enoxaparin doses were significantly lower than the equation calculated doses (p < 0.005).

Conclusions: Majority of patients included achieved goal antifactor-Xa level with a low incidence of VTE. The enoxaparin dosing equation may have resulted in more patients achieving target prophylactic antifactor-Xa levels; however, the calculated dose may have resulted in larger doses than necessary. Based on these data 0.5 mg/kg appears to be an appropriate starting dose for prophylactic enoxaparin, but antifactor-Xa levels are still needed due to high interpatient variability inherent to burn injury.

1173 INCREASED RED CELL DISTRIBUTION WIDTH IS ASSOCIATED WITH MORTALITY FOLLOWING BURN INJURY
Soman Sen, Nam Tran, Brian Chan, Tina Palmieri, David Greenhalgh, Kiko Cho

Learning Objectives: Increased red cell distribution width (RDW) is a measure of the variability in the size and shape of erythrocytes. Elevated RDW is associated with a number of chronic hematologic conditions. Recently increased RDW is associated with increased risk of mortality in critically ill patients. Based on these findings we hypothesize that increased RDW is associated with increased mortality in burn-injured patients. Our primary aim was to determine if admission RDW was a predictor of death following burn injury. Methods: We performed a retrospective cohort study. We included adult patients (£18 yr) who suffered a burn injury from January 2010 to December 2014 and were admitted to the burn ICU. We compared survivors and non-survivors with respect to age, gender, total body surface area of burn (TBSA), length of mechanical ventilation, and length of ICU stay, and admission complete blood cell count (CBC). Results: 384 patients were enrolled in the study of which 75% were male. 26 patients died (7%). Mean age (60 ± 49 yr), median TBSA (36.5 ± 14%), median ventilator days (27.5 ± 0) and median ICU days (27.5 ± 15) were significantly higher in non-survivors compared to survivors. Admission white blood cell count was significantly higher in non-survivors (18.5 ± 14.1 × 103 cells/mm3). There were no significant differences in admission mean hemoglobin, platelets, and red cell count between non-survivors and survivors. Mean corpuscular volume and mean corpuscular hemoglobin concentration also did not differ on admission. RDW was significantly higher in non-survivors (15%) than survivors (14%) on admission. 17% of the patients with an admission RDW > 15 died while only 5% of the patients with an admission RDW ≤ 15 died. Adjusting for age, TBSA, ventilator days, and ICU days, both admission RDW (odds ratio 1.6) and admission RDW > 15 (odds ratio 5) were independently associated with mortality. Conclusions: Admission RDW is a marker for survival following burn injury. Increased RDW, especially RDW > 15, is a predictor of increased risk of mortality in burn patients.

1174 EXOGENOUS CYTOCHROME C IMPROVES ACIDOSIS AND OXIDATIVE STRESS IN A RAT MODEL OF HEMORRHAGIC SHOCK
Rebecca Powell, Donna Goodenow, Iain McKillop, Susan Evans

Learning Objectives: Hemorrhagic shock and reperfusion (HSR) injury leads to reactive oxygen species production, mitochondrial dysfunction, energy and multiple organ failure. Cytochrome c (CC) is the final electron carrier in the mitochondrial electron transport chain. We questioned whether exogenous CC would improve organ dysfunction and mitochondrial stability in a rat model of HSR. Methods: Male Sprague-Dawley rats were cannulated via carotid artery and hemorrhaged (MAP of 33 ± 2.0±0.8mmHg) for 1-hr prior to resuscitation. CC (40µg/kg/CC) or 200µg/kg/CC] or saline (HSR; 0.9%) was given (iv) 30-min prior to resuscitation. Sham (S) were cannulated and held under anesthesia for 1-hr. Rats were sacrificed by cardiac puncture (CP) 2-hr post surgery, and blood and sera were analyzed via iSTAT (pH, lactate (LAC), creatinine (CR), base excess (BE), PO2), and qPCR. Tissues were assayed for lipid peroxidation (TBARS). Data were analyzed via One way ANOVA w/ SEM (p < 0.05, n=5).

Results: HSR decreased BE compared to S (7.2±2.8 vs 2.8±1.0±0.8mmHg) and CC, but not CC5, restored BE to levels similar to S (5.0±2.8 (CC) vs 2.8±1.0 [S] vs 8.0±2.9 [CC5]). CC improved LAC clearance from mid-hemorrhage to CP compared to HSR (57.7±9.9 vs 32.3±3.0±0.8mg/dL). HSR increased PO2 levels compared to S, but CC and CC5 restored PO2 to levels similar to S (9.5±17 [HSR] vs 31±6±0.8 [S] vs 65±15 (CC) vs 42±9 (CC5) mmHg). HSR, CC and CC5 increased CR compared to S (9.0±0.7 [HSR] vs 9.8±0.7 [CC] vs 1.1±0.8 [CC5] vs 0.66±0.08mg/dL). CC and CC5 decreased hepatic lipid peroxidation compared to HSR (9.0±2.2 [CC5] vs 11±1.5 (CC5) vs 16±1.7µM MDA). Mitochondrial DNA (mtDNA) was not different in HSR animals compared to S, but CC and CC5 decreased levels of mtDNA compared to S and HSR (2.4±0±0.8 [S] vs 1.5±0.5 [HSR] vs 0.92±0.01 (CC) vs 0.62±0.01 (CC5). Conclusions: These data suggest exogenous cytochrome c improves acidosis, oxidative stress, and decreases circulating levels of mtDNA in a model of HSR. Work remains to determine if additional protection can be achieved by altering dose or time of administration.

1175 PREVALENCE OF ACUTE KIDNEY INJURY IN ELDERLY TRAUMA PATIENTS: A PROSPECTIVE OBSERVATIONAL STUDY
Jun Fujinaga, Akira Kuriyama, Noritaki Shimada

Learning Objectives: Acute kidney injury (AKI) in critically ill patients is associated with high mortality. Some retrospective studies reported the prevalence and risk factors of AKI in trauma patients, but the participants were relatively young. The aim of this study was to identify the prevalence and the risk factors of AKI in patients with trauma in Japan, the most aging country amongst developed ones. Methods: A 1-year prospective observational study was performed. We included the trauma patients who were admitted to our ICU from June 2014 to May 2015. The patients who were younger than 18 yr old, were discharged from the emergency department (ED), had already undergone hemodialysis, died in the ED, or required only palliative care on admission were excluded. The diagnosis and classification of AKI were made according to the Kidney Disease Improving Global Outcomes (KDIGO) criteria. We focused on the elderly participants who were > 64yr old, and identified the risk factors of developing AKI. Results: A total of 154 patients were included in this study. Median injury severity score was 19 (IQR, 13–26), and median age was 69 (IQR, 45–79). The overall incidence of AKI was 14.3% (n=22). Seventeen patients (77.3%) were categorized as Stage 1, two (9%) as Stage 2 and three (13.6%) as Stage 3. Patients older than 64 yr old developed AKI more frequently than younger patients (20.5% vs 6.0%, p=0.01). Univariate analyses suggested that AKI was associated with angiotensin-converting enzyme inhibitor (ACE-I) or angiotensin receptor blocker (ARB) (OR 8.47; 95% CI, 1.19 to 10.17) and the presence of chronic kidney disease (CKD) (OR 13.79; 95% CI, 3.09 to 61.54). Known risk factors such as age, contrast medium or diabetes mellitus were not the predictors for AKI. Conclusions: Elderly trauma patients were more likely to develop AKI than the younger ones. The presence of CKD and the intake of ACE-I/ARB were the risk factors of developing AKI.

1176 SURGICAL INTENSIVE CARE SHORT-STAY ADMISSIONS: THE IMPACT OF THE VENTILATOR DRIVE-BY
Tracy Geoffrion, Lori Kirkpatrick, Natalie Provzene, Christopher Tran, Christian Minshall, Brian Williams

Learning Objectives: Intensive Care Unit (ICU) resources are frequently utilized to care for patients whose clinical status does not require critical care medical services. We hypothesized that the majority of short-stay admissions to our Surgical Trauma (STICU) were admitted intubated from the operating room, rapidly extubated, and then transferred to the ward. Methods: We initiated a quality improvement project to assess short-stay admissions to the Surgical/Thaua ICU of an urban, Level 1, county, adult hospital. We retrospectively reviewed the
electronic medical records of admissions to the STICU from November 2013 to October 2014. All patients whose length of stay in the STICU was less than 12 hr were included. We recorded demographic data, admission diagnosis, admitting service, documented reason for ICU admission, time of ICU stay, time interval to extrabution, patient location prior to ICU admission, and time interval to death. **Results:** Of the 1244 admissions to the STICU, a total of 106 (8.5%) patients had a length of stay less than 12 hr. The most common documented indication for admission to the STICU was ventilator management accounting for 41.5% of all short-stay admissions. In this group, 23 (52%) patients were extrabuted within 4 hr of arrival and then transferred to the ward since they had no other indication for STICU admission. Over the course of the year, this represents a minimum increase of 0.5 full time equivalent (FTE) critical care nursing to provide care to these patients. **Conclusions:** Our review demonstrates that nearly 25% of short stay admissions in the Surgical/Trauma ICU only required a short period of ventilator management prior to extrabution and subsequent transfer to the ward. Developing a mechanism to treat these patients that does not require STICU admission could result in better resource utilization by reducing required full-time equivalent nursing care.

**VASOPRESSOR USE FOLLOWING TRAUMATIC INJURY–A SINGLE-CENTER HISTORICAL COHORT STUDY**

Mathieu Hylands, Marie-Pier Godbout, Francois Lamontagne

**Learning Objectives:** Vasopressors are not recommended by current trauma guidelines, but recent reports indicate that they are commonly used. Lack of equipoise has hampered the conduct of clinical trials of vasopressors in trauma. We aimed to describe vasopressor use and other life-sustaining therapies during the early resuscitation of trauma patients. **Methods:** We conducted a single-center historical cohort study at the Centre Hospitalier Universitaire de Sherbrooke, a regional Canadian trauma center. We reviewed the medical records of all adult patients treated for severe traumatic injury in 2013. Patients who died within 24 H of admission or were transferred to the ICU were included in our cohort. A systolic blood pressure <90 mmHg, a mean arterial pressure <60 mmHg, the use of vasopressors or ≥2 L of intravenous fluids defined hemodynamic instability during the early phase of resuscitation. We defined this as the period from admission to surgical management or, when surgical management was not required, the first 6 H. We collected data relevant to the medical management of unstable patients and variables associated with vasopressor use. **Results:** Of 111 eligible patients, 63 met our criteria for hemodynamic instability. Of these, 60 (95%) had sustained blunt injury and 22 (35%), severe traumatic brain injury (TBI).

**Conclusions:** At our institution, patients with severe trauma commonly receive vasopressors, particularly after severe TBI. Patients who sustain trauma outside large urban centers may receive care that deviates from guidelines and transport to specialized trauma centers can lead to prolonged exposure to therapies such as vasopressors. A better understanding of the benefit vs. harm of vasopressors for distinct patient subgroups during early trauma resuscitation requires adequately designed prospective studies.

**EARLY HYPERCOAGULABILITY IN TRAUMA ICU PATIENTS DETECTED BY CALIBRATED AUTOMATED THROMBOGRAM**

Stacy Voils, Stephen Lemon, Janeen Jordan, Stephanie Molchan, Paul Riley, Reginald Frye

**Learning Objectives:** Incidence of VTE in adult trauma patients is high despite mechanical and pharmacologic prophylaxis. We hypothesized that thrombin generation as measured by calibrated automated thrombogram (CAT) is increased early in hospitalization which contributes to the observed hypercoagulable state. **Methods:** We conducted a prospective study in adult, critically ill trauma patients. Plasma was generated from whole blood samples collected within the first 3 days of hospital admission. CAT was used to determine lag time, thrombin peak, endogenous thrombin potential (ETP), and velocity index (rate of thrombin formation) in plasma samples from patients, and in control samples of platelet-poor, pooled normal plasma. **Results:** There were 16 trauma patients and 16 controls included in this pilot analysis. Patients were a mean (SD) age of 47 (21) yr, and 9 (56%) were male. The most common mechanism of injury was motor vehicle crash followed by falls, and the median (IQR) injury severity score was 23 (11–29). Mean (SD) lag time, thrombin peak, ETP, and velocity index was 5.7 (1.3) min, 248 (74) nM, 1217 (302) nM/min, and 108 (38) nM/min, respectively. Lag time, thrombin peak, ETP, and velocity index were 125% (44), 150% (54), 108% (29), and 222% (93) of controls, respectively. There were 2 patients with ultrasound-confirmed DVT during the study, at hospital day 2 and hospital day 10, with the following coagulation profiles: lag time of 1.9 and 2.5 min (65% and 85% of controls), thrombin peak of 209 and 215 nM (112% and 115% of controls), ETP of 889 and 1122 nM/min (75% and 94% of controls), and velocity index of 90 and 122 nM/min (160% and 217% of controls). **Conclusions:** Despite a longer lag time overall, thrombin was generated at a higher rate and extent in patients compared to controls as observed by increased thrombin peak, ETP and velocity index. Compared to controls, patients with VTE events had a shorter lag time, higher thrombin peak and velocity index, and similar ETP.
review was conducted for subjects who were admitted as trauma activation from the field and had a detectable serum ethanol level upon admission. Risk factors and characteristics compared included demographics, Injury Severity Score (ISS), Glasgow Coma Score (GCS), serum ethanol level upon arrival, urine drug screen results, incidence of respiratory depression, and opioid and other sedative medication usage. Results: 233 patients were included (78.5% male). Patients who received opioids were more likely to have higher ISS and initial pain scores on admission as compared to those who did not receive opioids. Blood ethanol content was higher in patients who did not receive opioids (0.205 vs 0.237 mg/dL, p=0.015). Patients who did not receive opioids were more likely to be intubated within four hr of admission (1.7 vs 12.1%, p=0.02). Opioid administration was not associated with increased risk of respiratory depression (19.7 vs 22.4%, p=0.606). Increased cumulative fentanyl dose was associated with increased risk of respiratory depression. Blood ethanol content and cumulative midazolam dosing were not found to be risk factors for respiratory depression. Conclusions: Opioid administration to the intoxicated trauma patient was not associated with increased risk of respiratory depression. Increased cumulative fentanyl dose was found to be a risk factor for respiratory depression.

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ROLE OF IN-HOUSE TRAUMA SURGEON IN THE INITIAL RESUSCITATION OF SEVERE MAJOR TRAUMA PATIENTS

Maru Kim, Hang Joo Cho

Learning Objectives: Initial resuscitation is very important for the survival of major trauma patients. This study will evaluate the effect of in-house trauma surgeon (IHTS) on time for decision making about major procedure (TD), time for hospitalization (TH) and time to operation (TO) in patients with major trauma. Methods: This is a retrospective cohort study using trauma database. According to the hospital system, IHTS takes on trauma patients for three days to a week. On the other four days, trauma patients were managed without IHTS. IHTS residents in hospital not only for torso trauma operation but to communicate with other surgeons in order to take care of admissions to ICU, avoid unnecessary prescriptions and orders and act as a coordinator among surgeons. Between January, 2011 and December, 2011, 272 of major trauma patients were consecutively enrolled in this study. TD, TH, TO, trauma team activation (TTA). Data were analyzed with presence of IHTS. Results: In patients who were admitted to the department of trauma surgery, TD and TH with IHTS took significantly less than those without IHTS (TD: 1.37 vs. 283 min, p = 0.002; TH: 302 vs 635 min, p= 0.001). Also TO with IHTS took shorter than that without IHTS (200 vs 256 min), although it shows no statistical significance. In patients who were admitted to the department of other surgery department, TD and TH with IHTS took 173, 331 minute. They were lower than those without IHTS (289, 642 min) and showed statistical significance. Likewise TO with IHTS took shorter than that without IHTS (283minute vs. 283 minute) but, showed no statistical difference. In patients with TTA, TD and TH took statistically less time than those without TTA (TD: 168 vs 320 min, p < 0.001; TH: 329 vs 773 min, p = 0.001). Conclusions: IHTS proved its important role in reducing decision making time and time for hospitalization in initial trauma management. Especially, IHTS played also an important role even for patients who are not admitted to trauma surgery department. Trauma team activation has definitively proved its importance role in reducing decision making time and time for hospitalization in initial trauma management. Espe-

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TRAUMA PATIENTS ADMITTED TAKING WARFARIN OR DABIGATRAN – A COMPARISON OF MANAGEMENT AND OUTCOMES

Carinda Feild, Bao Anh Tran, Jeffery Johnson

Learning Objectives: Trauma patients taking oral anticoagulants may require reversal of therapy to manage injuries. Restoration of functional coagulation is typically accomplished with vitamin K and fresh frozen plasma (FFP) but Factor VII or prothrombin complex concentrate (PCC) may also be used. Dabigatran, an oral, direct thrombin inhibitor is being used with increasing frequency. Unlike warfarin, dabigatran does not have a specific antidote and data on responsiveness to the above therapies is limited. Restoration of functional coagulation may be challenging. This study compared the resources utilized and outcomes of trauma patients receiving dabigatran or warfarin. Methods: Adult patients admitted to the trauma service taking warfarin (INR at least 1.5) or dabigatran were enrolled. Through a retrospective chart review, blood product, fluid, and vitamin K, use was captured. Demographics, time to functional coagulation (INR < 1.5), Length of stay (LOS), Injury Severity Score (ISS) and mortality were also documented. The parameters were compared using Chi Square or Fisher’s Exact Test and Wilcoxon Rank Sum to determine if there were differences. Results: There were 106 patients evaluated (95 warfarin/11 dabigatran). There was no significant difference in age (77.2yr/74.2yr), sex (50M/45F vs 7M/4F), or ISS (10.5/10.01). There was no significant difference in mortality (11.6%/27.3%), LOS (8.53 days/5.09 days), or ICU LOS (6.92 days/2.83 days). There was no significant difference in the proportion receiving, PRBCs, FFP, Platelets, crystalloids or colloid. There was a significant difference in the proportion who received vitamin K (40/0, p = 0.006). For those receiving blood products, only the amount of PRBCs was significantly different (3.6 units/10.5 units, p=0.039). The difference in mean volume of crystalloids given (2852mLs/3490mL) was significant (p=0.002). Variation in group size and doses may have impacted difference detection. Conclusions: Based on these data one cannot conclude a difference in utilization for most resources or mortality, LOS, and ICU LOS, but there are trends which warrant further evaluation.

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GONE BUT NOT FORGOTTEN: TRAUMA TRIAGE GUIDELINES DO NOT CAPTURE INJURED BLUNT TRAUMA PATIENTS

Aman Jambhekar, Ryan Lindborg, Matthew Briggs, Paris Darttio, Joseph Bove Jr., James Rucinski, Bashar Fahoum

Learning Objectives: The triage guidelines of individual trauma centers are often based on the American College of Surgeons (ACS), applying similar principles in which mechanism of injury is a key determinant of trauma team activation. The objective of our study is to determine if our ACS based triage guidelines appropriately identify injured blunt trauma patients. Methods: Data was prospectively collected on 231 patients admitted between April 1, 2015 and July 27, 2015. Patients were included if they had a blunt traumatic mechanism of injury and were evaluated by our Trauma Service. The entire cohort was then stratified into two groups: those for whom level one or level two trauma team activation was called (n = 100) and those for whom a trauma consult was requested but without trauma team activation (n = 131). The two groups’ demographics including age, mechanism of injury, Injury Severity Score (ISS), and length of stay (LOS) were compared using the unpaired Student t test and Fisher’s exact test. Results: ISS did not significantly differ between the two groups (8.30 vs 7.89 yrs, p= 0.002, p = 0.08). LOS was also similar between the two groups (3.89 days + 1.7 vs 2.07 days + 1.93, p=0.072). Trauma consult patients were more likely to be older (38.1 yr + 16.9 vs 62.2 yr + 23.4, p < 0.001) and more likely to use antiplatelet agents (4% vs. 21%, p = 0.003). The time to trauma team evaluation was significantly longer for trauma consult patients (0.08 hr + 3.0 vs 2.93 hr + 3.21, p < 0.001). Conclusions: Our trauma triage guidelines did not effectively differentiate injured patients with a blunt mechanism of injury. In addition, triage guidelines which are contingent upon mechanism of injury appear to be associated with a significant delay of care for certain patients. The inclusion of additional components, such as the use of antiplatelet agents and advanced age, may improve the timeliness and quality of care for patients with a blunt mechanism of injury.

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THE CHECKLIST MANIFESTO RETURNS: USE OF A CHECKLIST IMPROVES INITIAL DISPOSITION AT A TRAUMA CENTER

Ryan Lindborg, Aman Jambhekar, Paris Darttio, Joseph Bove Jr., James Rucinski, Anthony Tortolani, Bashar Fahoum

Learning Objectives: Many trauma centers have adopted activation algorithms intended to improve the processes and outcomes of trauma care. There have been no studies evaluating the use of a trauma checklist to determine admission to the appropriate level of care. The objective of our study is to evaluate the use of a trauma checklist to direct initial disposition at a regional trauma center. Methods: Data was collected on 280 injured patients admitted between April 1, 2015 and
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and July 31, 2015. The patients were divided into two groups: those seen between April 1 and June 30 (n=189) and those seen between July 1 and July 31 (n=91) after the trauma checklist was implemented. In the checklist group of patients Injury Severity Score (ISS) was required to be calculated prior to admission. ISS, age, and mechanism of injury were compared using the unpaired Student’s t test and Fisher’s exact test. Results: Patients with a significantly higher ISS were admitted to the Surgical Intensive Care Unit (SICU) in July after use of the checklist was mandated (20.25 +/- 9.68 vs. 11.7 +/- 7.57, p = 0.008). Those patients who did not meet criteria for SICU admission were admitted to the Surgical Stepdown Unit although their ISS trend did not reach statistical significance (8.89 +/- 6.43 vs. 7.14 +/- 3.93, p = 0.06). Patients in the pre-checklist and checklist groups were of similar age (52.96 +/- 24 vs. 54.76 +/- 24.6, p = 0.56) and overall ISS (6.38 +/- 6.96 vs. 7.24 +/- 5.58, p = 0.27). There was a similar percentage of penetrating trauma in each group (12.2% vs. 13.7%, p = 0.85). There were significantly fewer trauma activations in the checklist group (18.9% vs 31.7%, p = 0.03). Conclusions: The use of a trauma checklist is associated with higher ISS values in patients admitted to the critical care setting when compared to pre-checklist practices. More severely injured patients were admitted to the SICU in the checklist group despite fewer associated trauma team activations. The continued use of such a checklist may help deter unnecessary trauma admissions to higher levels of care.

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ROLE FOR LAPAROSCOPIC TREATMENT OF BLUNT SPLENIC INJURIES IN A REGIONAL LEVEL 1 TRAUMA CENTER
Gregory Huang, Barbara Hileman, Elisha Chance, Donald DeSanto II, Eric Emerick, Renee Merrell

Learning Objectives: Laparoscopic splenectomy is considered an acceptable approach for non-traumatic spleen injuries. However, its role in blunt traumatic spleen injuries is poorly defined. Methods: This is an IRB approved, retrospective analysis of trauma patients with splenic injuries admitted between 01/2011 and 12/2014. Patients admitted to trauma services, aged 18 or older, with a blunt mechanism of injury, and who underwent operative management of the splenic injury were included. Operative management was categorized into open and laparoscopic techniques. Demographics, injury severity score, abdominal abbreviated injury score, admission Glasgow Coma Score (GCS), ventilator days, ICU and hospital length of stay (LOS), admission vital signs, procedure length, intra-operative blood loss, complications, mortality, discharge disposition, and total transfusion requirements were examined. Chi squared test, Student t test, and Mann-Whitney U test were used for analysis. Results: Open and laparoscopic techniques were utilized in 41 and 11 patients, respectively (n=52). The laparoscopic group had a higher admission GCS compared to the open group (15 vs. 13.5; p=0.03). The laparoscopic group had less blood loss and fewer blood transfusions, but had longer operating times (all p<0.01). Laparoscopic patients also had fewer days on the vent (0.09 vs. 6.6; p=0.001), and shorter ICU LOS (2.9 vs. 8.46; p=0.001). Laparoscopic patients went to surgery later than open patients (day 3 vs. 0; p=0.001), and the indication was for non-operative management failure vs. radiology imaging in the open group (p=0.001). More laparoscopic patients were discharged home or to acute rehab, but this was marginally significant (90.9% vs. 53.7%; p=0.071). Conclusions: Laparoscopic splenectomy was associated with decreased blood loss, shorter ICU LOS and decreased ventilator days for the management of splenic injuries in this study. Our data show that laparoscopic splenectomy can be an option in stable patients who fail non-operative management of blunt splenic injuries.

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REDUCTION IN RED BLOOD CELL UTILIZATION ASSOCIATED WITH A BLOOD CONSERVATION INITIATIVE IN A SICU
Keri Bicking, Sarah Monchar, Melissa Blatt, Lorraine Castro, Javier Martin Perez

Learning Objectives: Transfusion of red blood cells (RBC) is common practice in critically ill patients. Between 40%-50% of patients admitted to the ICU receive at least one unit of RBC during their ICU admission despite transfusion-related risks and the lack of supporting evidence for transfusion in hemodynamically stable patients with anemia. In efforts to reduce unnecessary RBC transfusion in the surgical intensive care unit (SICU) including trauma patients, a multifaceted blood conservation initiative was undertaken. Methods: Retrospective, single center before and after cohort study of patients in a 14 bed SICU. Several blood conservation interventions were sequentially implemented over an 18 month period. These included a reduction in laboratory draws, thromboelastography, a clinical decision making algorithm embedded in an order set promoting single unit transfusions and education to clinical staff, patients and family members of the hemoglobin threshold (hgb) of 7 g/dl in patients without active hemorrhage. Data was compared to a historical sample excluding patients receiving massive transfusion protocol. Results: A total of 2187 SICU admissions were evaluated; 842 in the historical group (HG) and 1345 in the rolling intervention group (RIG). The percentage of patients receiving RBC transfusions and the number of units transfused did not differ between groups, however the number of RBC units transfused for a hgb ≥ 7 g/dl significantly decreased each year (67.8% vs. 58.5%, p < 0.01) between year one and two and (58% vs. 44.8%, p < 0.01) between year two and three. Two or more unit RBC transfusions decreased from 26.5% to 14.6% (p < 0.05). Although not statistically significant, there was a decrease in the mean hgb prior to transfusions after the intervention (7.45/dl vs. 7.07/g/dl). Conclusions: In SICU patients particularly prone to RBC transfusions, a multifaceted approach to blood conservation significantly reduced RBC transfusions in patients with a hgb ≥ 7 g/dl. Additionally, there was an increase in single unit transfusions administered in lieu of 2 or more units.

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PERIOPERATIVE COMPLICATIONS OF LAPAROSCOPIC SLEEVE GASTRECTOMY: A SINGLE CENTER EGYPTIAN EXPERIENCE
Ahmed Hasanin, Karim Hussein, Sherene Mostafa, Gihan Obayah, Hanan Mostafa, Yasmin Ibrahim

Learning Objectives: Laparoscopic sleeve gastrectomy (LSG) is a bariatric operation with increasing popularity. Many studies reported patient outcome after LSG from the surgical and metabolic point of view. Although this procedure is usually done in morbidly obese patients with frequent co-morbidities, no studies to the best of our knowledge reported outcomes of this operation of anesthetic interest. Methods: A prospective cohort study was conducted in Cairo university teaching hospitals. All patients scheduled for LSG during a period of seven mo were included in the study. All anesthesia related complications were reported as well as surgical outcomes. Major anesthesia complications were defined as: intra-operative or postoperative cardiac arrest, failed intubation, postoperative ventilation, and postoperative intropic support. Possible risk factors for developing perioperative complications were also analyzed using univariate and multivariate analysis. Results: One hundred and fifty patients were included. Mean age was 33 ± 6 yr and mean Body mass index (BMI) was 48 ± 6. No major anesthesia related complications were reported. Three cases (2%) of surgical anastomotic leakage were reported. Four cases (2.6%) of difficult intubation were reported. As regards minor anesthesia related complications, the most common complications were intraoperative and postoperative tachycardia (75%), increased plateau airway pressure (75%), and postoperative nausea and vomiting (60%). By multivariate analysis; independent risk factors for airway complications were smoking and Mallampati score. Independent risk factors for respiratory complications were restrictive pattern of pulmonary function tests, STOP-BANG questionnaire score, and Mallampati score. Conclusions: We reported that LSG is done in our center with no major anesthetic complications and low incidence of surgical complications. We consider LSG to be a safe procedure with a good outcome.

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OUTCOMES OF TRAUMA PATIENTS NOT RECEIVING ANTIBIOTICS FOR POLYMICROBIAL GROWTH OF BAL
Sarah Wright, James McMillen, Christy Lawson

Learning Objectives: Ventilator-associated pneumonia (VAP) is a frequent cause of nosocomial infections and carries a high rate of mortality. Quantitative BAL cultures are used as a diagnostic method for VAP. The IDSA guidelines state that there are worse outcomes for patients that have polymicrobial growth from BAL cultures. Although not statistically significant, one study found patients with polymicrobial growth had decreased mortality, with only 75% of patients receiving appropriate antibiotics. The purpose of this study is to evaluate the outcomes of trauma patients with untreated polymicrobial growth from BAL compared...
to those who received treatment for monomicrobial growth. **Methods:** Single-center, retrospective cohort analysis of patients admitted to the Trauma/Surgical ICU service, received mechanical ventilation (MV) for ≥ 48 hr, and had BAL cultures with microbial growth ≥10000 CFU/mL. Patients were grouped as follows: those with BAL cultures for monomicrobial growth who received antibiotics for ≥ 7 days or polymicrobial growth that did not receive definitive treatment. A non-inferiority analysis was conducted for the primary endpoint of mortality at 28 days. Mortality at discharge, MV duration, ICU length of stay (LOS), hospital LOS, and recurrent treatment with antibiotics were also assessed. **Results:** Eighty trauma patients were included; 30 with polymicrobial growth and 50 with monomicrobial growth. Baseline characteristics were similar between groups including APACHE-II scores and GCS. Regarding mortality at 28 days, the polymicrobial growth group was non-inferior to the monomicrobial growth group (monomicrobial – 14% with upper CER of 95% CI 29%; polymicrobial –16.6% with upper CER of 95% CI – 28%). However, hospital LOS and duration of MV were inferior. Mortality at discharge, ICU LOS, and the need for additional antimicrobial therapy were all non-inferior. **Conclusions:** Not treating polymicrobial growth from BAL appears to correlate with non-inferiority when compared to definitive treatment for monomicrobial growth in trauma patients.

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**PATHOPHYSIOLOGICAL DIFFERENCES IN COAGULOPATHY DUE TO BLUNT AND PENETRATING TRAUMA**

Toru Hifumi, Nobuaki Kiriu, Junichi Inoue, Hiroshi Kato, Yuichi Koido, Kenya Kawakita, Yasuhiro Kuroda, Yukata Kondo

**Learning Objectives:** Traumatic coagulopathy is caused by multiple factors. Disseminated intravascular coagulation (DIC) with a fibrinolytic phenotype is the predominant initiator of coagulopathy. Acute coagulopathy of trauma shock is another proposed pathophysiology of coagulopathy following major trauma. However, the association between the type of injury and pathophysiology of coagulopathy remains unclear. We aimed to identify the pathophysiological differences in DIC between blunt and penetrating injury. **Methods:** We retrospectively analyzed records of trauma patients who required large amount of transfusions (more than eight units of red cell concentrate, fresh frozen plasma, and/or platelets) within 24 hr of admission to our emergency department from November 1, 2011 to October 31, 2014. The primary outcomes were the association of type of injuries and rate of presence of DIC on admission. The secondary outcomes were comparison of the trend of coagulation markers (FDP d-dimer, and platelet counts) in acute phase of trauma resuscitation, and the association of type of injuries with the rate of presence of DIC on admission and FDP levels according to the injury severity score (ISS). **Results:** Fifty-nine patients (median age: 48 yr; 10 penetrating trauma cases) were included; in-hospital mortality was 10.1%. No significant differences with regard to age, gender, and time from injury to emergency department admission were observed. ISS was significantly higher in the blunt trauma group than in the penetrating trauma group. The rate of DIC was higher in blunt trauma patients than in penetrating trauma patients as per the following criteria; Japanese Association of Acute Medicine (83.7% vs 0%, p<0.01); ISS 16—<25 (88.9% vs 0%, p=0.02); and ISS ≥25 (96.7% vs 2.5 0%, p=0.0007). FDP levels were significantly higher in blunt trauma patients than in penetrating trauma patients in ISS 16—<25 and ISS ≥25 [2.3 (1.4—3.2) vs 90.5 (37.3–151)], p=0.04 and 2.5 (0–15.9) vs 182.5 (117.4–489), p=0.006, respectively. **Conclusions:** Our results indicate pathophysiological differences in coagulopathy between blunt and penetrating trauma.

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**EARLY VENOUS THROMBOEMBOLISM PROPHYLAXIS IN BLUNT TRAUMA: THE EVENT STUDY**

Eileen Shomo, Stephen Tan, Donald Johnson, Mark Schreiber

**Learning Objectives:** A leading complication of major trauma continues to be the development of venous thromboembolism (VTE), resulting in major morbidity and mortality. Current trauma guidelines fail to identify an optimal timeframe for VTE prophylaxis initiation in blunt trauma. The purpose of this study was to investigate how early versus late initiation of pharmacologic VTE prophylaxis in blunt trauma impacts bleeding and VTE complications. **Methods:** We retrospectively reviewed blunt traumatic injury admissions at one trauma center between January 1, 2014 and March 30, 2014. Patients were considered for inclusion if they survived ≥ 72 hr post-injury and received pharmacologic VTE prophylaxis for no less than 24 hr duration. Two groups were formed: early and late prophylaxis, defined as administration of prophylaxis within 24 hr or ≥ 24 hr from hospital presentation, respectively. The primary endpoint was the rate of bleeding complications during prophylaxis administration in the early versus late groups. Secondary endpoints for the study included the rate of VTE development and overall in-hospital mortality. **Results:** Eighty-seven patients were included in the study. Baseline characteristics were similar between the early and late groups except for injury severity score (10.27 ± 5.67 versus 14.87 ± 5.53, p=0.0003), INR (1.06 ± 0.27 versus 1.19 ± 0.41, p=0.003), and systolic blood pressure (140.7 ± 29.9 versus 125 ± 28.7, p=0.03). Three patients in the early group and one in the late group experienced bleeding. The groups had a similar number of patients that required blood transfusion, with a similar transfusion rate (3 ± 2.2 versus 4.38 ± 3.29, p=0.52). One patient in the early group and three patients in the late group developed VTE (1.8% versus 9.7%, p=1.00). No difference in mortality between the groups was observed. **Conclusions:** Results reveal no difference in bleeding; however, all bleeding required only temporary cessation of VTE prophylaxis. Early prophylaxis resulted in numerically fewer VTE events, which may be clinically significant, given that all patients required therapeutic anticoagulation.
Case Reports

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OXYGENATION VIA BI-VENTRICULAR ASSIST DEVICE FOR EMERGENCY AIRWAY MANAGEMENT

Samuel Howitt, Sarah Stirling, Piotr Krysiak, Bryce Fate, Marc Maybauer

Case Report: We describe the emergency insertion of an oxygenator into a patient's bi-ventricular assist device (BiVAD) circuit during an airway emergency. A fifty six year old man treated with a BiVAD for cardiogenic shock was noted to be bleeding from a mucosal tear on the left palatoglossal pillar. The oropharynx was packed to promote hemostasis and bleeding seemed to settle. However, twelve hr later the patient's tracheostomy tube blocked suddenly. The mouth and nose remained packed with bloodstained gauze but we were able to ventilate with difficulty through the tracheostomy tube using a Mapleson C circuit noting markedly limited exhalation. Fibre optic bronchoscopy via the tracheostomy tube revealed a large blood clot at the end of the tube. The scope was maneuvered past the clot and ventilation became easier. Distal to the blockage the airway was clear; no bleeding source was identified. A passage through the clot was cleared using suction catheters and grasper devices but the clot quickly reformed. A size 6.0 cuffed Endotracheal Tube (ETT) was loaded onto an intubating fiber optic scope, passed through the tracheostomy tube, past the clot and positioned just above the carina. Our perfusionist then inserted an oxygenator into the BiVAD circuit creating a Veno/Aortal-ECMO configuration providing an alternative source of gas exchange in case of recurrent airway obstruction and to allow definitive treatment to the bleeding point. While oxygenating the patient via VenoAortal-ECMO, bleeding from the traumatized palatoglossal pillar and the tracheostomy site was treated with bipolar diathermy and copious clots were removed from the oropharynx, subglottis and the esophagus. The tracheostomy tube was replaced and the size 6.0 ETT was removed. In this group of patients who are at high risk of hemorrhagic airway complications, the ability to provide gas exchange via an oxygenator in the event of an airway emergency is invaluable. Our unit now considers early insertion of an oxygenator into the circuits of all patients receiving MCS who show signs of airway bleeding.

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BACK PAIN, HYPERTENSION, AND SEIZURES: AN UNUSUAL CAUSE OF HYPONATREMIA

Richard Ramonell, Mayur Mody, Jessica Valente, Michael Yin, R. McClung, Jean Wheeler, Michael Connor

Case Report: Hyponatremia is a common clinical entity that can result from a variety of causes. Here we describe a rare etiology of symptomatic hyponatremia in a critically ill patient. A 19-year-old female with no significant past medical history presented to the emergency department with a seven day history of poorly localized back pain, hypertension, and found with marked hyponatremia of 125 mEq/L. She was thought to be volume depleted but her serum sodium level decreased to 113 mEq/L after volume resuscitation with 0.9% sodium chloride. The patient experienced an acute decline in mental status and she had a generalized tonic clonic seizure. She was admitted to the ICU and was stabilized with administration of 3% sodium chloride. Extensive evaluation into the etiology of her euvolemic hyponatremia, including thyroid studies and an adrenocorticotropic hormone (ACTH) stimulation test, was unremarkable. Urine studies were obtained and were consistent with the syndrome of inappropriate antidiuretic hormone (SIADH). The patient was managed with free water restriction, hypertonic sodium chloride, vasopressin receptor antagonists, and antihypertensive medications. After a thorough review of the patient's medications, emetic emulsion of a recently inserted enoxogestrel pellet was performed with resolution of the patient's hyponatremia, back pain, and hypertension. A urine porphobilinogen was found to be significantly elevated and the patient was diagnosed with acute intermittent porphyria (AIP) precipitated by implantation of a subdermal enoxogestrel pellet. AIP is one of several disorders that result from derangements in the heme biosynthesis pathway. Patients with AIP will typically be symptom-free until one of several precipitating factors causes increased transit through the porphyrin metabolic pathway causing nonspecific symptoms such as sinus tachycardia, vague abdominal or back pain, and hypertension. AIP exacerbations are also known to cause SIADH via hypothalamic dysfunction caused by damage to the hypothalamic-hypophyseal tracts.

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NEUROTOXICITY ASSOCIATED WITH CEFEPIME DURING IHD AND THE EFFECT OF CVVHDF ON DRUG CLEARANCE

Michael Bentley, Laura White, James Cain, Jason Roberts, Scott Pakosy, Steven Walls, Jeffrey Lipman

Case Report: Cefepime's postulate of dose adjustment in patients with kidney disease to reduce the likelihood of toxic effects. We report a case of seizures in a patient treated with renally adjusted cefepime while receiving intermittent hemodialysis (IHD) that resolved after its discontinuation and treatment with continuous venovenous hemodiafiltration (CVVHDF). Serial plasma concentrations, including prior to start CVVHDF (Cmax), were collected to determine relevant pharmacokinetic parameters (elimination rate constant (kl) and half-life (t½)), and the saturation coefficient (SA). All samples were processed at The University of Queensland, Australia. While receiving renally adjusted cefepime for Gram-negative aortic valve endocarditis an 84-year-old female was noticed to have abnormal mouth and shoulder movements. An electroencephalogram (EEG) demonstrated a left temporal seizure focus and levetiracetam was started. Over the next 48 hr she failed to improve and repeat EEG showed almost continuous discharges suggestive of status epilepticus. Phenytoin was added. The following morning she had minimal improvement and continuous EEG (cEEG) monitoring was initiated showing continued disturbances. Cefepime-induced neurotoxicity was included in the differential and cefepime was discontinued. Her IHD was converted to CVVHDF. The Cmax was 63.8 mcg/ml and showed a linear decrease over time (25.2 mcg/ml at 8-hr, 16.4 mcg/ml at 12-hr, and 9.0 mcg/ml at 24-hr). The SA at 8-hr was 0.67. The Kel and t½ was 0.861 and 11.4 hr. Over the next 23-hr she improved and the rhythmic activities on her cEEG completely resolved. She was responsive, smiling, and talking. She remained seizure free and was discharged to a skilled nursing facility for physical therapy and dialysis. Neurotoxicity should be suspected in critically ill patients receiving renally adjusted cefepime if the clinical and physical exam is consistent with this unwanted effect. Treatment with CVVHDF effectively removed cefepime.

1195

CHICKEN POX WITH SEVERE SEPSIS WITH MULTI-ORGAN DYSFUNCTION AND SEVERE RHABDOMYOLYSIS

Sharmili Sinha, Jyotimayee Pati

Case Report: Chicken pox in adults can be more serious than in children. Complications are more common in immunocompromised individuals and pregnant women. However, there have been case reports of secondary bacterial infections mostly pneumonias in immunocompetent adults and rarely instances of severe sepsis. Rhabdomyolysis has been reported in cases of varicella. We here report a young healthy adult with chicken pox with septic shock with multi-organ dysfunction and acute kidney injury with severe rhabdomyolysis. A 45 year male was admitted with chicken pox and pain abdomen for 2 days. On admission he was conscious and in respiratory distress. Within 6 hr, he developed severe septic shock, acute respiratory distress syndrome, hepatic dysfunction, acute kidney injury. He was ventilated and put on vasopressors after fluid resuscitation. His procalcitonin was high (25ng/ml). He was dialyzed due to persistent anuria and acidosis. His hemodynamics and ventilation status gradually improved, but renal failure persisted with a high catabolic state despite daily dialysis for 4 days. On day 8, rhabdomyolysis was suspected and serum CKP was found to be very high (15765U/L). His muscles appeared wasted. Good hydration was maintained. He was dialyzed even after his urine output improved in view of high urea and creatinine values. His sensorium slowly improved, though limb power was 1/5 in all limbs. He was diagnosed to have critical illness myopathy accentuated by severe rhabdomyolysis. On discharge, his limb power was 4/5 in all 4 limbs with muscle wasting. On day 15 after discharge, his limb power was normal. After 90 days, he had full recovery of muscle strength. Discussion: We successfully treated a case of varicella zoster with septic shock with multi-organ dysfunction and acute kidney injury complicated by severe rhabdomyolysis. High grade of rhabdomyolysis contributed to persistence of kidney injury for long time and accentuated the critical illness myopathy with severe muscle wasting. He improved with supportive therapy and good hydration.
THYMIC ABSCESS DUE TO MSSA LEADING TO MEDIASTINITIS AND SEPTIC SHOCK IN A PEDIATRIC PATIENT
Alicia Teagarden, Matthew Yuknis, Courtney Rowan

Case Report: There are several etiologies of mediastinitis, but there is little known evidence of thymic abscess leading to acute mediastinitis. We report a patient with MSSA bacteremia, mediastinitis and septic shock due to a thymic abscess. A four-month-old male presented with fevers, dyspnea, and fussiness. On exam he was inconsolable with clear breath sounds, subcostal retractions, and hypoxia. Chest radiograph demonstrated bilateral pleural effusions and enlarged cardiomyocytic silhouette. Routine cultures were obtained and broad spectrum antibiotics were started. Echocardiogram revealed normal anatomy and function. He progressed to respiratory failure requiring intubation. Enlarging bilateral effusions prompted chest tube placement. Blood and pleural fluid cultures were positive for MSSA. He then developed septic shock requiring inotropes, steroids, and broadening of antibiotics. Repeat echocardiogram showed fluid accumulation anterior to the heart. CT scan of the chest showed an enlarged, rim enhancing anterior mediastinum concerning for mediastinitis. A thymic ultrasound revealed a heterogenous anterior mediastinal fluid collection suspicious for abscess. A surgical mediastinal washout was done and bilateral chest tubes and mediastinal drains were placed. Mediastinal cultures were positive for MSSA. Pathology revealed a thymic abscess. Antibiotics were narrowed to nafcillin. The patient was weaned from inotropes quickly and was extubated 11 days post-operatively. He was transferred out of the PICU 20 days after admission, and remained on naf-cillin for six weeks. This is the first case to our knowledge of thymic abscess causing mediastinitis and septic shock. It is easy to assume that patients presenting with increased work of breathing and fever have a primary respiratory infection, but it is important to maintain a broad differential. Though a rare condition, mediastinitis is life threatening and requires prompt and aggressive treatment. It should be considered in the differential of sepsis and a widened mediastinum on chest imaging.

ACUTE THERAPY WITH IVIG IN A PEDIATRIC PATIENT WITH IDIOPATHIC SYSTEMIC CAPILLARY LEAK SYNDROME
Ashley Bjorklund, Gwyneth Fischer

Case Report: Idiopathic systemic capillary leak syndrome (ISCLS) is a rare syndrome characterized by severe hypotension, hypoalbuminemia, and hemocoencentration. It is a diagnosis of exclusion considered in cases of severe unresponsive shock. ISCLS has mostly been described in adults, however, a recent review highlighted its clinical significance in 12 pediatric patients. This review discussed chronic management, but did not have specific acute therapy recommendations. We present a case of a two-year old admitted to the PICU with clinical course and treatment of patients with ISCLS, especially in pediatric age. There are many unknowns surrounding the diagnosis and required escalating vasopressor infusions with unsustained response. He developed cardiac tamponade and had a bedside pericardiocentesis but his hemodynamic instability persisted. Due to resistant severe shock the diagnosis of ISCLS was entertained. Literature review revealed a case series of 3 adults treated successfully with high dose IVIG as acute therapy for ISCLS. No successful acute therapies were described in pediatric reports. The decision was made to treat with 1gm/kg IVIG and within an hour our patient’s hypotension stabilized. He received no additional fluid boluses and his vasopressors were weaned over the next few hr. Evaluation for a broad array of diagnoses was negative. He developed compartment syndrome, as is often seen with ISCLS, but he survived with no long standing physical deficits. There are many unknowns surrounding the diagnosis, course, and treatment of patients with ISCLS, especially in pediatric patients. We believe this is the first reported use of acute therapy with high dose IVIG in a pediatric patient with ISCLS. This intervention was lifesaving for our patient and additional studies of efficacy should be considered as children are identified with this syndrome.

A RARE CASE OF COMBINATION OF LANGERHANS CELL HISTIOCYTOSIS AND HEMOPHAGOCYTIC LYMPHOHISTIOCYTOSIS
Samir Gautam, Omar Dhabbi, Nancy Maary, Michael Seneff, Danielle Davison

Case Report: A 49-year-old white male presented with fever, malaise and a rash. Initial laboratory results were significant for WBC of 4100 (21% bands), creatinine of 1.8, lactate of 4, and LDH of 799. After 4 liters of resuscitation and broad-spectrum antibiotic administration, repeat labs were: WBC of 1100, (24% bands), platelets 41,000, INR of 1.7 and persistently elevated creatinine and lactate. An elevated ferritin level of 2001 and bedside Endotoxin Activity Assay of 8 was noted. A CT Scan demonstrated splenomegaly and multiple lymphadenopathies. Within 24 hr, multi-system organ failure ensued, necessitating intubation, pressors, and CRRT, DIC with resultant 4 distal extremity cyanosis/necrosis also ensued. The admitting diagnosis was septic shock but an extensive infectious work-up was unrevealing. A lymph node biopsy revealed histiocytic infiltration consistent with Langerhans Cell Histiocytosis (LCH) without evidence of erythropagocytosis. Hemophagocytic lymphohistiocytosis (HLH) is a similar hemolacitic disorder, but characterized by extreme immune activation. Given our patient’s life-threatening presentation combined with histological evidence of histiocytosis, therapy for HLH with intravenous etoposide and decadron was initiated. Resolution of total body inflammation and multi-organ failure followed. Worsening digital necrosis not responding to initial heparin infusion secondary to DIC exacerbated by vasopressor infusions complicated the patient’s hospital course. In an effort to augment peripheral arterial dilation, a trial of intravenous Epoprostenol, hyperbarics, peripheral nerve blocks and transdermal oxygen administration commenced. These interventions halted the progression of digital necrosis and contributed to significant improvement. HLH in adults is a rare condition, but should be considered in the context of shock, multi-organ failure, DIC and an elevated ferritin. To our knowledge, intravenous etoposide, hyperbarics and peripheral nerve blocks have not been described as a therapeutic modality for DIC complicated by digital necrosis.

CEFTOLOZANE-TAZOBACTAM PHARMACOKINETICS IN A PATIENT ON CONTINUOUS VENO-VENOUS HEMOFILTRATION
Wesley Oliver, Jeffrey Gonzales, Emily Heil, Shailly Mehrotra, Kathryn Robinett, Paul Saleeb, David Nicolaou

Case Report: Case Report: Ceftolozane-tazobactam is a novel cephalosporin/beta-lactamase inhibitor used in the treatment of multidrug-resistant gram-negative organisms. There is currently no data guiding its use when administered as an extended infusion in critically ill patients receiving continuous veno-venous hemofiltration (CVVH). We report a 61-year old man admitted to the medical intensive care unit (MICU) with moderate acute respiratory distress syndrome secondary to septic shock. The patient was receiving ceftolozane-tazobactam for a prosthetic hip joint infected with multidrug-resistant Pseudomonas aeruginosa with a minimum inhibitory concentration (MIC) of 1.5 mcg/mL to ceftolozane-tazobactam. During the course of treatment, the patient developed acute kidney injury and was started on CVVH, administered using a Gambro Prismaflex machine with a Prismaflex M150 Set AN69HF 1.5 m2 hollow fiber membrane (Blood flow=250 mL/min; Dialysate flow=2L/hr). Ceftolozane-tazobactam was administered intravenously at a dose of 1.5 grams every 8 hr, with an extended infusion time of 4 hr to achieve a goal PK/PD target of free drug concentration maintained above the MIC throughout the dosing interval (100% f T>MIC). With the third dose of antibiotic, drug concentrations were drawn at 1, 4, 5, 6, and 8 hr after the start of infusion pre- and post-filter. Using the pre-filter levels a Cmax (38.57 mcg/mL); Cmin (31.63 mcg/mL); T max (4 hr); AUC0-6, and 8 hr after the start of infusion (268.56 mcg•hr/mL; and t1/2 (30.7 hr) were calculated using non-compartmental analysis in Phoenix WinNonlin 6.4. The means SD extraction ratio for ceftolozane was 13.6 ± 12.3%. Free drug concentrations were calculated assuming 20% protein binding for ceftolozane and were all greater than 4x the MIC for 100% of the dosing interval. This report is the first documentation of a patient receiving extended infusion ceftolozane-tazobactam while on CVVH, with no adverse events. Given the obtained drug concentrations, a regimen of 1.5 grams every 8 hr was able to provide a target attainment of 100% f T>MIC.
A RARE CASE OF LACTOCOCCUS GARVIEAE ENDOCARDITIS IN A CRITICALLY ILL PATIENT
Lauren Ignieri, Noha Eltoukhy, Andrew Shaffer, Ronald Goren

Case Report: Lactococcus garvieae is a gram-positive, catalase-negative bacterium, growing in pairs or short chains. It is pathogenic in animals and has been isolated from cow’s milk, cheese, and meat products. Few cases of infective endocarditis (IE) secondary to L. garvieae have been reported. An 83-year-old, 80kg male presented to the emergency department (ED) after 1 week of worsening malaise and fever of 102°F. He reported vomiting, headache, non-productive cough, myalgias, and diaphoresis. Pertinent history includes CHF, chronic lymphocytic leukemia, prostate and bladder cancers, coarctation of aorta (1940s), aortic valve prosthesis (1970s), coronary artery bypass grafting (1994), and bioprosthetic aortic valve replacement (2010). Dental work was performed 1 week prior to symptom onset. In the ED, WBC was 29.2 x10^9 cells/µL and platelets were 24 x 10^9 cells/µL. Blood cultures were collected, and after receiving 250mL of normal saline in the ED, he was discharged home with a suspected viral illness. The next day, two sets of blood cultures revealed gram-positive cocci in pairs and chains identified as possible Enterococcus, and he was asked to return to the hospital to rule out IE. Transesophageal echocardiograph could not exclude vegetation on the bioprosthetic aortic valve. Transeosophageal echocardiograph was contraindicated secondary to thrombocytopenia. The clinical picture was consistent with Enterococcal IE and the patient was ordered ampicillin 2g IV every 4 hr with gentamicin 80mg IV every 12 hr. On day 4, L. garvieae was confirmed and susceptibilities were reported: intermediate to penicillin, sensitive to ceftriaxone and 1 mg/kg prednisone was initiated with remarkable clinical improvement in just 24 hr. Discussion: To date, the exact mechanisms underlying this autoinflammatory disorder remain unclear. Pulmonary involvement is new disposable equipment and syringes of epoprostenol reconstituted with SW continuously for 7 days. Small amounts of precipitate were noted in the t-piece within 3 days of initiation of epoprostenol. A CT Angiogram of the Chest failed to show a cAMP, leading to vasodilation of smooth muscle in the lungs when administered via inhalation. Institutions use various concentrations of the drug and different administration systems. Epoprostenol must be reconstituted with sterile water (SW) or normal saline (NS) and is delivered continuously through a nebulizer system in line with the inspiratory limb of ventilator circuit. A standardized method of administration for inhaled epoprostenol is not well established in the literature. Twelve mechanically ventilated patients receiving continuous aerosolized epoprostenol using an Aerogen nebulizer were monitored for signs of precipitation formation in the Aerogen t-piece and vent circuit. All patients received a PICC was placed in the lower extremity. The patient tolerated ultrafiltration therapy and a negative fluid balance was achieved without significant hemodynamic derangements. The post-operative course was complicated by ventricular dysfunction and tachyarrhythmia causing MODS with AKI and anasarca. He was unresponsive to conventional diuretics. Prior to initiation of therapy, a PICC was placed in the lower extremity. The patient tolerated ultrafiltration therapy and a negative fluid balance was achieved. Patient 1: 11 y/o, 25kg male with complex congenital heart disease who underwent one and half ventricle repair. The post-operative course was complicated by ventricular dysfunction and tachyarrhythmia causing MODS with AKI and anasarca. He was unresponsive to conventional diuretics. Prior to initiation of therapy, a PICC was placed in the lower extremity. The patient tolerated ultrafiltration therapy and a negative fluid balance was achieved. 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THE FORMATION OF PRECIPITATE DURING CONTINUOUS INHALED EPOPROSTENOL IN VENTILATED ADULT PATIENTS
Christian Sanchez, Telford Williams, Judy Schloss, Paula Ahrens, Denise Johnson

Case Report: Epoprostenol (Veletin®), a synthetic form of prostacyclin increases pulmonary arterial pressure resulting in multiorgan dysfunction syndrome (MODS) requiring extracorporeal mechanical support. Following decannulation, he developed severe anasarca due to oliguria unresponsive to conventional diuretics and vasopressor support. A PICC was placed transeptically and ultrafiltration was initiated. Fluid was successfully removed and a negative fluid balance was achieved. Patient 2: 11 y/o, 25kg male with complex congenital heart disease who underwent one and half ventricle repair. The post-operative course was complicated by ventricular dysfunction and tachyarrhythmia causing MODS with AKI and anasarca. He was unresponsive to conventional diuretics. Prior to initiation of therapy, a PICC was placed in the lower extremity. The patient tolerated ultrafiltration therapy and a negative fluid balance was achieved. Patient 1: 11 y/o, 25kg male with complex congenital heart disease who underwent one and half ventricle repair. The post-operative course was complicated by ventricular dysfunction and tachyarrhythmia causing MODS with AKI and anasarca. He was unresponsive to conventional diuretics. Prior to initiation of therapy, a PICC was placed in the lower extremity. The patient tolerated ultrafiltration therapy and a negative fluid balance was achieved. Patient 1: 11 y/o, 25kg male with complex congenital heart disease who underwent one and half ventricle repair. The post-operative course was complicated by ventricular dysfunction and tachyarrhythmia causing MODS with AKI and anasarca. He was unresponsive to conventional diuretics. Prior to initiation of therapy, a PICC was placed in the lower extremity. The patient tolerated ultrafiltration therapy and a negative fluid balance was achieved. Patient 1: 11 y/o, 25kg male with complex congenital heart disease who underwent one and half ventricle repair. The post-operative course was complicated by ventricular dysfunction and tachyarrhythmia causing MODS with AKI and anasarca. He was unresponsive to conventional diuretics. Prior to initiation of therapy, a PICC was placed in the lower extremity. The patient tolerated ultrafiltration therapy and a negative fluid balance was achieved. Patient 1: 11 y/o, 25kg male with complex congenital heart disease who underwent one and half ventricle repair. The post-operative course was complicated by ventricular dysfunction and tachyarrhythmia causing MODS with AKI and anasarca. He was unresponsive to conventional diuretics. Prior to initiation of therapy, a PICC was placed in the lower extremity. The patient tolerated ultrafiltration therapy and a negative fluid balance was achieved. Patient 1: 11 y/o, 25kg male with complex congenital heart disease who underwent one and half ventricle repair. The post-operative course was complicated by ventricular dysfunction and tachyarrhythmia causing MODS with AKI and anasarca. He was unresponsive to conventional diuretics. Prior to initiation of therapy, a PICC was placed in the lower extremity. The patient tolerated ultrafiltration therapy and a negative fluid balance was achieved.
1204

ACTIVATED PCC (FEIBA) FOR REVERSAL OF RIVAROXABAN-INDUCED LIFE-THREATENING BLEEDING–A CASE SERIES
Elizabeth Messana, Suprat Saiedy Wilson

Case Report: Activated 4-factor PCC (FEIBA) has been studied off-label for its effectiveness in reversing warfarin-induced bleeding. Despite positive outcomes in healthy volunteers, minimal evidence is available to support its use to reverse life-threatening bleeding due to rivaroxaban. We present seven patients who received FEIBA for the reversal of life-threatening bleeds from rivaroxaban. The mean age of the patients was 71.4 ± 13.5 years and 57% were males. Five patients received rivaroxaban for atrial fibrillation and two for venous thromboembolism. All patients presented with a life-threatening bleed, with the following diagnoses: intracerebral hemorrhage (n=2), subdural hematoma (n=1), subarachnoid hemorrhage (n=1), and gastrointestinal bleed (n=3). Mean dose of FEIBA was 3592 ± 446 units with a mean weight-based dose of 51.4 ± 45 units/kg. One patient required a repeat dose of FEIBA at 45 units/kg and one patient received 5 mg of vitamin K. Five patients received fresh frozen plasma (FFP); of which, 4 patients received 2 units (mean volume = 614 ± 93ml) and 1 patient received 1 unit (volume = 295ml) of FFP. Two patients received packed red blood cells, 4 received platelets and 1 received cryoprecipitate transfusions. The median baseline prothrombin time (PT) was 16.1 seconds (range 12.0–36.7) and at 24-hour post-treatment, two patients had a >50% reduction of baseline PT (28.6 to 16.5 seconds; 20.6 to 11.3 seconds). Four patients survived to hospital discharge, two patients did not survive, and care was withdrawn on one patient. One patient had multiple post-treatment DVTs and ultimately died. Discussion: Although FEIBA was able to effectively promote cessation of rivaroxaban-induced life-threatening bleeding for the majority of patients in our case series, its use was not associated with reversal of abnormal coagulation parameters in most cases. Thromboembolic complications occurred in one patient. Use of FEIBA may be helpful in reversing bleeding from rivaroxaban in addition to general supportive measures, but this lacks clear evidence as few cases have been reported.

1205

QUETIAPINE INDUCED ATYPICAL NEUROLEPTIC MALIGNANT SYNDROME AND HYPERGLOMERIC STATE
Siu Yan Amy Yeung, Sue Lee

Case Reports: Quetiapine is an atypical antipsychotic approved for management of various mental disorders, and has been associated with serious adverse effects including neuroleptic malignant syndrome (NMS) and severe hyperglycemia. We present a case of quetiapine induced NMS, rhabdomyolysis and hyperglycemic hyperosmolar hyperglycemic state (HHHS) that was managed with bromocriptine and continuous veno-venous hemofiltration (CVVH). A 4 year old African American Man was brought to the Emergency Department after being found down at home with synthetic marijuana beside him. Per medication history, he was taking quetiapine 400mg daily, methadone and trazodone 200mg daily. On admission, his temperature was 41.4°C and heart rate was 150 bpm. Laboratory data significant for serum creatinine of 3.0 mg/dL, blood glucose > 1400 mg/dL and creatinine kinase of 36747 units/L. Fluids and insulin infusion were initiated for management of HHHS and rhabdomyolysis, and he was admitted to the ICU. On day 2 of ICU admission, he continued to have low grade temperature and agitation, but exhibited no signs of muscle rigidity or hyperreflexia. Despite aggressive fluid repletion, creatinine kinase and myoglobin levels continued to increase. NMS was suspected and bromocriptine 2.5mg tid was initiated. CVVH was also started to facilitate myoglobin removal. After initiation of bromocriptine and CVVH, myoglobin levels trended downwards and patient’s mental status improved. Patient was extubated and bromocriptine was tapered off over 7 days. The renal replacement therapy was also discontinued upon clearance of myoglobin and his renal function continued to improve. Insulin infusion was transitioned long acting subcutaneous insulin therapy. He was transferred to step down unit and eventually discharged home. This case demonstrated an atypical presentation of NMS in conjunction with HHHS caused by quetiapine. Prompt recognition of the condition and initiation of adequate treatment including insulin therapy, bromocriptine and renal replacement therapy is crucial.

1206

ADJUNCTIVE USE OF KETAMINE DURING EXTRACORPOREAL MEMBRANE OXYGENATION
Catherine Floroff, Tanna Hassig, Joel Cochran, Joseph Mazur

Case Report: Use of ketamine in patients requiring extracorporeal membrane oxygenation (ECMO) has rarely been reported, and the optimal dosing strategy is unclear. Ketamine is an attractive agent because it provides analgesia at low doses with relative hemodynamic stability and maintained airway reflexes. We report a case describing high-dose sedative and analgesic requirements, including adjunctive use of low-dose ketamine, in an adult patient receiving ECMO secondary to acute respiratory distress syndrome. A 53-year-old male with no past medical history was admitted with fever, chills, and altered mental status. He was intubated and initiated on venovenous ECMO. Initial sedative and analgesic medications included propofol (max rate: 15 mcg/kg/min) and morphine (max rate: 6 mg/hr). Within 24 hr, the patient developed pancreatitis and acute renal failure. Subsequently, his regimen was changed to lorazepam (max rate: 10 mg/hr) and hydroxyzine (max rate: 8 mg/hr). At that time, the patient experienced increasing agitation, with desaturation episodes, and sedative therapy was changed to midazolam (max rate: 16 mg/hr). A ketamine infusion was started at 1 mcg/kg/min (4.2 mg/hr), and reached a maximum rate of 10 mcg/kg/min (42 mg/hr). After ketamine initiation, infusion rates of opioids and/or sedatives were maintained or decreased. Recorded RASS scores were -4 to -3 and documented pain scores were 0 using the Critical-Care Pain Observation Tool. His heart rate ranged from 60 – 112 and blood pressure was stable without the use of vasopressors while on ketamine. No adverse effects were reported while receiving ketamine and the patient was successfully discharged. As ketamine may have opioid/sedative sparing effects, tapering other pain and sedative medications should be individualized based on clinical response, considerations of PK/PD differences during ECMO, and adverse effect profiles. Additional studies are needed due to the absence of clear standards for analgesia and sedation while on ECMO. However, the use of low-dose ketamine in patients receiving ECMO is encouraging.
Cardiac Arrest Secondary to Massive Pulmonary Embolism in Two Adolescent Patients

Ryan Morgan, Hannah Stinson, Robert Sutton, Robert Berg, Heather Wolfe, Todd Killbaugh

Case Report: Massive pulmonary embolism (PE) is a rare, under-recognized, and often fatal event in the pediatric population. Case studies report high mortality rates with few reports of thrombolytic therapy. There are no published reports of survival with thrombolysis following pediatric cardiac arrest (CA) due to PE. We describe two children who survived PE-associated CA after treatment with systemic tissue plasminogen activator (tPA). Patient 1, a 16 year-old obese male with a 12 day-old falunar fracture presented with dyspnea and developed pulseless electrical activity (PEA) CA. Cardiopulmonary resuscitation (CPR) was performed for 2 min with a brief return of spontaneous circulation (ROSC), followed by a second PEA CA requiring 12 min of CPR with ROSC. Imaging revealed extensive bilateral pulmonary artery emboli; heparin therapy was initiated. Four hours post-ROSC, the patient exhibited profound hemodynamic instability with multisystem organ failure. Systemic tPA was administered with resolution of PE by angiography. The patient was transferred from the Intensive Care Unit (ICU) after 4 days, and subsequently discharged without end-organ injury. Patient 2, a 16 year-old female inpatient with newly diagnosed diffuse large B-cell lymphoma, developed altered mental status and hypoxia necessitating intubation. Due to bradycardia with poor perfusion, CPR commenced and was continued in the setting of PEA. After 8 min of CPR, ROSC was briefly attained. PEA recurred and CPR continued for 20 more min. Echocardiography demonstrated severe right ventricular dysfunction and due to concern for PE, tPA was administered with immediate ROSC. CT confirmed PE in segmental pulmonary arteries. The patient was transferred from the ICU after 4 days and was discharged without end-organ injury. There are limited published reports of successful thrombolysis in children with acute PE. None describe survival with intra- or peri-CA thrombolysis. We report excellent outcomes following high-quality CPR and the administration of systemic tPA for PE-associated CA in two children.

1209 Post-Traumatic Splenectomy in a Patient with Chronic Myeloproliferative Neoplasm

Jane Faris, Che Chang, Tiffany Yoon

Case Report: We present the case of a 53 year old, Caucasian male with a history of polycythemia vera (PV) transferred from an outside hospital for management of hemodynamic instability secondary to a fall. The patient was intubated in the ED and found to have a spastic laceration, resulting in a splenectomy. Post-operative day (POD) 1, a right hemi-colec-tomy was performed for necrotic portion of transverse colon. Post-operatively the patient was hemodynamically stable and no longer required mechanical ventilation but his white blood cell (WBC) and platelet (plt) counts continued to increase. By POD 9, his WBC count was 56.5 x 10^9/L and plt count was 715 x 10^9/L. A hematology consult was ordered for increasing cell counts and history of PV. Hematologist recommended the initiation of hydroxyurea. Despite increasing doses of hydroxyurea the cytoreductive therapy was modified to prednisone (HU) and thrombocytopenia to facilitate plt reduction. After the completion of 8 days of thrombocytopenia, the plt count was significantly reduced to 608 x 10^9/L. The BM biopsy resulted in a diagnosis of essential thrombocytemia (ET) on POD 26. Unfortunately, the patient’s plt count continued to rise despite maximal dosing of HU. An increasing plt count of 2020 x 10^9/L on POD 32, resulted in the third therapeutic regimen change. The HU was discontinued and the patient was started on interferon alfa therapy. The resulting decrease in plt counts allowed the patient to be discharged on POD 37. The patient’s traumatic injuries were treated successfully with surgical intervention; however, his hospital course was complicated due to his past medical history of PV and then subsequent change in his diagnosis to ET based on the BM biopsy. An interdisciplinary team approach including trauma surgeons, hematologist and pharmacist allowed for the appropriate management of this complex patient.

1210 A PICC to Pique Interest

Faiza Hashmi

Case Report: A 58-year-old female with PMH significant for DM complicated by PAD (toe amputations) was transferred from an outside hospital for altered mental status. On arrival in the ER she was drowsy but rousable but had a left gaze deviation, equal and reactive pupils, present right corneal reflex, very weak left corneal reflex, intact oculocephalic reflexes, absent cough reflex and spontaneous breathing. She had withdrawal to pain in upper and left lower extremities with the left big toe extensor response (right toe was surgically absent). Further history was obtained that revealed that earlier in the day of transfer a right arm Peripherally inserted central catheter was placed at the outside hospital. A chest x-ray obtained initially at that time demonstrated the PICC being malpositioned as it was seen traveling superiorly up into the neck. It was then repositioned, and a repeat chest x-ray was completed and interpreted as the tip being in the superior vena cava. Shortly after this procedure she became poorly responsive. Given her mental status, a CT scan of the head was also completed and showed no evidence of hemorrhage or tumor. In our ER after a stroke evaluation she was intubated and an emergent head CT and CTA was obtained, that showed acute ischemic infarction right posterior cerebral artery distribution. Additional acute infarctions in both cerebellar hemispheres and left occipital lobe posteriorly. Right PICC tip seen in the aorta. This PICC was removed and replaced by a correctly placed venous line. Follow up MRI revealed that the patient had suffered profound neurologic insult and remained comatose. This case illustrates the risks and complications of vascular access catheters. Though PICC lines are commonplace and relatively safe but there are risks associated with any procedure especially if the catheterer is malpositioned, enters the central arterial circulation as in this patient, and can cause stroke by various mechanisms. In a patient with an acute neurologic decline and possible stroke, PICC related complications should always be entertained and worked up.

1211 Thiamine Deficiency Causing Refractory Lactic Acidosis in a Neonate with Malignant Pertussis on ECMO

Alicia Teagarden, Brian Leland, Courtney Rowan, Riad Latifi

Case Report: In critical illness, lactic acidosis may be ominous and merits further exploration. A 5-week-old female presented with cough and apnea. History remarkable for vaccination noncompliance and a sibling with a cough. Pertussis PCR returned positive day 2 with a rapidly rising WBC count. Despite ventilator support, respiratory failure progressed, with worsened lung compliance and acute refractory hypercapnia requiring venous (VV) extracorporeal membrane oxygenation (ECMO). Severe pulmonary hypertension, fluid overload, and hemodynamic instability required conversion to venoarterial (VA) ECMO. Due to an exam concerning for compromised gut perfusion, TPN was started on day 3. Worsening lactic acidosis (>3mmol/L) was noted day 9, and an extensive (infectious, GI, metabolic) workup for the acidosis was unrevealing. Lactate remained elevated for 10 days (up to 40mmol/L) despite maximum ECMO flow and fluid clearance via continuous renal replacement therapy (CRRT). Day 20, the TPN was noted to be without standard multivitamin and trace minerals since initiation. Thiamine deficiency was proposed and empiric supplementation initiated. Over the following 30 hr, lactate rapidly decreased from 10mmol/L to 1,3mmol/L. Initial thiamine level was low at 55nmol/L. She was decannulated day 24 and discharged home on day 94, mechanically ventilated with a good neurologic exam. To our knowledge, we report the first case of an unvaccinated pediatric patient with malignant pertussis on VA ECMO, CRRT and TPN, who developed severe lactic acidosis from thiamine deficiency. Thiamine deficiency is more common in the critically ill due to increased metabolic demands, increased glucose delivery via TPN, and thus higher thiamine requirements. Thiamine deficiency should be on the differential of any critically ill patient with persistent lactic acidosis.
1212

METHEMOGLOBINEMIA IN ACETAMINOPHEN OVERDOSE AND GLUCOSE-6-PHOSPHATE DEHYDROGENASE DEFICIENCY

Maelen Ignacio, Colin Craft, Fern Martin, Cara McDaniel

Case Report: Methemoglobinemia occurs when the iron moiety of hemoglobin is oxidized from the ferrous to the ferric state, resulting in impaired oxygen delivery to tissues. Methemoglobinemia can be hereditary or acquired, and common offending agents are dapson and benzocaine. Acetaminophen (APAP) is reported as a rare cause of methemoglobinemia in humans. We present a case of methemoglobinemia following an APAP overdose, complicated by glucose-6-phosphate dehydrogenase (G6PD) deficiency. A 66-year-old woman with a history of hypertension, asthma, and congestive heart failure presented to the emergency room with four days of fever, chills, and cough followed by nausea, vomiting, and dyspnea. For pain control, the patient consumed approximately 14 grams of APAP/day. Upon admission, the patient tested positive for influenza. Her labs were remarkable for a serum creatinine 3.0 mg/dL, anion gap 26 mmol/L, lactate 4.5 mmol/L, AST 59,270 IU/L, ALT 9,560 IU/L, ALP 254 IU/L, total bilirubin 7.9 mg/dL, direct bilirubin 5.6 mg/dL, and a serum APAP level of 25.2 mg/L. Intravenous N-acetylcysteine was initiated. The patient was not eligible for liver transplant due to active influenza infection. She was persistently hypoxic on non-rebreather with 100% FiO2. Her SpO2 on pulse oximetry remained in the mid-80s but her SaO2 on arterial blood gas was normal. The discrepancy prompted a co-oximetry panel that revealed a methemoglobin (MetHb) of 7.8%, which later peaked at 14.2%. On day three, the patient acutely decompensated and was emergently intubated. Methylene blue (MB) was withheld given the absence of a MetHb above 20%. On day four, hemoglobin reached a nadir at 7.0 g/dL from 11.6 g/dL. The patient expired after a pulseless electrical activity arrest that evening. Two days later, lab results showed G6PD deficiency. This case illustrates that oxidative stress from APAP overdose can cause methemoglobinemia. Treatment of choice is MB due to its rapid effect, but it may precipitate acute hemolysis in patients with G6PD deficiency. In these cases, ascorbic acid is an alternate treatment.

1213

BORDETELLA PERTUSSIS BACTEREMIA ASSOCIATED WITH FULMINANT PERTUSSIS PNEUMONIA

Patricia Abboud, Shruti Patel, L Mirkin, Ryan Simon

Case Report: Bordetella pertussis is a fastidious gram negative coccobacillus which causes whooping cough. It can cause severe pneumonia in infants and children. The clinical manifestations of pertussis are caused by the toxins that are produced by the bacterium locally and not by bacterial invasion. Isolation of the organism from blood cultures is extremely rare. To the best of our knowledge there are only three cases of Bordetella pertussis isolated from blood cultures reported so far. We present a case of Bordetella pertussis bacteremia associated with fulminant pertussis pneumonia in an immunocompromised patient. A 3 year old female with a history of Acute Lymphoblastic Leukemia had persistent cough for one month. Pertussis was diagnosed one month ago and treated with azithromycin. Her household contacts received prophylaxis with azithromycin as well. Three days prior to admission, her productive cough, dyspnea, fever and fatigue worsened. Her chest radiograph showed prominent peribronchial markings with right upper lobe and lower lobe consolidation. She was admitted to ICU with acute respiratory failure and pneumonia. She was started on empiric antibiotics regimen of vancomycin, ceftriaxone and fluconazole. Respiratory failure progressed with worsening hypoxia and she required BiPaP. She developed cardiopulmonary arrest and despite extensive efforts to resuscitate her, she expired within 24 hr of admission. Lung biopsies from her autopsy showed numerous coccobacilli at the luminal surface of the bronchial epithelium and respiratory spaces with alveolar hemorrhage and fibrinous edema which was consistent with fulminant pertussis pneumonia. One out of two blood cultures obtained on admission grew gram negative bacilli after six days of incubation, which was identified as Bordetella pertussis by outside labs and confirmed by Centers for Disease Control.

1214

SEPTIC SHOCK OR PULMONARY EMBOLISM? THE ANSWER FROM POINT OF CARE ULTRASOUND

Jason Filoppi, Gargi Bajpayee, NAVITHA RAMESH, Pierre Kory, Samuel Acquah

Case Report: Goal directed echocardiography (GDE) should be used to differentiate shock states in critically ill patients. Point of care ultrasound (POCUS) protocols that combine multiple organ systems increases the diagnostic accuracy for shock. New literature suggests GDE combined with both lung ultrasound (LUS) and lower extremity compression ultrasound (CUS) can increase the pre-test probability for suspected pulmonary embolism (PE). A POCUS protocol for diagnosing PE can be particularly useful in patients with contrast dye allergy, significant renal insufficiency, or pregnancy. A 28 year old male with AIDS presented to the ER with acute onset right sided pleuritic chest pain. Three days prior the patient had an incision and drainage of a buttck wound. Exam showed a cædochetic appearing male with vital signs of BP 88/44 mmHg, HR 119, RR 28, O2 saturation of 87% on room air. Initial labs showed a white blood cell count of 14.2 k/ul, creatinine of 1.92 mg/dL, and lactic acid of 4.2 mg/dL. Chest X-ray showed a possible right lower lobe opacity. A diagnosis of severe sepsis was made prompting initiation of a sepsis protocol. The patient received two liters of crystalloid and broad spectrum antibiotics; however, his shock state worsened prompting ICU evaluation. A GDE revealed a severely dilated right ventricle with decreased systolic function and paradoxical interventricular septal wall motion. LUS showed predominantly A-line pattern. Lower extremity CUS was negative for thrombus. These POCUS findings suggested obstructive shock from PE rather than vasoplegic shock from sepsis. Fluids and antibiotics were held. A CT Chest PE protocol was performed and confirmed the suspected diagnosis of massive PE. The patient was quickly brought to the ICU for thrombolysis with improvements in all hemodynamics within 4 hr. POCUS altered this patient’s outcome by appropriately re-categorizing his diagnosis of shock from sepsis to PE. Besides GDE for shock, a protocol including LUS and lower extremity CUS should be used to help confirm or rule out suspected pulmonary embolism.

1215

THERAPEUTIC HYPOTHERMIA FOR NEAR-DROWNING COMPLICATED BY CHROMOBACTERIUM VIOLACEUM BACTEREMIA

Chadwick Smith, Jameson Wiet, Indermeet Bhullar, Karen Saafak

Case Report: A 46-year-old male presented after near drowning. He was face down in a retention pond for 5 to 10 min and in Pulseless Electrical Activity (PEA) arrest. He was intubated and CPR was initiated with a return of spontaneous circulation prior to hospital arrival. Initially, he had a Glasgow Coma Score (GCS) of 3. He underwent a full trauma radiographic evaluation, which did not demonstrate any injuries. Due to his PEA arrest, therapeutic hypothermia was initiated utilizing the Arctic Sun®(Bard) with a target temperature of 33 °C for 24 hr, followed by rewarming at 0.25 °C per hour until 37 °C. Following extubation, he returned to a GCS of 15. He subsequently developed fevers and was placed on cefepime. Cultures revealed Klebsiella and Edwardsiella pneumonia, as well as Chromobacterium violaceum bacteremia. Ciprofloxacin was added to broaden his antibacterial coverage. Sensitivities revealed that all organisms were sensitive to ciprofloxacin, and the cefepime was discontinued. He was discharged on hospital day 20 with oral ciprofloxacin. A 2012 Cochrane Review of therapeutic hypothermia after cardiac arrest found benefit in patients with out-of-hospital cardiac arrest, a presumed cardiac cause of cardiac arrest, and ventricular fibrillation or ventricular tachycardic rhythms as the first recorded arrhythmia. However, the sample size for asystole and non-cardiac causes of arrest were too small to draw significant conclusions. This case supports the use of therapeutic hypothermia in those patients. Chromobacterium violaceum is a rare cause of human infection, with only around 150 documented cases. Our patient was in a retention pond, which is a likely source of exposure. Infection most commonly causes fever, skin lesions, abdominal pain, visceral abscess formation, and rapid progression to sepsis, of which our patient only developed fever. The mortality rate is around 50% but is much improved with appropriate antibiotic therapy. One study found that ciprofloxacin was the most active, which was the treatment rationale for our patient.
1216
SHORT TERM USE OF TOLVAPTAN IN AN ADOLESCENT WITH CONGENITAL HEART DISEASE AND DECOMPEN- SATED FAILURE
Melissa Busovský-McNeal, Puneet Bhatia, Michael Argilla, Sujata Chakravarti

Case Report: Hyponatremia is a frequent finding in chronic heart failure (HF), associated with increased morbidity and mortality. Arginine vasopressin (AVP) receptor antagonists are shown to increase sodium levels and improve clinical symptoms in adults with hypertensive hyponatremia and HF. There are scant reports of their use in pediatrics and in congenital heart disease. We report use of tolvaptan, a nonpeptide, selective, AVP V2 receptor antagonist in an adolescent with hypertensive hyponatremia secondary to chronic HF and chronic loop diuretic use in the setting of palliated complex congenital heart disease (CCHD) with residual severe tricuspid regurgitation (TR). An 18-year-old male with CCHD status post complete repair and subsequent tricuspid valve repair, pulmonary valve replacement, and Maze procedure presented with one week of frequent palpitations, increasing abdominal girth, progressive dyspnea, abdominal pain, emesis, and dizziness. Medications included amiodarone, furosemide, spironolactone, and esparaplatin. He was admitted with exacerbation of right HF in the setting of recurrent atrial flutter and severe TR, and placed on milrinone, furosemide, and amiodarone infusions. He continued on spironolactone with a 1.5 liter per day fluid restriction. A peritoneal drain was placed for ascites. His arrhythmia was controlled and weight decreased, while sodium level decreased to 121 mmol/L by the fifth day. He was started on tolvaptan 15 mg orally daily with a two liter per day fluid restriction, other diuretics held. Over the next several days, he achieved negative fluid balance and sodium gradually increased to 133 mmol/L with a further increase in weight. There was no significant change in heart rate, blood pressure, serum potassium, or renal function over that period. Sodium and weight remained stable until he underwent successful tricuspid valve replacement. He was discharged one week postoperatively on furosemide and metolazone with sodium of 130 mmol/L. Tolvaptan was used safely and effectively in this adolescent with CCHD and severe decompensated right HF.

1217
EXTRACORPOREAL MEMBRANE OXYGENATION FOR HEMOPHAGOCYTIC LYMPHOHISTIOCYTOSIS SECONDARY TO EHRLICHIOSIS
Felel Williams, Amy Cheng, James Fortenberry, Steve Salinas, Cartherine Preising, Pradip Kamar

Case Report: Ehrlichiosis, caused by transmission of Ehrlichia chaffeensis to humans through the bite of an infected lone star tick (A. americanum), can lead to secondary hemophagocytic lymphohistiocytosis (HLH), a life-threatening condition caused by uncontrolled activation of the cellular immune system. We describe a child with HLH secondary to ehrlichiosis who developed multi-organ failure (MOF) and successfully managed with extracorporeal membrane oxygenation (ECMO) support. A 9-year-old male developed headaches, fever, and sore throat after suspected tick exposure. He had leukopenia, thrombocytopenia, ferritin level > 40,000 mg/mL, and elevated soluble IL-2 receptors, all consistent with HLH. Bone marrow biopsy showed hemophagocytosis. PCR was positive for E. chaffeensis. He developed acute kidney injury (AKI), coagulation failure, hepatic insufficiency, and progressive respiratory failure requiring intubation. Due to refractory hypoxemia, he was cannulated for veno-venous (VV) ECMO with a 27 French bicaval dual lumen cannula. Challenges during ECMO included: hypotension requiring an epinephrine infusion, profound coagulopathy/gastrointestinal bleeding requiring multiple blood products and aminocaproic acid/octreotide infusions. Continuous venovenous hemofiltration (CVVHF) was used to manage AKI and fluid overload. He received doxycycline and dexamethasone/etoposide for the treatment of ehrlichiosis. ECMO likely allowed a platform for stabilization and additional therapeutic interventions.

1218
RAPID CARDIAC RECOVERY WITH BIVAD: SEVERE BIVEN- TRICULAR FAILURE DUE TO 1,1-DIFLUROETHANE INHA- LATION
Eddie Brown, Luis Urrutia, Jeremy Patterson, Russell Carter, Karen Korzick

Case Report: Inhalant abuse has been described since the 1980s. Known as “dust- ing”, when keyboard cleaner (1,1-Difluoroethane)is used, it is associated with sudden cardiac death due to ventricular arrhythmias. We present a 29 yo male with depression, poly substance abuse and alcoholic pancreatitis who came to the ED with shortness of breath, chest pain, and abdominal pain that began after inhaling multiple cans of keyboard cleaner. In the ED, he had 2 episodes of V fib arrest requiring CPR, intubation and defibrillation. Labs revealed Mg 0.3 mg/dL, Ca 6 mg/dL, and K 3.6 mmol/L. In the ICU, 13 more episodes of V fib arrest occurred requiring defibrillation. Electrolytes were replaced, 4L NS infused and dopamine was started for hypotension. ECMO consultation was obtained for refractory cardiogenic shock. Veno-arterial ECMO was initiated via femoral sites. There was no more cardiac arrest. Modified arctic protocol, T goal 36°C, began. TTE showed severe biventricular failure with LVEF<10%. CT surgery was consulted for a BiVAD (CentriMag) to unload his heart and allow for possible cardiac recovery. BiVAD was successfully placed, ECMO was stopped, and dopamine weaned off. Hospital day 3, nitroprusside began for hypotension. Day 4, TEE was used to evaluate LV function while weaning BiVAD support. LVEF was improved, with no significant decline as LVAD support was reduced. RV function remained moderately reduced. BiVAD device was removed. Day 6, repeat TTE showed normal LV systolic function. Cardiac biopsy from OR showed focal contraction bands and eosinophilia. Exubrated on day 7. At discharge on day 13, he was ambulatory with minimal neuro-cognitive deficits and continues to do well as an outpatient. To our knowledge, this is the first reported case using BiVAD to treat refractory cardiogenic shock from 1,1-difluoroethane inhalation. Aggressive cardiac support with advanced modalities (ECMO/BiVAD) should be considered when treating V fib storm and acute biventricular heart failure in the setting of an acute toxin exposure as good cardiac and neurologic recovery may be possible.

1219
TISSUE EROSION AS A LATE COMPLICATION OF TRANSCATHETER CLOSURE OF AN ATRIAL SEPTAL DEFECT
Rodrigo Mendirichaga, Ramez Smairat, Rhanderson Cardoso, Damien Farach, Rhea Sancassani

Case Report: Introduction: Transcatheter closure of atrial septal defects (ASD) offers similar procedural success and mortality rates when compared to surgical intervention. Current guidelines favor transcatheter closure, when feasible, with serious complications presenting in less than 1% of patients. Case Description: We present the case of a 27 year-old male presenting with sudden onset sharp retrosternal chest pain, dyspnea, and hemodynamic instability. He had a history of an ASD closed percutaneously with the use of an Amplatzer device 4 yr prior to presentation. ECG showed no specific ST-segment or T-wave abnormalities. CT angiography of the chest revealed a large pericardial effusion with similar density to the ventricular cavity, consistent with hemopericardium. Transesophageal echocardiography re-demonstrated a large pericardial effusion leading to cardiac tamponade physiology. A large thrombus attached to the right atrial surface of the Amplatzer device was also evidenced. The device was found to have eroded through the left atrial wall, leading to hemopericardium and cardiac tamponade. Emergent surgical management of the hemopericardium, followed by surgical removal of the device, repair of the left atrial wall perforation, and patch closure of the ASD were performed successfully. The patient was discharged home 5 days after his presentation. Discussion: Late tissue erosion is a rare, but serious complication following transcatheter closure of ASDs which can lead to perforation, hemopericardium, and cardiac tamponade. Erosion likely occurs as a result of a complex interaction between mechanical forces caused by the device and structural defects in the atrial tissue. Conclusions: Tissue erosion leading to

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hypoventilation and cardiac tamponade should be suspected in subjects with a history of percutaneous closure of an ASD who present with acute chest pain or shortness of breath and signs of hemodynamic instability.

1220

SEVERE LARYNGEAL EDema FROM BORDEtella PERTUSSIS REQUIRING INTUBATION IN A HEALTHY ADULT FEMALE
Rana Beg, Jerry Capote, David De La Zerda, Luis Shimose, Mohammed Shakh- homer, Prashanth Kananagasab

Case Report: The incidence of Bordetella pertussis has been increasing recently, with a marked rise noted in 2012, with 48,000 cases reported by the CDC that year. The jump is attributed to resistance to vaccination as well as lack of public awareness of booster immunizations. While the disease carries significant morbid-ity in children, its course is typically mild in adults. At our facility, we admit- ted a 33-year-old female with history of mild intermittent asthma who works in a day care center. She reported a 6-day history of upper respiratory symptoms. She had been compliant with albuterol, Medrol dosepack, and amoxicillin pre-scribed by her primary care, with minor improvement in symptoms. In the EIR, she was found to be in impending respiratory failure, with tachypnea, stridor, and pulse oxygen saturation of 84% on non-rebreather mask. Emergent intubation was performed using a glidoscope and bougie with a 6.0 endotracheal tube. Follow- ing stabilization of the airway, a CT of the neck showed edematous infra and supraglottic airway encompassing the ETT. Laboratory data revealed lactic acido-sis and bandemia. The patient was given intramuscular epinephrine and started on azithromycin, ceftriaxone, and steroids. Workup for hereditary angioedema, blood and sputum cultures, and viral multiplex PCR were negative. On day 3 of hospitalization, the patient had a positive cuff-leak test; the next day, she was taken to the operating room for extubation, which was well tolerated. She was discharged on hospital day 6 on prednisone taper. Following discharge, serology for pertussis showed elevated IgA at 52 (normal range <50), consistent with acute pertussis. This case reinforces the importance to deliver booster vaccination in all adults. In our case, our patient had underlying reactive airway disease and was frequently exposed to sick children, some of whom may not have completed their vaccination series due to age. Although pertussis rarely causes disease in adults, our patient nearly died due to severe laryngeal edema.

1221

OCCULT MALIGNANCY PRESENTING AS PULMONARY TUMOR THROMBOTIC MICROANGIOPATHY
Jason Stankiewicz, Mahmudul Haque, Brian Aboff, Mithil Gajera

Case Report: Cancer predisposes an individual to thromboembolic disease including pulmonary embolism, but can also manifest as emboli of the primary tumor itself known as pulmonary tumor emboli syndrome. This syndrome includes different extents of tumor involvement of the pulmonary vasculature including emboli involving larger pulmonary arterial branches, pulmonary arte- rial or capillary walls, lymphatics, or combination of the aforementioned. We present a case of a 67-year-old gentleman with a history of tobacco dependence, hypertension, hypereosinphilia who presented with a four-week history of dyspnea on exertion, nonproductive cough, and unintentional weight loss. He presented initially with tachycardia and hypoxemic respiratory failure which responded to supplemental oxygen. Initial workup included an EKG, chest x-ray, and chest CTA, which demonstrated a slight right axis deviation, no focal infiltrate, and mild emphysematous lung changes with no acute pulmonary embolism, respec-tively. Further inpatient evaluation revealed echocardiographic findings of severe pulmonary hypertension (pulmonary arterial pressure of 119 mmHg) with signs of right heart strain. Laboratory data demonstrated an evolving microangiopathic hemolytic anemia and disseminated intravascular coagulopathy. Unfortunately, the patient suffered from a cardiac arrest approximately 36hr into hospitaliza-tion. The subsequent autopsy report demonstrated massive para-aortic lymphade-nopathy without any grossly identifiable tumor; the lungs demonstrated extensive carcinoma in the pulmonary arteries and capillaries where some of the arteri-oles showed tumor-associated fibrosis with total or near-total luminal obstruction consistent with the diagnosis of pulmonary tumor thrombotic microangiopathy (PPTM) with metastatic, moderately differentiated, papillary adenocarcinoma with an unknown primary disease. This case highlights one of the pulmonary vasculature manifestations of an underlying malignancy, and a reminder that an occult malignancy could initially present as pulmonary tumor emboli syndrome.

1222

SUCCESSFUL MANAGEMENT OF RECURRENT IDIOPATHIC SYSTEMIC CAPILLARY LEAK SYNDROME IN A 4-YEAR OLD GIRL
Regina Okhuyzen-Cawley

Case Report: The Idiopathic Systemic Capillary Leak Syndrome (ISCLS), extremely rare in children, is increasingly recognized. Episodes are recurrent and usually triphasic: (1) Prodromal (2) Shock due to fluid extravasation, and (3) Recovery/fluid recruitment phases occur. The prodrome is nonspecific. Shock and anasarca follow, with end-organ injury, compartment syndrome, and cere-bral infarction complicating this massive fluid extravasation phase; a “classic triad” of hypotension, hypoaalbuminemia and hemoconcentration are typically seen then. The recovery/recruitment phase soon follows: pulmonary edema/ respiratory insufficiency may occur as shock resolves. The etiology of ISCLS is unknown; theories include endothelial cell/adhesive junction dysregulation with cell contraction and leakage, explaining diverse treatment approaches described, including theophylline, terbutaline, steroids, cyclosporine, immunoglobulins, bevacizumab and others. A four-year old previously healthy girl presented with severe distributive shock requiring vigorous isotonic fluid resuscitation and dopa-mine infusion, with rapid resolution over the next 24 hr. No cause could be found despite extensive investigation. Hypoalbuminemia, hypoaalbuminemia and hemocon-centration, hyponatremia and lactic acidosis occurred at initial presentation and during 3 subsequent episodes over the next 5 mo. Furosemide and high-flow nasal cannula were required during the recovery/recruitment phase. A trial of theophylline mitigated the severity of her fourth episode after which intravenous immune globulin (IVIg) 1 gram/kg was started, and repeated as a monthly IV infusion. There have been no recurrences since the first dose of immunoglobulin in over 14 mo of follow-up. ISCLS should be considered in otherwise unexplained distributive shock with classic triad features/triphasic disease course, given the clinical implications of each rapidly-evolving phase, and the high morbidity and mortal-ity of the syndrome. ISCLS appears to be amenable to modulation with immune globulin, as noted in the adult literature.

1223

EARLY INVESTIGATIONS FACILITATE DIAGNOSIS AND TREATMENT OF HEMOPHAGOCYTIC LYMPHOHISTIOCYTOSIS
Shana Nisenbaum, Linda Butros, Sheila Hickey, Anjali Subbawamy, Hemant Agarwal

Case Report: Hemophagocytic lymphohistiocytosis (HLH) is an underdiag-nosed disease with 95% mortality in untreated patients. We report early diagnosis of HLH secondary to bacterial sepsis with good outcome. A 6 year old previ-ously unvaccinated female presented to ER with 4 days of dry cough, decreased appetite, and fatigue with history of sick contacts. She was febrile to 38.5 Celsius, tachycardic to 160/min, tachypneic to 30/min and had 82% O2 saturation. She was dehydrated; had coarse breath sounds bilaterally and had splenomegaly. Her chest x-ray revealed widespread bilateral pneumonia and investigations revealed cytopenia (Hb 2.6 g/dl, hematocrit: 9%, WBC 23,700/ cmm, platelets 57,000/cmm); liver dysfunction (total bilirubin 4.2 mg/dl, AST 820 U/L, ALT 195 U/L, glucose 30 mg/dl) and metabolic acidosis. She was fluid resuscitated including glucose bolus and emergently intubated. She had brief bradycardic arrest during trans-port to the children’s hospital PICU. Further investigations revealed low reticulo-cyte count of 0.05; coagulopathy(INR: 2.7), and serum ferritin of 11,095 ng/ ml (normal: 47–110 ng/ml). A bone marrow biopsy undertaken within 24 hr revealed hemophagocytosis. She developed multi-organ failure that was treated with packed red cell blood transfusions, high frequency oscillation, renal replace-ment therapy and broad spectrum antibiotics. She was positive for RSV and Influenza B and her blood and endotracheal tube secretions grew Streptococcus pneumoniae. Her hemoglobin electrophoresis revealed sickle-thalassemia and her soluble interleukin-2 receptor level was 48/58 units/ml (normal: <2126 units/ml).
She met 6 of 8 criteria for HLH (fever, splenomegaly, cytopenia, hemophagocytosis in bone marrow, elevated serum ferritin and soluble interleukin-2 receptor levels) and was treated with high dose steroids and etoposide. She made gradual recovery and was discharged home 3 weeks later. An uncontrolled hypercytopenia complicates differentiation of HLH from severe sepsis. However, early investigations can facilitate diagnosis and aggressive treatment of HLH with good outcome.

1224
AN ATYPICAL PRESENTATION OF OTC DEFICIENCY IN AN ADOLESCENT MALE
Mark Shlomovich, Michael Miksa, Jacqueline Weingarten-Arams, Jennifer Liedel

Case Report: Ornithine transcarbamylase (OTC) deficiency is an X-linked urea cycle defect. Typically, neonates present shortly after establishing protein intake with poor feeding and tachypnea, progressing to hypothermia, emesis, lethargy, and coma. Classic laboratory findings include hyperammonemia, normal pH and glucose, low or absent serum citrulline, and elevated urine orotic acid. Presentations after infancy are more common in female carriers during periods of excess protein intake or extreme metabolic stress. Males rarely present after infancy. There is often a history of protein avoidance, recurrent headaches and cyclic vomiting. Males who are diagnosed after infancy have been found to have significantly higher mortality rates than male infants. We report a case of a 12-year-old male who presented with bronchoscopy and was diagnosed with OTC deficiency, despite no family history of metabolic disorders or unexplained deaths. In the referring PICU, he received methylprednisolone and continuous albuterol for status asthmaticus. On hospital day 3 his respiratory status had improved, but headache and vomiting developed. His mental status waxed and waned with periods of combative, treated with haloperidol. The patient developed status epilepticus and was transferred for further management. On admission he was obtunded. Evaluation of encephalopathy included determination of serum ammonia, which was 408 μmol/L. An intracranial pressure (ICP) monitor was placed which revealed rapidly rising ICP despite aggressive therapy with hemodialysis, arginine, sodium phenylacetate, and sodium benzoate. Biochemical testing was significant for markedly increased urinary orotic acid (421 mmol/mol Cr) and absent serum citrulline. The patient progressed to brain death. This case highlights the importance of considering unrecognized metabolic disorders in patients who develop gastrointestinal symptoms, headaches, and behavioral changes during episodes of acute illness or stress. Early diagnosis and treatment may lessen the neurologic sequelae and prevent mortality in this disease.

1225
MERS-COV DISEASE ASSOCIATED ARDS – A CASE REPORT
Brigitte Meyer, Arii Bara, Stephan Aberle, Judith Aberle, Bruno Robibaro, Christoph Wenisch, Hermann Lafer

Case Report: Background: The Middle East respiratory syndrome coronavirus (MERS-CoV) is an emerging highly pathogenic virus. First identified in the Arabian Peninsula, it is spreading to many other countries as an imported travel associated infection. MERS-CoV causes severe respiratory tract infection with mortality rate up to 40%. To date, no causative therapy exists. Methods: We provide data of a 29-year-old woman from Saudi Arabia, who was admitted to a Vienna hospital with adult respiratory distress syndrome (ARDS). MERS-CoV infection was diagnosed by RT-PCR in blood and respiratory tract samples. In addition determination of MERS IgG and IgM was done, using indirect immunofluorescence. An experimental treatment with combination of lopinavir and ritonavir therapy was used as a new causative treatment approach against MERS-CoV. Supportive intensive care therapy included evidence bases intensive care medicine including lung protective ventilation. Results: Evidence based intensive care medicine and causative treatment with lopinavir/ritonavir led to complete clinical recovery. Highest MERS-CoV RNA levels were detected in tracheal secretion. RT-PCR showed viral clearance on day 8 in blood samples and day 14 in tracheal secretion. Drug monitoring revealed high drug plasma levels of lopinavir/ritonavir. MERS-CoV IgG antibodies were already detected in an acute serum sample taken two days prior to admission, showing a peak of IgM and IgG antibodies on day 11. Conclusion: Treatment with lopinavir/ritonavir might be a promising causative treatment option for patients with severe MERS CoV infection.

1226
REFRACTORY HYPERKALEMIA IN A NEWBORN
Neha Longani, Jennifer Liedel

Case Report: The triad of hyperkalemia, hyponatremia and severe metabolic acidosis in a neonate is most often associated with salt-losing congenital adrenal hyperplasia (CAH). However, the derangements may also result from insensitivity to aldosterone in pseudohypoaldosteronism (PHA). Here we present the case of an 8 day male with lethargy, emesis and poor feeding who was found to have PHA. He was born vaginally at term and discharged with his mother. The baby presented to the referring ED with shock and a wide complex rhythm. Laboratory evaluation revealed severe metabolic acidosis (pH 6.84/-31), hyponatremia (125 mEq/L) and hyperkalemia (0.3 mEq/L). The creatinine was elevated (1.1 mg/dL). Therapy was initiated with high dose hydrocortisone, sodium bicarbonate, albuterol, calcium, keyexalate, furosemide and insulin/glucose. Despite aggressive treatment, the patient continued to have worsening hyperkalemia, hyponatremia, and episodes of ventricular tachycardia. The creatinine normalized and urine volumes were robust (>150 mL/hr). Transfer for the purpose of dialysis was initiated. Upon arrival, therapy for presumed PHA with sodium and volume replacement, chlorothiazide and furosemide was begun. The electrolyte disturbances and acidosis resolved; polyuria improved. Aldosterone levels suggested PHA. The patient was discharged on renin-decanted formula, sodium replacement and chlorothiazide. Genetic testing revealed autosomal recessive type 1 pseudohypoaldosteronism with mutations in SCN11A, a subunit of the epithelial sodium channel (ENaC). In PHA1, ENaC is unable to regulate sodium and potassium exchange in the distal tubule in response to aldosterone. Thus, sodium is excreted, potassium is resorbed and a diuresis ensues. Lifelong treatment with sodium supplementation and limitation of potassium is necessary. Although a rare entity, pseudohypoaldosteronism should be considered when managing an infant with refractory hyperkalemia, hyponatremia and metabolic acidosis.

1227
PERSISTENT TACHYCARDIA AS A MANIFESTATION OF KAWASAKI DISEASE
Arya Sheybani, Danielle Deines, Hemant Agarwal

Case Report: Kawasaki disease is uncommon in infants less than 6 mo old who present with incomplete clinical manifestations. We present Kawasaki disease in an infant that did not have the typical presentation. A 3 month old previously healthy male presented with 3 days of dry cough and fever with 1 day of conjunctivitis and rash. He was febrile to 38.8 °C with HR: 198/min, RR: 36/min and O2 saturation: 91%. He had sinus tachycardia, clear lung fields on auscultation and appeared dehydrated. He was fussy, had erythematous papules on his trunk, and conjunctivitis. Diagnostic studies revealed WBC of 11,400 /cmm, platelets of 347,000/cmm, serum sodium of 132 meq/L, and perihilar infiltrates on chest x-ray. He met 3 of 5 Kawasaki criteria without fever duration and was admitted for suspected viral bronchiolitis with 1 liter/min nasal cannula oxygen. His fever defervesced with ibuprofen and he remained afebrile for 60 hr prior to discharge. He came off oxygen therapy and had improved oral intake as well. His respiratory viral panel, blood, CSF and urine cultures were negative. Although he remained in sinus tachycardia of 160–180 beats/min, he was otherwise clinically stable and discharged home. Ten days later, he was readmitted for respiratory arrest requiring CPR at home. He required mechanical ventilation, inotrope support and his echocardiogram showed poor biventricular function (ejection fraction: 43%), left ventricle dilatation and giant aneurysms of right main, left main, and circumflex coronary arteries suggestive of Kawasaki disease. He was treated with intravenous immunoglobulin, tissue plasminogen activator and later transitioned to aspirin therapy. His cardiac function gradually improved with ejection fraction of 72% at 6 month follow-up, but continued to have coronary aneurysms. Our patient failed to meet criteria for either typical or atypical Kawasaki disease diagnosis. In the absence of persistent high grade fever for 5 days, sustained tachycardia in an infant with few apparent stressors may provide additional evidence for the diagnosis of Kawasaki disease.
NEONATAL HYponATREMIA SECONDARY TO CORTICOSTEROiNE METHYL oXIDASE TYPE ii DEFICIENCY
Aryza Sheybani, Alexandra Aguilar, John Brandt, Hemant Agarwal

Case Report: Chronic hyponatremia defined as serum sodium concentration <135 meq/L lasting > 48 hr is rare in full term neonates. We report chronic hyponatremia in a neonate secondary to corticosterone methyl oxidase type II (CMOT II) deficiency. A 4 weeks old full term male neonate presented with failure to thrive associated with serum sodium of 122 meq/L. His diet included 22 kcal/oz formula. He had 4-6 wet diapers daily with no vomiting or diarrhea. On PICU admission, he had stable vital parameters: HR: 154/minute, BP: 79/54 mm Hg, with no clinical signs of dehydration or fluid overload and normal external genitalia. His investigations revealed hyponatremia: 122 meq/L, hyperkalemia: 5.8 meq/L, serum osmolality: 267 mosm/kg, normal anion gap and renal functions. He was placed on 26 kcal/oz formula feeds and 1 meq/kg sodium supplementation q 3 hours that gradually improved his weight and serum sodium to 130 meq/L. His newborn metabolic screening test was negative for congenital adrenal hyperplasia. Further studies revealed normal serum cortisol, aldosterone, thyroid hormone levels, normal kidney anatomy on ultrasound and negative sweat chloride test. His uroanalysis revealed renal salt wasting with urinary sodium:68 to 126 meq/L and urinary osmolality of 212 mosm/kg. Further work up revealed markedly elevated serum renin levels (95.2 ng/mg/hr; normal: 2.4-37 ng/mg/hr). Pre and 60 min post-ACTH stimulation levels revealed persistently low aldosterone levels (pre-ACTH: 2 (normal: 5-90) and post-ACTH: 2.4 (normal: 5-160)) and significantly elevated 18-Hydroxycorticosterone: Aldosterone ratio (pre-ACTH: 37 (normal: 1.3-5) and post-ACTH:117.9 (normal: 2.1-13)). Based on these results, he was diagnosed with CMOT II deficiency and initiated on 9 alpha-fluorohydrocortisone therapy that led to improvement of his serum sodium: 140 meq/L and weight gain. CMOT II is an adrenal enzyme that is responsible for the final step of aldosterone synthesis. CMOT II deficiency although rare, should be considered in neonates with persistent hyponatremia when other causes are ruled out.

BEYOND HELLP: PERIPARTUM CATASTROPHIC THROMBOEMBOLISM DUE TO HEREDITARY DIFFUSE GASTRIC CANCER
Udh Dhul, Omar Rahman, Rajat Kapoor, Emily Gundert

Case Report: INTRODUCTION: Peripartum thrombocytopenia and thrombotic events are usually attributable to diseases like HELLP and Thrombotic Thrombocytopenic Purpura (TTP). Malignancy is a rare cause and gastric cancer even more unusual. We present the case of a patient with undiagnosed Hereditary Diffuse Gastric Cancer (HDGC) in the peripartum period. DESCRIPTION: A 28 year old female was transferred for plasmapheresis for presumed TTP after cesarean section at 35 weeks gestation. A week ago she presented with nausea and blurry vision. Due to thrombocytopenia and anemia, HELLP was initially diagnosed. Acute kidney injury and worsening hematological tests lead to consideration of TTP. Despite plasmapheresis she had no improvement, developed respiratory failure and had acute large vessel arterial and venous thrombosis. She had multiple cerebral, renal, splenic and lower extremity arterial infarctions. Deep venous thrombosis of lower limbs was also seen. She was tested for antiphospholipid antibody syndrome, placed on corticosteroids and anticoagulation. Connective tissue disease work up was negative. Vegetations were seen on mitral valve on echocardiography and she was placed on antibiotics for endocarditis. She deteriorated rapidly into refractory shock, multiple organ failure and died on post partum day 8. Her autopsy showed diffuse submucosal gastric adenocarcinoma (linitus plastica). Metastases were present on small bowel, fallopian tubes, ovary and the placenta. Mitral valve had marantic vegetations. Tumor cells were seen in young people, diagnosis in pregnancy is very challenging due to overlapping symptoms. Thromboembolism in our patient was malignancy related and rapid spread probably hormone associated. Atypical thromboembolism in pregnancy should warrant investigation for cancer workup for other common conditions.

THERAPEUTIC DRUG MONITORING OF LEVOFLOXACIN IN AN OBSESE ADOLESCENT WITH INTRA-ABDOMINAL INFECTION
Jeffrey Cies, Wayne Moore, Jason Parker, Paul Shea, Arun Chopra

Case Report: Levofoxacin is not commonly utilized in the PICU. PK parameters can be significantly altered for individuals in the PICU. Further, the impact of obesity on PK parameters in pediatrics in general is not well described. A 168 kg, 15 year old female with past medical history of Prader-Willi syndrome and asthma initially presented with respiratory distress secondary to status asthmaticus due to noncompliance. She failed non-invasive ventilation and was subsequently intubated for respiratory failure and progressed to high frequency oscillatory ventilation. On HD#11 and infectious workup was begun due to a fever, worsening clinical status with initiation of vasopressors and an empiric anti-microbial regimen of cefepime and clindamycin. The urine culture subsequently grew E. coli and the respiratory culture grew Pseudomonas aeruginosa. She continued to be febrile which was thought to be due to an intra-abdominal abscess. On HD#14, the anti-microbial regimen was changed to levofloxacin due to continued fevers and no significant improvement in clinical status. Levofloxacin was initiated at a dose of 1000 mg IV q24h. Levofloxacin serum levels were obtained at 0.5, 3.5 and 11.5 hr post infusion which were 8.61, 5.76, and 2.7 mg/mL, respectively. These levels translated into a peak level of 8.79 mcg/mL a half-life of 6.4 hr and an AUC of 80 which were discordant from the expected peak of 16 mcg/mL a half-life of 8 hr and an AUC of 120. Based on these levels, the levofloxacin regimen was adjusted to 1000 mg IV q12h and repeat levels 0.5, 3.5 and 11.5 hr post infusion were 9.91, 6.56, and 3.27 mcg/mL, respectively corresponding to a peak of 19.5 mcg/mL a half-life of 5.18 hr and an AUC of 200. After the adjustment in levofloxacin regimen, she became afebrile, WBC resolution and improvement in her overall clinical status and she received a total duration for levofloxacin of 21 days and was successful in providing for an appropriate AUC of 200 and a successful clinical outcome in this morbidly obese adolescent.

LIPID EMULSION FOR INADVERTENT INTRATHECAL ADMINISTRATION OF LOCAL ANESTHETICS IN THE ED
Gabrielle Procopio, Amit Gupta, Monica Hernandez, Patrick Charles, Ruchi Patel

Case Report: Bupivacaine and ropivacaine are frequently used for interscalene nerve blocks, although generally well tolerated, in rare occasions, it may be associated with cardiovascular collapse and/or paralysis. While the treatment is mostly supportive, we report an unusual case of administering intravenous lipid emulsion (ILE) as part of resuscitative effort to hasten neurologic recovery. A 43 year old male (83kg) presented to the Adult Emergency Department for evaluation of acute respiratory arrest requiring emergent endotracheal intubation prior to ED arrival. The patient complained of difficulty breathing and developed complete paralysis and respiratory arrest requiring emergent endotracheal intubation prior to ED arrival. The patient immediately received 2 liters of normal saline and a dopamine infusion was initiated for persistent bradycardia and hypotension. Ninety min after presentation, the decision was made to administer 20% ILE, with a bolus of 1.5 mL/kg bolus followed by an infusion of 125 mL given over 2 hr (0.015 mL/kg/min). About 30 min after ILE administration, the patient began to regain brainstem reflexes. An hour after ILE infusion, patient was able to communicate by writing responses to questions and an hour and a half later, the patient had full recovery and was extubated. The patient recovered completely without any evidence of neurologic sequelae and discharged 30 hr after presentation. To our knowledge, this is the first case report documenting ILE for the reversal of intrathecal administered local anesthetics. Although, the safety of using ILE to treat overdoses is largely unknown, current evidence suggest potential benefit as salvage therapy in patients presenting with overdoses involving lipophilic molecules. In summary, intrathecal anesthetic toxicity may be reversed with ILE administration.
1232
VOLATILE ANESTHESIA FOR CHILDREN WITH REFRACTORY ASTHMA: A CASE SERIES AND A GUIDELINE DEVELOPMENT
Yana Vaks, Jason Gatling, Michele Wilson, Disha Kripiani, Paul Nguyen, Grace Oei

Case Report: Despite advances in asthma care, mortality in pediatric patients with severe exacerbations remains high. Mechanically ventilated patients often require high peak airway pressures leading to dynamic hyperinflation, baro-trauma, air leak and hemodynamic compromise. Those who fail conventional treatment may receive rescue therapies such as Extracorporeal Membrane Oxygenation (ECMO) and Volatile Anesthetics (VA). We present 2 patients treated with VA for bronchodilatation and describe development of a guidelines for use of VA in the PICU. Two patients, ages 8 and 9 received VA for status asthmaticus refractory to maximal medical therapy, resulting in rapid improvement in ventilation and reduction in peak ventilator pressures. Both required vasoactive support. Patients 1 and 2 received VA for 16 and 55 hr respectively and mechanical ventilation for 5 days each. Length of ICU/hospital stay was 7/8 and 14/25 days. With patient 1, lack of a formal process to initiate the use of VA for status asthmaticus necessitated a prolonged negotiation between the PICU and Anesthesia services and hospital administration. Meanwhile, the ECMO team was mobilized. Following the successful use of VA for patient 1, we assembled an interdisciplinary team of key providers and developed a guidelines that specified patient eligibility, provided instructions for initiating and maintaining VA therapy, defined provider roles and responsibilities and offered a summary of potential adverse reactions. Our guideline was written after reviewing protocols from other hospitals and specifically addressed potential barriers to implementation within our system. We activated the guideline for patient 2 and VA therapy was started within 30 min. The ECMO team was not consulted. These cases show not only the successful use of VA to achieve bronchodilatation in refractory asthma, but also that the use of a process guideline vastly improved clinical efficiency. Our next step is to compare effectiveness, safety and cost of VA and ECMO in severely ill asthma patients.

1233
INTRACEREBRAL HEMORRHAGE IN THE SETTING OF SEROTONERGIC ANTIDEPRESSANT AND ANTIPLATELET MEDICATIONS
Katherine Gregersen, Lauren Marsillio

Case Report: Serotonergic antidepressants are the most commonly prescribed class of antidepressant medication due to their favorable adverse-effect profile. We present a case of an acute non-traumatic intracerebral hemorrhage in a teenager taking a serotonin-norepinephrine reuptake inhibitor. A 13-year-old male with a past medical history of anxiety, a concussive injury several yr earlier, and migraine headaches presented altered and vomiting. Per parents, he initially complained of a severe headache and was given Excedrin, acetaminophen, and ibuprofen without relief. He developed emesis and bowel incontinence, shortly thereafter was unable to ambulate, became agitated, and was brought to the ED. Head CT showed a large right parietal intraparenchymal hemorrhage with intraventricular extension, suspicious for arteriovenous malformation (AVM). On admission to the PICU, his neurologic status deteriorated and he was intubated for airway protection. He went emergently to the OR for hemotoma evacuation and EVD placement. He had no intraoperative bleeding difficulties. There were no obvious vascular malformations identified. Postoperatively, a cerebral angiogram showed no evidence of vascular malformation. The following day, he became responsive, was extubated, and a few days later discharged home. Repeat cerebral angiogram performed 3 weeks later again showed no malformation. Brain MRI showed no evidence of tumor or other potential hemorrhagic structural lesion. CBC, coagulation panel, and platelet function assay were normal. Serotonin is released by platelets to promote platelet aggregation. Serotonin-reuptake inhibitors act at the serotonin transporter on platelet membranes, causing serotonin depletion, decreased coagulation, and possible bleeding. There are case reports of intracerebral bleeding associated with serotonergic antidepressants in adults; however, this has not been reported in children. Pediatric Intensivists should be aware of the risks of intracerebral bleed with serotonergic antidepressants, particularly in combination with other antiplatelet medications.

1234
A CURIOUS CASE OF SEVERE COPPER DEFICIENCY AND CRITICAL ILLNESS MYOPATHY
Cynthia Tsai, Mary Reed, Sarah Dayton, Joseph Smith

Case Report: Gastric bypass surgery increases the risk for multiple acquired nutritional deficiencies. Acquired copper deficiency after gastric bypass can potentially lead to serious neurologic and hematological complications. A 45-year-old female was admitted to the ICU with altered mental status and muscle weakness. Past medical history included Roux-en-Y gastric bypass and nonalcoholic steatohepatitis. She was febrile with negative gag, corneal, and cough reflexes and she was intubated. Labs revealed lactic acidosis, hyperammonemia, leukocytosis, anemia, and thrombocytopenia. Magnetic resonance imaging (MRI) of the head was negative for ischemic or hemorrhagic stroke. Lumbar puncture was normal. Chest x-ray showed bilateral pulmonary and antibiotics were initiated. Despite aggressive therapy, she remained unresponsive. After a week, the patient started to have mild improvement in her mental status with consistent eye opening, but was still unable to move her extremities. Cervical spine MRI was normal. Electromyography showed a severe inflammatory myopathy. A quadriiceps muscle biopsy revealed chronic denervation and reinervation. Trace element levels were obtained and she was found to have severe copper deficiency with a serum level of 27 mcg/dl (reference range 70–175 mcg/dl). She was treated with intravenous copper for five days and transitioned to oral supplementation. Her copper level improved to 93 mcg/dl. Following normalization of her copper level, she started moving all four extremities and was liberated from mechanical ventilation. Her muscle strength slowly improved and she was discharged to a skilled nursing facility. She has since returned home and her copper level remains within normal range. Critical illness myopathy is a frequent and known complication in the ICU. Few cases of severe copper deficiency and critical illness myopathy have been reported. This case highlights the importance of considering copper deficiency as a cause of unexplained critical illness myopathy in a patient with previous gastric bypass surgery.

1235
A NERVE-WRECKING CASE OF HEMOPHAGOCYTIC LYMPHOHISTIOCYTOSIS
Elliot Ho, Keren Fogelfeld

Case Report: Hemophagocytic lymphohistiocytosis (HLH) is a rare, life-threatening clinical syndrome caused by excessive stimulation of lymphocytes and histiocytes. It can be hereditary or secondary to underlying malignancy, autoimmune disorder or infection. The syndrome is characterized by splenomegaly, cytopenia, fever, and hemophagocytosis. Central nervous system (CNS) involvement is not infrequent. We present the first reported case of acquired adult onset HLH causing progressive CNS injury evidenced by hemophagocytosis in cerebrospinal fluid (CSF). A 41-year-old male presented with hemoptysis, cough, fevers, night sweats, generalized fatigue and cytopenia. Bone marrow biopsy confirmed presence of hemophagocytosis and etoposide was started. When he later developed headaches, confusion, and apraxia, workup for infectious and malignant causes was initiated including lumbar puncture revealing CSF with 84% lymphocytes, normal protein and elevated EBV titer. Despite treatment with acyclovir, he deteriorated into a coma with loss of brainstem reflexes. The progressive deterioration was accompanied by increased left mesio-temporal lobe and right occipital enhancement on MRI. EEG demonstrated diffuse slowing with superimposed left temporal slowing. Repeat lumbar puncture revealed CSF with leukocytosis, 14% bands, 52% lymphocytes, protein of >620 mg/dl, and hemophagocytosis. Treatment was escalated to systemic methotrexate and leucovorin rescue; however he succumbed to the disease on hospital day 46. Despite early recognition and prompt treatment, our patient’s HLH progressed. Although this progression is suspected to be secondary to HLH, it is often difficult to discern if the decline is due to underlying infection, malignancy, autoimmune disease or caused by hemophagocytosis itself. While in our case hemophagocytosis was identified in the CSF, less specific findings
such as pleocytosis or elevated protein are also suggestive. Given the high associated mortality, aggressive treatment for possible CNS involvement of HLH should be considered base on clinical suspicion.

### 1236

**DESENSITIZATION PROTOCOL IN A PATIENT WITH DIABETES INSIPIDUS AND HISTORY OF ANAPHYLAXIS TO DDAVP**

Peggy White, Clay Conldley

**Case Report:** Anaphylaxis is a rare but serious complication of desmopressin (DDAVP) therapy for diabetes insipidus (DI). Because there are few options for the management of DI, the history of an anaphylactic reaction to DDAVP can complicate its management. Thus, rapid desensitization protocols have been developed to allow the use of DDAVP in the setting of acutely developing DI. We present the case of a 45-year-old female with a history of anaphylaxis to DDAVP and macroaglossia presenting for trans-sphenoidal resection of a recurrent pituitary tumor. This patient had developed DI after her initial tumor resection and had subsequently suffered a severe anaphylactic reaction when DDAVP therapy was initiated, resulting in angioedema and hemodynamic instability and requiring intubation and hemodynamic support. A plan for DDAVP desensitization was coordinated prior to the patient’s second surgery with input from the surgical critical care team, the hospital pharmacy, and the patient’s allergist. The patient’s surgery was uneventful, but the developed DI on post-operative day one requiring DDAVP therapy. The desensitization protocol was enacted with an initial dose of 0.001 nanograms intravenous DDAVP. Subsequent doses were given hourly, increasing incrementally by a factor of ten each hour to a final dose of 1 microgram. The patient was then continued on a standard dose of 1 microgram DDAVP IV every twelve hr. Epinephrine and difficult airway equipment were kept available at the patient’s bedside throughout the desensitization process. In this way, the patient was successfully treated without the occurrence of clinically significant anaphylaxis and was discharged home on post-operative day five after being transitioned to an oral DDAVP taper for ongoing control of DI symptoms.

### 1237

**THERAPEUTIC PLASMA EXCHANGE IN HEMOPHAGOCYTIC LYMPHOHISTIOCYTOSIS DUE TO TOXIC SHOCK SYNDROME**

Pooja Nawathe, Constantinos Chrysostomou

**Case Report:** We describe a case of a 3 year old previously healthy boy who presented with refractory septic shock and multiorgan dysfunction syndrome secondary to Group A Streptococcal Toxic shock syndrome (TSS) needing intubation and escalation of inotropes rapidly. He presented with a history of fever, Shock, with ARDS (Murray score 3.7), metabolic acidosis (pH 7.1) and neutropenia. Transthoracic echocardiography showed a severely impaired, non-dilated left ventricle (ejection fraction <15%) and normal right ventricle. She rapidly deteriorated requiring mechanical ventilation and treatment was initiated for community-acquired pneumonia, but requiring significant vasopressor support (norepinephrine (1-1.5mcg.kg-1.min-1) and vasopressin 0.04U.hr-1) in addition to dobutamine. She was transferred to our center for consideration of extracorporeal life support. In view of the severity of the combined respiratory and cardiac failure and worsening organ function with rising lactate, venoarterial ECMO (percutaneous femoral cannulation) was instituted within 5 hr of arrival. A cytokine hemoadsorption column (Cyso sob®, Linc Medical, Leicester, UK) was added to the hemofilter circuit (Prismaflex®, Gambro, Sweden) and continued for 24hr. Anticoagulation was achieved with unfractionated heparin. From direct bronchoscopy staphylococcus aureus expressing Panton-Valentine leukocidin (PVL) and H1N1 Influenza A were isolated. Clindamycin was added and intravenous immunoglobulin G (IVlg) therapy was commenced. There was improvement in oxygenation and gradual resolution of lactic acidosis after institution of these therapies. Most notably the vasopressors could be weaned off after 12 hr. Levoisomid was enabled. There was recovery and LV function was normal by day 9 when ECMO was discontinued. The patient was discharged to the ward on day 30. She was reviewed two months later and was asymptomatic. This case demonstrates the novel and successful use of ECMO and cytokine removal in severe PVL-S.aureus sepsis with ARDS and cardiomyopathy and adds to the evidence showing cytokine adsorption as a compelling adjuvant therapy in severe sepsis.
to OR for abdominal closure and was extubated. The patient was discharged home with no residual sequelae of ARDS. At 50 days post-op, she is home with normal liver function. Early recognition and aggressive intraoperative and ICU treatment of V/Q mismatch and ARDS is crucial for patient recovery in cases of intraoperative argon gas embolism.

1240

ACUTE PERICARDITIS, A RARE PRESENTATION OF AUTOIMMUNE POLYGLANDULAR SYNDROME TYPE II (APS II)
Yub Raj Sedhai, Shriyanka Jain, Anushr Asija, Asim Mohammed, ADIL MIR, TAWSEEF DAR, Abubaker Jilani, Dominic Valentino

Case Report: Autoimmune polyglandular syndrome type II (APS II) is described as autoimmune damage of adrenal, thyroid &/or type 1 diabetes. Here we report a rare presentation of APS II with acute pericarditis. A 47 yr old male presented to emergency department after he was found unresponsive. He was in a state of shock with blood pressure 70/40, heart rate 120, had 9 cm jugular venous distension, muffled heart sounds & diffuse crackles. EKG showed low voltage in precordial leads. Contrast computed tomography of the chest done to rule out pulmonary embolism revealed hyperemia & thickening of pericardium with pericardial effusion. Acute pericarditis with cardiac tamponade was diagnosed and treated with emergent pericardiocentesis. Serum inflammatory markers were normal. Rheumatologic and viral serology were negative. He had low free T4, elevated TSH, low serum cortisol & normal ACTH. Adrenal response to cosyntropin was poor. Other hormone levels were normal except mildly elevated prolactin. Brain MRI showed partially empty sella (PES) with no pituitary tumor. Petrifed ear pinna were noted in brain MRI. He was treated colchicine & supplemented with hydrocortisone & levothyroxine. Striking features in our patient are acute pericarditis, adrenal insufficiency (AI), hypothyroidism, petrified ear pinna & PES. PES was considered primary. Autoimmunity is regarded as the most common cause of AI in the developed world & AI is considered the most frequent systemic disease associated with calcification of the ear pinna. We tried to speculate a common etiology that would trigger pericarditis, thyroid & adrenal damage. APS II explains the clinical picture. 88.4% APS II have two gland disease, thyroid & adrenal is the most frequent combination accounting 56.1%. 11.6% cases may have tri-glandular involvement described as Carpenter’s syndrome. Pericarditis can be a rare presenting feature of APS II & endocrine work up should be pursued in unexpected pericarditis. To the best of our knowledge, this is the first reported association of APS II with petrified ear pinna and empty sella.

1241

OTC SEXUAL ENHANCEMENT AND POPPERS: A DEADLY COMBINATION UNKNOWN TO THE PUBLIC
Charles Foster, Scott Mueller

Case Report: Phosphodiesterase 5 inhibitors (PDE5-I) are used for erectile dysfunction but are contraindicated in patients who take nitrates due to risk of hypotension. We present the case of a patient who suffered cardiac arrest after consuming a sexual enhancement product in addition to inhaling volatile nitrates. A 56 year old male with a past medical history of substance abuse was found down by his significant other 20 min after last seen normal. The patient had taken a product called Xzen 1200 and inhaled a product labeled as Jungle Juice. Initial rhythm showed asystole, with subsequent rhythm showing ventricular tachycardia leading to 3 defibrillation attempts in route to the hospital. The patient was administered epinephrine, amiodarone, dextrose, and sodium bicarbonate prior to hospital arrival. In the emergency department, CPR and epinephrine infusion were continued with ROSC obtained. Therapeutic hypothermia was initiated and patient underwent cardiac angiography that was normal. Neurologic exam was notable for fixed and dilated pupils with no brainstem reflexes. Head CT showed diffuse anoxic injury and patient was transitioned to comfort measures. He expired shortly after life sustaining therapies were stopped. This case represents a deadly combination of pharmaceuticals that are not appropriately labeled to advise the public of the risks involved with their consumption. The FDA has released a statement that Xzen 1200 contains the PDE5-I tadalafil, and a PDE5-I has been isolated from more than 80 additional mislabeled OTC products. Jungle juice contains alkyl nitrates, commonly sold in stores under the disguise of a cleaning or deodorizing product and referred to in the community as “poppers.” They are inhaled for sphincter relaxation and psychoactive effects. As evidenced by this case, individuals in the the community, particularly in the homosexual population, need to be aware of the risk involved with consuming “natural” sexual enhancement products as they likely contain a PDE5 inhibitor. These products used in combination with any nitrates may be deadly.

1242

ACUTE CEREBELLAR EDEMA WITH OBSTRUCTIVE HYDROCEPHALUS IN HEMOPHAGOCYTIC LYMPHOHISTIOCYTOSIS
Kirankumar Bhosrekar, Julie-an Talano

Case Report: Hemophagocytic lymphohistiocytosis (HLH) is a rare disorder that is characterized by nonmalignant diffuse infiltration of multiple organs, including the central nervous system (CNS), by lymphocytes and histiocytes. Diffuse white matter infiltrations, parenchymal atrophy, calcifications and ring enhancing lesions have been previously reported in patients with HLH with CNS involvement. The optimal treatment of patients with central nervous system involvement is not well defined. We present a case of acute obstructive hydrocephalus with acute cerebellar edema in a case of familial HLH. A 14 month old male was diagnosed with familial HLH, underwent allogenic stem cell transplantation at our center after he was treated with dexamethasone, cyclosporine and etoposide, according to HLH-2004 protocol. On day 0 of SCT, he was transferred to our PICU after he developed acute onset altered sensorium and respiratory failure needing intubation and mechanical ventilation. Computed tomography (CT) of brain showed diffuse cerebral and cerebellar mass effect, most prominent in the posterior fossa with compression of the brain-stem and obliteration of the fourth ventricle and subsequent tonsillar herniation. Emergent external ventricular drain (EVD) was placed in view of obstructive hydrocephalus within the lateral and third ventricles along with significant global edema and obliteration of fourth ventricle. Serial neuroimaging showed gradual resolution of cerebellar swelling and posterior fossa mass effect accompanied by slow recovery of his neurologic functions including return of brain stem reflexes. He was extubated by the end of a month stay in our PICU. Subsequently, four mo after the SCT, repeat lumbar puncture was positive for hemophagocytes in his cerebrospinal fluid needing changes in his treatment regimen. Although his serial neuroimaging showed waxing and waning signal intensity in the cerebellum, he continued to make slow recovery of neurologic functioning with aggressive rehabilitation.

1243

SIMULTANEOUS MYASTHENIC CRISIS AND STRESS CARDIOMYOPATHY
Ramya Radhakrishnan, Nureddin Alnaddah, Mohit Shukla, Jasleen Minhas, Joshua Englert

Case Report: Myasthenia gravis (MG) and stress cardiomyopathy (SCM) can have similar presentations and inciting events. Cardiac manifestations of MG can include asymptomatic EKG changes, myocarditis, SCM, arrhythmia and can occur with or without respiratory muscle involvement. We report a case of 73 year-old female with history of hypertension and diabetes who presented with orthopnea and subternal chest discomfort of several mo duration. In the ED, she became acutely hypoxic while lying flat for a CT scan, but recovered on sitting up. Vital signs were notable for a heart rate of 91 bpm, BP 128/79 mmHg, and O2 saturation of 93% on 4L O2. Cardiac exam revealed II/VI pan-systolic murmur at apex, JVP < 8 cm H2O and no leg edema. Crackles were heard bilaterally at the lung bases. Neurologic exam revealed mild paresis of the left eye and weakness of eye closure. EKG showed sinus rhythm, poor R wave progression and flat T waves in lateral leads. CT angiogram of the chest revealed no thymoma or pulmonary embolus. A tropinol I level was initially negative but rose to 0.14ng/mL within 6 hr. Cardiac catheterization showed patent coronaries and segmental akinesis of the mid-ventricular area with contractility preserved at the base and apex. During cardiac catheterization, she developed acute respiratory failure requiring Crit Care Med 2015 • Volume 43 • Number 12 (Suppl.)
intubation and was admitted to the ICU. An edrophonium challenge test revealed transient improvement in ocular muscle strength and vertical capac-
ity from 800µl to 1100-1200µl. Anticholinesterase receptor antibody titer was elevated at 5.9nmol/L. Striated antibodies titer was elevated at 1:7680.

The patient was diagnosed with myasthenic crisis and SCM. She was treated with IVIG and pyridostigmine and she rapidly improved over five days. A TTE two weeks later was normal. Prior studies describe a correlation between striatational antibodies and cardiac manifestations in MG, but the role of anti-
bdies in the pathophysiology of MG is unclear. Physicians should be aware that patients with myasthenic crisis can present with cardiac involvement which may manifest as SCM.

1244

CANDIDA ENDOCARDITIS PRESENTING AS ACUTE MYOCARDIAL INFARCTION

Anirudh Aton, Upanasa Aton

Case Report: Embolization to coronary arteries is rare but can be a fatal sequela of endocarditis. We report a case of Candida endocarditis presenting as ST-Eleva-
tion Myocardial Infarction (STEMI). 57 year old woman with past history of diabetes, hypertension and hyperlipidemia presented with chest pain radiating to the left arm. She was afebrile, her blood pressure was 180/93, and rest of her physical examination including cardiac was unremarkable. Troponin was 0.27 ng/ml (0.00–0.09 ng/ml) and her EKG showed inferior wall ST-elevation. She underwent cardiac catherization which showed occluded posterolateral branch of the right coronary artery that was abruptly cut off without any evidence of ath-
erosclerotic plaque. On aspiration thrombectomy a pale organized thrombus was removed. She was doing well. This patient did not have usual risk factors for fungal endocarditis but had positive C. glabrata fungal culture. She was treated with amphotericin B and her EKG showed improvement. A valve culture was also positive for C. glabrata. She was treated with valvular replacement and her troponin showed improvement. This patient was a type II diabetic and had history of endocarditis. We report a case of Candida endocarditis presenting asSTEMI.

1246

MISSED CHRONIC RESPIRATORY FAILURE IN A POST-POLIO SYNDROME PATIENT

Mohammed Aljami, Kanal Agarwal, Sri Uppalapati, Luisa Bazan

Case Report: Introduction: Prior to the introduction of the polio vaccine, para-
lytic poliomyelitis was a major cause of morbidity and death. Twenty-five to fifty percent of the survivors are known to develop post-polio syndrome. Symptoms include fatigue, insidious respiratory failure, obstructive sleep apnea, bulbar neu-
ropathy, central respiratory abnormalities, hemi-diaphragmatic paralysis and pro-
gressive functional decline with new onset weakness, among others. We present a case of post-polio syndrome presenting with hypercapnic respiratory failure. Case Report: A 76-year-old male with polio diagnosed at age seven, requiring ventila-
tion with “iron-lung”, presented with dysnea, orthopnea and fragmented sleep. He had insidious respiratory decline that he attributed to his advancing age the year prior. Physical examination was significant for atrophy of the upper extremities, decreased left sided chest wall movement, scoliosis and oxygen desatura-
tion to 83%. Chest radiograph and computed tomography were normal except for elevation of the right hemi-diaphragm. The arterial blood gases demonstrated acute on chronic respiratory acidosis with compensatory metabolic alkalosis. Due to hypoxemia, oxygen supplementation of 3 liters per minute was initiated. The patient later became obtunded, with worsening hypacapnia (PaCO2 93.2) and was transferred to the ICU where bivac was initiated. His hypacapnia improved on a pressure of 24/10cm of H2O with a back-up rate of 12. During the out-
patient attended titration study, there was evidence of obstructive sleep apnea that resolved on bilevel 25/10cm of H2O and back-up rate of 12. Pulmonary function tests demonstrated severe restrictive respiratory failure and reduced respiratory muscle forces. During follow-up, the patient reported symptomatic improvement of his dysnea and fragmented sleep with bilevel. Conclusion: This case illustrates post poliomyelitis syndrome presenting with insidious progres-
sive respiratory failure and the significance of early treatment with noninvasive respiraory support.

1245

ACUTE HYPERAMMONEMIC ENCEPHALOPATHY POST LIVER TRANSPLANT WITH NORMAL GRAFT FUNCTION

Avvep Aggarwal, Rashmi Sreedharan, Teresa Diago Uso, Silvia Perez-Prosto

Case Report: Orthotopic Liver transplantation (OLT) is the only definitive treatment for End Stage Liver Disease (ESLD). Hyperammonemia post OLT is commonly attributed to a decline in graft function. We report a rare case of acute hyperammonemic encephalopathy with a normal graft and urea cycle function post OLT. A 62 year old female with ESLD complicated by hepatopa-
nal syndrome secondary to Nonalcoholic steatohepatitis underwent an OLT. Of note, she had undergone a gastric bypass procedure in the past. The OLT was uneventful and she was extubated on POD-2 but had to be reintubated on POD-4 due to worsening encephalopathy and severe hyperammonemia (peak-1962 mmol/l). Her clinical condition deteriorated despite maximum doses of lactulose and rifaximin. She was started on continuous venovenous hemodialysis (CVVHD) and later plasmapheresis for ammonia clearance. Liver graft func-
tion was normal. EEG revealed diffuse encephalopathy. Serial CT scans of the head to look for worsening cerebral edema, were unremarkable. Amino acid analysis was negative for urea cycle defects. Nutrition (initially tube feeds and then parenteral) was altered to minimize ammonia production. Oral sodium benzoate and zinc therapy was initiated. Given a normal graft and urea cycle, an alternative hypothesis was a possible bacterial overload in a blind loop from the previous gastric bypass for which she was treated with rifaximin and metroni-
dazole. Ammonia levels normalized over next few days with an improvement in her neurologic status. She was subsequently extubated and discharged from ICU without neurologic deficits. With an increase in the number of OLT’s performed annually, it is imperative for the intensivist to recognize and manage complica-
tions associated it. Acute hyperammonemic encephalopathy post OLT associated with normal graft function is rare. In such instances, alternate causes including urea cycle defects, ureaplasma infection, dietary defects or interventions resulting in bacterial overgrowth should be investigated and managed aggressively to avoid acute clinical deterioration.

1247

AVOIDING ADMISSIONS FOR RESPIRATORY FAILURE WITH NON-INVASIVE VENTILATION IN TRACHEOBRONCHOMALACIA

Gwen Thompson, Finnbar Foley, Jeremy Clain, Patricio Escalante

Case Report: Recurrent exacerbations associated with respiratory failure can be difficult to prevent in patients with advanced COPD and bronchiectasis. When treatment for known conditions does not result in improvement alternate eti-
ologies should be investigated. We present a case of recurrent respiratory exac-
erbations attributed to bronchiectasis. Tracheobronchomalacia (TBM) was later identified and treatment with non-invasive ventilation ended the cycle of recur-
thospiations. An 85-year-old nonsmoker female with a history of gastro-
ophageal reflux status post Nissen fundoplication was admitted for cough and dyspnea. CT chest revealed bronchiectasis attributed to reflux aspiration. She was treated with broad spectrum antibiotics followed by thrice weekly azithromycin, and compliance with anad acid therapy and reflux precautions was assured. One week later she was readmitted with recurrent symptoms. Broad spectrum antibi-
otics, mucolytics, hypertonic saline, and airway clearance were initiated without improvement. Bronchoscopy demonstrated dynamic airway collapse consistent with TBM. The patient underwent a trial of nocturnal continuous positive air-
way pressure (CPAP) and significantly improved. She was noncompliant and

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readmitted due to respiratory failure initially requiring bilevel positive airway pressure support. On discharge, the patient utilized nocturnal CPAP and bronchial hygiene regimen. She has successfully avoided readmission for the last year. This case demonstrates that failure of treatment targeted to known conditions should prompt investigation for comorbid conditions. TBM is becoming more recognized with the advent of improved imaging modalities. Treatment is difficult as medical management often fails and stenting has many complications. Studies demonstrate a benefit of CPAP in the pediatric population but there is a paucity of data in adults. In this case the response of TBM to CPAP resulted in decreased admissions for respiratory failure. This suggests that the use of CPAP in TBM may be a useful adjunct to medical therapy in adults.

1248
DON’T BE PREMATURE: WAITING MAY BE KEY
David Shiu, Nadeem Ali, Nancy Holder

Case Report: Induced hypothermia and emergent coronary intervention after cardiac arrest has led to improved outcomes in the last decade. Despite treatment benefit, the guidelines regarding neurologic assessment are ill-defined and prediction of prognosis via EEG may lead to unnecessary morbidity. An 81 year old Caucasian male with a history of hypertension, poorly controlled diabetes, dyslipidemia, recent coronary angioplasty with stent placement one week prior was placed on hypothermic protocol and emergent coronary intervention for witnessed cardiac arrest with immediate CPR and return of circulation. Findings revealed potassium of 7.2, glucose of 1167, with no occlusion or stent thrombosis on angiography. The insult was assumed to be an arrhythmic event from hyperkalemia and diabetic ketoacidosis. Seventy-two hr post normothermia, video electroencephalogram (EEG) showed persistent low voltage activity consistent with diffuse encephalopathy, no gag reflex, minimally reactive pupils and a Glasgow coma score of 3. Given the poor prognosis the family agreed to withdraw care the following day. Ninety-six hr post normothermia, withdrawal of care was aborted at the request of the family due to spontaneous movement of the lower extremity followed by spontaneous eye opening with unchanged EEG readings. Neurologic assessment was then based solely on physical exam. Ultimately patient’s neurologic exam improved incrementally and eight days post normothermia regained full neurologic function and was eventually discharged home. This case underscores the limits of video EEG and timing of neurologic exam in the prognostication at seventy-two hour and ninety-six hour post normothermia. The timing of neurologic assessment with EEG and clinical exam in comatose, post arrest patients receiving therapeutic hypothermia is still unknown and current guidelines are not sufficient. This case exemplifies a patient who received therapeutic hypothermia in post cardiac arrest where withdrawal of care was avoided and full recovery was achieved when provided sufficient time.

1249
INDEPENDENT LUNG VENTILATION AND SURFACTANT AS A MEANS TO FACILITATE ECMO DECANNULATION
Marlina Lovett, Tom Heeter, Melissa Robinson, Todd Karsies

Case Report: Independent lung ventilation (ILV) is a rarely used tool in the PICU that can be beneficial in asymmetric lung disease. We describe a patient with unilateral lung disease requiring extracorporeal membrane oxygenation (ECMO) who rapidly improved with ILV and surfactant therapy. An 11-year-old female presented with fever, cough, and hypoxic respiratory failure. Chest X-ray showed near complete opacification of her right hemithorax. Within 8 hr she transitioned to the oscillator and ultimately veno-venous ECMO due to refractory hypoxemia (Oxygenation Index 60). She was diagnosed with necrotizing pneumonia secondary to community-acquired MRSA and Influenza A. After 4 days of lung rest with no improvement in compliance, her endotracheal tube was changed to a dual lumen tube after bronchoscopy and unilateral surfactant instillation (40 mL/m2 × 1). When ILV was initiated her ventilator settings were: R (SIMV-PC)–PEEP 14/PIP 34 (effective tidal volume 1.4 mL/kg); I (PRVC)–PEEP 8/PIP mid-20s (effective tidal volume 3.1 mL/kg). Within 12 hr her lung compliance and aeration improved. She was weaned within 24 hr, extubated 48 hr later, and survived to hospital discharge. National data from the ELSO registry show survival from pediatric viral and bacterial pneumonia treated with ECMO to be 65% and 59% respectively, with mean ECMO times of 317 and 286 hr. Our patient had a run time of 117 hr. She had severe unilateral lung disease requiring VV ECMO yet did not improve after several days of antimicrobial therapy. With the use of ILV it was possible to differentially ventilate her lungs to avoid overdistribution, improve ventilation-perfusion mismatch, and allow for recruitment of her poorly compliant lung while avoiding baro and volutrauma to the healthy lung. In addition, surfactant also assisted in recruitment and maintenance of functional residual capacity in her diseased lung. ILV was associated with rapid decannulation from ECMO (< 24 hr), and warrants consideration in the management of severe unilateral lung disease to facilitate liberation from ECMO.

1250
THAT’S NOT COLON: MASSIVE GAS-FORMING PYOGENIC CLOSTRIDIAL LIVER ABDOMINAL ABSCESS
Justin Tsai, Hsan Asbahi, Jinping Lachmansingh, Robert Johnston

Case Report: Pyogenic liver abscess is a rare condition with a high mortality rate; it infrequently presents as a gas forming variant. The majority of gas forming pyogenic liver abscesses are caused by Klebsiella pneumoniae, but occasionally by Clostridium, Bacteroides, and anaerobic streptococci as well. Frequent co-morbidities are poorly controlled diabetes, immunosuppression, and gastrointestinal malignancy. We present a case of massive gas-forming multi-Clostridium species liver abscess with accompanying sepis, initially misdiagnosed as bowel perforation. A 54-year-old male with a history of unexplained anemia, asthma, hypotension, and gout presented with nausea and emesis for 1 day, with a blood pressure of 92/67, a heart rate of 89, and a white blood cell count of 7.4. CT revealed a massive 20 × 17 × 16.5 cm gas filled structure in the epidiasenterium, portal venous air, and free air in the abdomen. The patient was taken emergently to the operating room with presumptive bowel perforation. Surgical exploration revealed massive amounts of hepatic air actively bubbling from Glisson’s capsule and a mid-jejunal mass, which was resected. The patient was admitted to the ICU where fluid resuscitation and vasopressor support continued, and was empirically treated with ertapenem, metronidazole, and micafungin. On hospital day 3, admission blood cultures grew Clostridium perfringens and clindamycin was added. The patient was weaned off of pressors and extubated; however, imaging revealed minimal improvement and the emergence of additional gas filled abscesses. Interventional radiology was consulted and 4 hepatic drains were placed; drain samples grew Clostridium septicum. Pathology results from the resected mass and abdominal lymph nodes revealed metastatic melanoma, and a primary lesion was found on the patient’s back. This small bowel lesion likely seeded enteric Clostridium into the portal venous system. The patient was placed on a 6 week course of clindamycin and ertapenem, and discharged on hospital day 15, with plans to undergo FOLFOX chemotherapy when recover.
was treated with cetrixatone, vancomycin, azithromycin, and bicarbonate. Potassium and magnesium were replaced. She expired despite all resuscitative measures which included mechanical ventilation and vasopressor support. The majority of tenofovir associated nephrotoxicity has been reported in the HIV population. To our knowledge, this is one of the rare cases reported in a non-HIV patient. The patient's non-anion gap metabolic acidosis, hypokalemia, glucoseuria, proteinuria, ketonuria, multiple spontaneous rib fractures and osteopenia were consistent with Fanconi's syndrome. The severity of the acidosis and renal failure likely contributed to this patient's inability to withstand the stress of severe sepsis. Recently the WHO has issued guidelines regarding the management of renal diseases in patients being treated with tenofovir for chronic hepatitis B that include obtaining baseline and biannual renal indices. Tenofovir induced renal failure and Fanconi's syndrome can significantly worsen the prognosis of patient with severe sepsis.

1252

ANTI-N-METHYL-D-ASPARTATE RECEPTOR ENCEPHALITIS: AN UNDERRECOGNIZED, TREATABLE DISEASE
Jacqueline McLatchy, Ilya Shnaydman, Mary Leong, Michael Nimaroff, MD, Helen Greco, MD

Case Report: Anti-N-methyl-D-aspartate receptor (Anti-NMDAR) encephalitis is a newly defined autoimmune encephalitis predominantly affecting young, previously healthy women. It is considered paraneoplastic as 60% of cases are associated with tumors, usually ovarian teratomas. It typically presents in separate phases. A prodromal phase that mimics a viral infection. A psychotic phase often characterized by sudden onset delusions, hallucinations or other bizarre behaviors. Lastly a deterioration phase associated with seizures, inability to maintain an airway and catatonia. Diagnosis is confirmed by serum and CSF anti-NMDAR antibodies. Treatment centers on early immune suppression, antibody removal and tumor resection if present. Tiers guide treatment response. Prognosis is correlated with timely treatment. 75% of patients make a near/full recovery. There is a 5% mortality rate. Recovery may take up to 2.5 yr and prolonged hospital stay is common. This case series describes the classic presentation of anti-NMDAR encephalitis in three patients at a tertiary care center over five yr. All three are young, previously healthy women that presented with status epilepticus and were admitted to MICU. Despite treatment for bacterial/viral encephalitis the patients failed to improve. Anti-NMDAR antibody serology testing was sent with diagnostic elevated titters. Adnexal evaluation was remarkable showing ovarian lesions unilaterally. Laparoscopic salpingoophorectomy was completed. Final pathology showed mature cystic teratoma. All three patients received IVIG and plasmapheresis following resection with significant improvement and eventual discharge to rehab after 2-3 mo. Anti-NMDAR encephalitis is a rare, often under/misdiagnosed autoimmune encephalitis with distinctive clinical features, a diagnostic antibody, and effective treatment; the prognosis of which is greatly affected by early intervention. This case series seeks to provide clinical knowledge so that anti-NMDAR encephalitis is considered in the differential diagnosis of any unknown encephalitis.

1253

MASSIVE PE TREATED WITH CATHETER-DIRECTED TPA IN AN 11-WEEK GRAVID PATIENT
Angela Smolarz, Laurie Grier

Case Report: Case Report: In the United States PE causes 20–30% of maternal deaths and is the 6th leading cause of mortality. There is some difficulty in diagnosing thromboembolic disease in pregnancy due to overlap of physiological changes and symptoms of DVT or PE. Only 36 reports involving 172 obstetric patients have been published describing the use of thrombolytic agents during pregnancy. A maternal mortality rate of 1.2 percent was observed with 10 pregnancy losses (5.8 percent). Hemorrhagic complications were reported in 8.1 percent of patients. Here we present a 36 yr G3P2022 at 11 weeks gestation who was previously diagnosed with saddle pulmonary embolism two weeks prior to presenting to our hospital and discharged on 100mg lovenox BID. She had a previous pregnancy with a DVT and had 2 previous miscarriages. The patient progressively became more symptomatic and re-presented to an outside facility requiring transfer for a higher level of care. While at home she was using intermittent oxygen but kept having episodes of positional shortness of breath. Upon presentation an ECHO revealed RV dilatation with severely reduced EF. CT was not repeated due to risks and ECHO findings. IR was consulted for possible catheter directed tPA as well as discussion with family about risks/benefits. Due to symptoms and progressive hypoxemia, the patient agreed to the procedure. A RIJ pigtail catheter was placed under fluoroscopic guidance and visualization of bilateral multi-segmental thrombi noted. The patient was started on tPA 1mg/hr and returned to the MICU. The following morning the patient was off oxygen and able to move around her room without SOB. A repeat angiogram revealed complete resolution of clot burden and the tPA was discontinued. Her total dosage was 24 mg. BLE dopplers were negative for DVT. The patient discharged to home the following day, continued on lovenox and repeat ECHO revealed normal RV dimensions and function. This case demonstrates the efficacy and safety of catheter directed tPA in massive/submassive PE in the Obstetric population.

1254

TICK BITE CAUSING WATER RETENTION: LYME’S DISEASE MANIFESTING AS ACUTE HYponATREMIA FROM SIADH
Wajihuddin Syed, Jill Yeager, Maria Fariduddin, Anup Shah, Amit Dhamoon

Case Report: Introduction: SIADH is caused by the inability to suppress secretion of ADH, usually caused by CNS disorders, lung cancer or drugs. We report a case of SIADH caused by Lyme’s disease. Case: 86 y/o female was admitted with encephalopathy and left-sided facial droop. The duration was unclear as she lived alone. CTA head & neck did not show any evidence of vascular disease or stroke. Concerned for Bell’s palsy, Lyme antibody was sent which returned positive. Her sodium at admission was 120 with serum osmolality of 268. She did not have any evidence of volume loss, and work up of hyponatremia ruled out heart failure, cirrhosis, renal failure, adrenal insufficiency or hypothyroidism as the cause. Urine electrolytes revealed a sodium of 63 and osmolality of 352 which suggested SIADH. Further work-up revealed no evidence of pulmonary or any chest malignancy. She was not on any medications and did not have any recent surgeries. She was started on steroids for her Bell’s palsy and doxycycline for Lyme’s disease. She showed remarkable improvement in her mental status and her sodium corrected with supportive treatment. The rapid response of sodium to treatment of Lyme’s disease and no other explanation for the SIADH, makes Lyme Neuroborreliosis the likely cause of this patient’s SIADH. Discussion: SIADH results in impaired water excretion, leading to hyponatremia which is treated by water restriction. However, the underlying cause of SIADH is important to recognize and manage. SIADH is commonly caused by malignancy, medications, CVA, and surgeries. CNS infections rarely cause SIADH. CNS involvement in Lyme’s disease can manifest in early disseminated disease as a lymphocytic meningoencephalitis associated with cranial neuropathy. Lyme’s disease causing SIADH is reported in two other cases of disseminated disease, and could have precipitated SIADH in this patient. This case highlights the importance of recognizing CNS infection as a cause of SIADH, which could help effectively manage the sodium and prevent fatal complications from the primary cause.

1255

EXTRAPYRAMIDAL REACTION TO ONDANSETRON IN A PATIENT WITH INTRACRANIAL HEMORRHAGE
Nicholas Watson, Tyler Schafer

Case Report: Introduction: Ondansetron is a selective 5-HT3 receptor antagonist typically used for nausea management. Reports of extrapyramidal reactions (EPR) associated with ondansetron appear sparingly in the literature, primarily during post-anesthetic care or chemotherapy. Some case reports suggest a dose-response relationship of EPR with ondansetron. We present a patient that developed dose-dependent EPR signs following the administration of ondansetron. Presentation: A 72 year-old man with a past medical history significant for aortic stenosis, hyperlipidemia, and hypertension presented with acute onset headache, nausea, and confusion. Computed tomography (CT) of the head demonstrated acute left parieto-occipital hemorrhage. He received ondansetron 4mg IV for treatment of nausea, followed by acute onset bilateral upper extremity tremor that resolved over 2hr. An external ventricular drain was placed and CT was...
performed to confirm positioning. During sedation for the CT he was administered ondansetron 4mg IV. Immediately following the ondansetron he demonstrated rhythmic jerking movements of his head and bilateral upper extremities with concomitant facial flushing, hypertension, and tachycardia. During this episode he was able to converse. Because this event was suspicious for seizure he was given lorazepam 2 mg IV, which did not resolve symptoms. EPR was next suspected and diphenhydramine 25 mg IV was administered, followed promptly by resolution of the myoclonus and flushing and normalization of hemodynamic. Relevance: The rarity of EPR to ondansetron makes formal study difficult, therefore knowledge development in this area relies primarily on case reports. Prior case reports on this topic have suggested that "push" IV administration of ondansetron is more likely to result in EPR than slow infusion or enteral route. Furthermore, there appears to be a dose-response relationship between ondansetron and EPR. This report supports these associations while highlighting the diagnosis and treatment of EPR related to ondansetron.

1256
ARTERIOVENOUS CO2 REMOVAL (AVCO2R) IN A POST-PARTUM PATIENT WITH REFRACTORY STATUS ASTHMATICUS
Matthew Raley, Baljit Gill, Laurie Grier, Steven Conrad

Case Report: AVCO2R is a form of extracorporeal life support (ECLS) used in severe cases of respiratory failure when conventional methods of ventilation are ineffective. We present the case of a post-partum patient with hypercapnic respiratory failure secondary to status asthmaticus. An 18 yo African-American female with severe persistent asthma and multiple prior intubations presents to the ED at 37 weeks gestation with one day of shortness of breath and cough. Initial evaluation revealed tachycardia and tachypnea with a SpO2 100% on 100% non-rebreather. Exam revealed prominent expiratory wheezes with accessory muscle usage, ABG showed 7.28/43/288/20.2. Fetal monitoring was normal. After admission to the ICU, she required intubation despite treatment with NIPPV and heliox 70/30. Fetal heart rate showed rapid decelerations, and the patient was taken for emergent C-Section. Upon return to the MICU, her ABG showed 6.77/191/353/14.6. Peak airway pressures were 70-80cmH2O with Vt <50 on PRC mode ventilation. Given significant hypercarbia, acidosis, persistently elevated airway pressures, and difficulty ventilating, it was decided to pursue ECLS. 16Fr and 12Fr catheters were placed in her femoral vein and artery, respectively. AVCO2R was initiated. She experienced rapid improvement in her respiratory acidosis with new ABG 7.14/71/72/20.1. On hospital day 3 she was extubated, AVCO2R was discontinued and she was decannulated. AVCO2R allows for removal of CO2 when conventional methods of ventilation have failed. The patient's arterial pressure drives blood through a heparinized membrane, which allows CO2 to freely diffuse into the air, returning blood through the venous circulation. Unlike ECMO, AVCO2R does not significantly allow for oxygenation. Catheter size should be chosen so that it occupies less than 70% of the lumen to allow for diffusion of CO2 until bronchospasm resolves and lung compliance improves.

1257
LITHIUM INDUCED THYROID STORM AFTER SLEEVE GASTRECTOMY
Maria Altieri, Aurora Pryor, James Vosswinkel, Randeep Jawa

Case Report: Introduction: Thyroid storm is a rare but life-threatening condi- tion. We discuss a patient with lithium induced thyroid storm in the ICU fol- lowing sleeve gastrectomy. Case report: An adult female with a past medical history of bipolar disorder for which she was taking lithium, morbid obesity for which she had undergone laparoscopic sleeve gastrectomy, presented with trem- ors, diminished oral intake, and emesis for about 3 days. Abdomen/pelvis CT scan was negative. She was found to have an elevated lithium level of 2.7 mEq/L (normal 0.5–1.2) and a serum creatinine of 2.2 mg/dL. Dialysis was adminis- tered for suspected lithium toxicity on hospital days (HD) 2 and 3. Following dialysis, although the lithium level normalized, she remained agitated. She was tachycardic (sinus tachycardia) with heart rates in excess of 140 and hypertensive with systolic blood pressures to 200 mmHg, despite therapy with metoprolol, labetalol, and hydralazine. Additionally, she was febrile with a Tmax of 105.8F. Thyroid studies demonstrated elevated T3 and T4 levels (266 ng/dL and 18.5 ng/ dL, respectively) and decreased TSH levels (0.013 mIU/L). Hence, proprano- rol, methimazole, iodine, and dexamethasone were started for suspected thyroid storm with eventual normalization of vital signs and mental status normalized. Conclusion: Treatment with lithium commonly induces hypothyroidism; very infrequently it may induce hyperthyroidism. However, thyroid storm from lithium therapy is extremely rarely reported. Findings of thyroid storm include altered mental status, fever, tachycardia, and hypertensive crisis. Altered gastro- intestinal motility/absorption and dietary changes after sleeve gastrectomy, albeit less significant than gastric bypass, may have affected its pharmacodynamics and pharmacokinetics. Early recognition can help mitigate adverse effects.

1258
LIPID RESCUE THERAPY AND HYPERINSULINEMIA/ EUGLYCEMIA FOR ATENOLOL AND ZOLPIDEM OVERDOSE
Emily Czerwonka, Melissa Heim

Case Report: Lipid rescue therapy (LRT) and hyperinsulinemia/euglycemia (HIE) alone are emerging treatments of medication overdose, however, limited evidence exists for their use simultaneously. Recently, an overdose of metoprolol treated with LRT and HIE was reported. We present a case of ingestion with atenolol and zolpidem requiring these therapies. A 33 year-old female with no significant past medical history was brought to the ED as a level 1 trauma due to a single motor vehicle accident at highway speeds. On the scene she was hypoten sive to 60/30, bradycardic to 54 bpm, and had a GCS of 3. She was intubated prior to arrival and given 4L LR, 2 units PRBCs, and 1 g tranexamic acid. Upon arrival, she had a RR of 12, SpO2 of 98%, and end-tidal CO2 of 25 mmHg. Her treatment was continued with 6L NS, 6 units PRBCs, 1 unit FFP, 1 g tranexamic acid infusion, dopamine and norepinephrine. During removal of clothing for the trauma evaluation, white and pink tablets were discovered. Tablets were identi- fied as atenolol and zolpidem. Imaging and further trauma evaluation revealed no injuries or hemorrhage. Labs returned an acetaminophen level of 249 mg/L and blood alcohol level of 0.17 mg/dL. Patient was treated with activated charcoal, n-acetylcysteine, calcium, glucagon, LRT and HIE. Imaging suggested evidence of ischemic bowel, and pressors were weaned off. The following morning (10.5 hr later) she became responsive and was extubated, and was discharged home after a hospital stay of 41 hr. The log P (partition coefficient) of zolpidem is 2.61 and atenolol is 0.10. Literature suggests LRT will be effective if the log P of the drug is greater than 2.0, however, it has been used for drugs that are less lipophilic, such as metoprolol which has log P of 1.79. The literature also recommends treat- ment with HIE for refractory hypotension and bradycardia due to beta-blocker overdose. To date, no clear treatment guidelines are available for using LRT and HIE together. Providers should be aware of these treatments and considerations when simultaneous use is warranted.

1259
CRYOGLLOBULINEMIA DUE TO HEPATITIS C LEADING TO LIFE-THREATENING PULMONARY ALVEOLAR HEMORRHAGE
Viveksandeep Thogulvula Chandrasekar, Poornima Ramadas, Pallavi Kopparthi, Patrick Kohlitz

Case Report: Cryoglobulinemia is an established entity with hepatitis C infec- tion with a wide spectrum of presentation involving multiple organs. We report a rare case of life threatening pulmonary alveolar hemorrhage due to cryoglobul- linemia treated with high dose steroids and rituximab. 63 year old male with history of Hepatitis C with liver cirrhosis and substance abuse presented with a two week history of generalized fatigue and rash in the thighs and buttocks. On physical exam, he was febrile (102 F), tachycardic and lethargic. He had swelling, erythema and tenderness of the anterolateral aspect of the left thigh with multiple petechial lesions. His platelet count was 56,000 cells/ mm3 with an elevated lactate of 6.2 mmol/L, d-dimer of 3890 mg/mL, fibrinogen of 628 mg/dL. CT of the left lower extremity revealed subcutaneous fat stranding suggestive of cellulitis, hence was started on broad spectrum antibiotics. Cryoglobulin levels were
positive with elevated ESR and low complement levels. The patient later developed acute hypoxic respiratory failure needing intubation, with drop in hematocrit requiring transfusion. CT angiogram of the thorax revealed bilateral airspace disease consistent with edema or hemorrhage. Broncho-alveolar lavage was done which confirmed pulmonary hemorrhage due to cryptogobulinemia flare secondary to Hepatitis C. He was started on high dose methylprednisolone followed by prednisone 60 mg daily. CD 20 subset of B-cells were found to be elevated and hence he received two infusions of rituximab. Patient improved clinically over the next few days and was discharged on a steroid taper. Cryptogobulin can be found in hematological malignancies, chronic infections like hepatitis C and lymphoproliferative disorders. Pulmonary involvement can include vasculitis, interstitial lung disease and alveolar hemorrhage which is rare but usually life threatening. Only 18 patients have been reported in the literature so far to the best of our knowledge. 

1260

NEUROSARCOIDOSIS INDUCED PANHYPOPITUITARISM
Vedha Sanghi, Aanchal Kapoor

Case Report: We describe the case of a 40 year old female who was brought with altered mental status, slurred speech and possible seizure. She had a history of pulmonary sarcoidosis with presumed CNS involvement, SLE limited to skin and traumatic brain injury. She was noncompliant with immunosuppressive and antiepileptic therapy. She was oriented to herself only. On physical examination, she had dry mucus membranes. Neurological examination was unremarkable. Differential diagnosis at that point was altered mental status secondary to infectious etiology, post-ictal stage or flare up of neurosarcoidosis. Laboratory workup was essentially unremarkable. Urine analysis was suggestive of urinary tract infection (UTI). EEG did not reveal any seizure activity. MRI of the brain showed new punctuate right parietal infarctions. Treatment with empirical antibiotics for UTI showed very little improvement in her confusion. Over the next 5 days, her sodium level started to rise and reached a maximum of 170mmol/L, with some rise in urine output (UO). DSW administered as therapy showed no improvement in sodium levels. CT of the head was unremarkable. DDAVP stimulation test confirmed central diabetes insipidus (CDI). A thorough hypothalamic-pituitary axis evaluation revealed low normal levels of TSH, FSH, LH consistent with pituitary dysfunction, later confirmed by MRI. She was started on DDAVP and levorthyroxine resulting in normalization of sodium levels. Discussion: The influence of thyroid on renal function has been discussed extensively but less often put into clinical practice. The thyroid hormones affect the water/sodium metabolism by their direct effect on renal tubular function. Hypothyroidism, results in decreased glomerular filtration rate and increased serum creatinine. Here we present a unique case of neurosarcoidosis induced CDI with low UO. The role of hypothyroidism in masking polyuria was evaluated by administering thyroxine in anticipation of polyuria. To our best knowledge, there is no such case reported in the English literature.

1261

ACUTE PARAPLEGIA AFTER MINOR TRAUMA DUE TO ARTERY OF ADEMKIEWICZ THROMBOSIS
Andrea Guardenier, Mary Hilfiker, Bradley Peterson, David Shellington

Case Report: Spinal cord ischemia is uncommon in children. We present a case of acute spinal cord infarction after minor trauma in a pediatric patient. A 14-year-old previously healthy male presented for evaluation of acute bilateral lower extremity weakness after colliding with a player during a soccer game. The patient struck another player with the side of his head and experienced mild pain and vertigo. After resting, he returned to play. He then experienced bilateral parathesias of bilateral feet and ankles ascending to his hips. He subsequently developed a burning sensation from his tailbone to thorax. Within min, he exhibited dense paresthesia of both legs with complete sensation deficit. He was transported to Rady Children’s Hospital for evaluation. On examination, his neurologic findings were notable for full and symmetric strength and normal sensation in bilateral upper extremities, complete flaccid paralysis in bilateral lower extremities, absent rectal tone, and absent patellar, Achilles, abdominal, and cremasteric reflexes. Sensory exam was notable for a T10 level to light touch, a T8 level to temperature, and a T12 level to vibration. He had loss of proprioception of his ankles and toes. Emergent MRI was ordered and interpreted as normal. The patient was admitted to the PICU for further monitoring. Symptoms remained unchanged. A follow-up MRI was obtained on HD2 with sagittal diffusion sequencing. This revealed abnormal central cord signal from T6 to T10 concerning for spinal cord ischemia in the territory of the artery of Adamkiewicz. Aspirin and plavix therapies were initiated without improvement in symptoms. On HD6, an angiogram was obtained that showed partial recanalization of the artery of Ademkiewicz, confirming a diagnosis of acute spinal cord infarction due to thrombosis of this artery. A high index of suspicion should be maintained for spinal cord infarction in the setting of neurologic deficits after minor trauma. Additional research is needed to determine whether efficacious therapies exist to treat these injuries.

1262

ASPIRIN-INDUCED ACUTE INTERSTITIAL NEPHRITIS IN A PEDIATRIC LIVER TRANSPLANT PATIENT
Sofia Padilla, Amanda Sebring, Prithi Jani, Jason Kane, Christopher Clardy

Case Report: Introduction: Acute interstitial nephritis is characterized by a decline in creatinine clearance and is caused by immune-mediated inflammatory infiltration of the kidney tubulo-interstitium. Non-steroidal anti-inflammatory drugs (NSAID) are a well documented cause of acute interstitial nephritis. Clinical manifestations include a spectrum of allergic-type symptoms and renal dysfunction. Aspirin (ASA) is often used following liver transplantation to maintain patency of vascular anastomoses. Case: The patient is a 5 month old female who underwent orthotopic liver transplant due to neonatal HSV infection and liver failure. On post-transplant day +8 low dose ASA was initiated. On the same day, rash and fever were noted and continued intermittently for two weeks. On day +20, she developed hematuria, proteinuria (2,000 mg/dL), hyperkalemia (6.3 mmol/L) and an increase in creatinine from 0.2 to 0.5 mg/dL. On day +22 the patient developed severe bronchospasm without evidence of volume overload. This constellation of symptoms and temporal correlation with the initiation of ASA lead to the presumed diagnosis of ASA-induced interstitial nephritis and bronchospasm. ASA was discontinued and within days the patient’s urine protein, potassium and creatinine normalized and her respiratory symptoms resolved. The child was maintained on clopidogrel for antiplatelet function without recurrence of symptoms. Discussion: Low dose ASA is commonly used in specific pediatric patient populations including congenital cardiac disease and organ transplantation. Although a well known association exists between NSAID use and renal injury, this is the first case of ASA-induced acute interstitial nephritis reported in a pediatric liver transplant patient. Conclusion: Given that ASA use is widespread in the liver transplant population, clinicians must be aware of the risk of acute interstitial nephritis associated with ASA use and may need to consider alternative anti-platelet therapy at the first signs of associated symptoms.

1263

A CASE OF LARYNGITIS CAUSED BY AN UNUSUAL SUSPECT
Alisha Hemraj, Jason Back, Tanya George

Case Report: A 53-year-old woman with diabetes mellitus, COPD (not on chronic steroid treatment), long-standing tobacco use, and T2N0M0 laryngeal and bilateral supraglottic squamous cell carcinoma status post radiation therapy, presented to the hospital after her daughter found her at home unresponsive. She was emergently intubated for airway protection. A neck computed tomography revealed edema of the epiglottis, uvula, and soft tissue causing a narrowing past the cricoid cartilage. Antibiotics and dexamethasone were promptly started. In the interim, patient failed multiple extubation trials and was eventually evaluated for tracheostomy. On exam, the patient was afebrile and normotensive while on mechanical ventilation. Lung exam revealed decreased breath sounds bilaterally with diffuse rhonchi. Bronchoscopy with biopsy confirmed significant edema of the vocal cords with no obvious lesions. Vocal cord biopsies revealed hypersensitive squamous mucosa with ulceration and necrosis with reactive epithelial changes. Viral cytopathic changes were consistent with herpes simplex virus (HSV), confirmed by immunohistochemical staining. The patient completed a 10-day course of acyclovir and was discharged home with tracheostomy tube. HSV laryngitis is an exceedingly rare clinical entity in adults. It is typically a result of systemic dissemination or of direct extension from lesions in the oropharynx or esophagus.
In our patient, HSV was confined to the larynx, without evidence of local or systemic disease. Localized HSV laryngitis has been attributed to suppressed cell-mediated immunity from HIV, chemotherapy, and prolonged corticosteroid use. In contrast, our patient was likely susceptible to HSV infection from damaged laryngeal mucosa from prior radiation exposure. Vrabec et al. noted the importance of maintaining a high index of suspicion of HSV laryngitis in patients who fail extubation, as was evident in this patient. Our case demonstrates that HSV can present at an atypical anatomic site and cause extensive damage, compromising airway patency if left untreated.

**FAMILIAL SPINOCEREBELLAR ATAXIA TYPE 7: A NEW INFANTILE PRESENTATION WITH COARCTATION OF AORTA**

Judith Ben Ari, Jason Parker, Mammen Ajit, Puja Mehta, Joseph Melvin

**Case Report:** Spinocerebellar Ataxia Type 7 (SCA-7) is a pathological condition stemming from CAG repeat expansions. The CAG expansions induces propagation of the ataxin-7 protein, with subsequent rapid progression of multi-organ tissue infiltration. An increasing number of pathological repeats may represent prognostic indicators for patients; with larger repeats correlating with worse prognosis. We report a 2 month old female with global hypotonia, intermittent hypoxemia, and a family history notable for walking difficulty and visual impairment across multiple generations, consistent with autosomal dominant inheritance. Echocardiogram revealed a Patent Ductus Arteriosus (PDA). Catherization demonstrated Coarctation of Aorta, type B as well as elevated trans-pulmonary gradient, resistant to oxygen and inhaled Nitric Oxide. The patient underwent end to end aortic anastomoses and PDA resection via lateral thoracotomy. Morbidity included chronic anasarca secondary to capillary leak syndrome; respiratory failure and inability to wean from ventilatory support due to global hypoxia necessitating tracheostomy; chronic renal failure with anorexia; concentric left ventricular hypertrophy-cardiomyopathy due to absence of residual aortic gradient; and visual evoke potentials consistent with blindness. DNA testing revealed a normal Karyotype (46,XX) and 78 CAG repeats of ataxin-7 gene protein. Repeats between 35 to 300 are known to be associated with pathology, while normal alleles contain 4 to 34 CAG units. The patient died within 3 mo of surgical repair; autopsy revealed septic pneumonia and cardiomyopathy as a cause of death. The longitudinal course of SCA-7 is unknown, as are the correlation between the repeat expansion sequences, clinical signs and symptoms, cardiomyopathy and neuropathology. Case reports of infantile SCA-7 suggests life expectancy of less than one year. Coarctation of Aorta has never been described in conjunction with SCA-7, making the post-operative course challenging when encountering multi-organ manifestations seen with this rarely described syndrome.

**UTILITY OF BEDSIDE ECHOCARDIOGRAPHY IN TREATMENT OF SEPSIS-INDUCED CARDIOMYOPATHY**

Ali Omranian, Mourad Sennussi, Harman Gill, Satish Nandyala, Ajit Moghekar

**Case Report:** Sepsis-induced cardiomyopathy is a challenging medical condition. We present a case of severe sepsis complicated by myocardial suppression and subsequent global hypoperfusion and multi-organ failure. We demonstrate the use of bedside echocardiography and the measurement of the velocity time integral (VTI) to titrate inotropic infusions. A 43-year-old female with a history of sarcoidosis, immunosuppression with prednisone and anticogulation for history of CTEPH admitted with respiratory distress, obtundation and profound tachycardia. Broad spectrum antibiotics, IV fluid resuscitation and respiratory support had been immediately initiated. Echocardiogram (TTE) prior to initiation of any vasopressor agents showed normal LVEF of 55% with no acute changes compared to her prior exam. Sepsis was diagnosed secondary to gram negative bacteremia and was complicated with septic shock requiring 3 vasopressor agents at high doses including norepinephrine, phenylephrine and vasopressin. She received stress dose steroids for refractory shock. bedside TTE was done for evaluation of the refractory shock which showed acutely and severely stunned myocardial activity. Baseline LVOT-VTI as well as lab values of ScVO2 and lactate were obtained. VTI 12.0 cm was achieved with 2.5mcg/kg/min of dobutamine, the infusion rate was then titrated to 5mcg/kg/min with increase in VT1 and subsequent improvement of ScVO2 and lactate level. Vasopressor requirement increased again in the following 24 hr and ScVO2 declined. Dobutamine was titrated to 8mcg/kg/min achieving VTI 16.8 cm with clinical improvement. Hemodynamics remained stable with this infusion rate for another 24 hour until other vasopressors were weaned off and later dobutamine was successfully discontinued. This case illustrates the use of bedside echocardiographic parameters to help guide clinicians in the titration of inotropic agents.Measurement of LVOT-VTI, a surrogate cardiac output measure, by an experienced practitioner is a helpful and non-invasive tool in titration of inotropic agents in cardiogenic shock.

**DEVELOPMENT OF FANCONI SYNDROME AFTER ADDITION OF LEDIPASVIR/SOFOSBUVIR IN A PATIENT ON TENOFOVIR**

Aruprecht Kahlon, Naveen Guanabakhan, Wajihuddin Syed, Amrita Dhillon, Anit Sharma

**Case Report:** Introduction: Tenofovir is a well described cause of Fanconi syndrome (FS). Ledipasvir/Sofosbuvir (Led/Sof) is an anti-HCV drug that can increase serum levels of Tenofovir. We describe a case of Led/Sof precipitating FS in a patient on chronic tenofovir therapy. Case: 63 year old male with past medical history of HIV, Hepatitis C infection, myocardial infarction (MI), was admitted to ICU with acute coronary syndrome and electrolyte abnormalities. He was receiving lopinavir/ritonavir, elavirenz and tenofovir for last 10 yr, recently diagnosed with hepatitis C infection and started on Led/Sof therapy 3 mo ago. Labs notable for a potassium of 2.3 meq/l, bicarbonate of 6meq/l, venous blood pH of 7.0 and pCO2 of 23mmhg. He was having lactulose induced loose stools that confounded the diagnosis. Aggressive supportive replacement of potassium and bicarbonate failed to improve his dyselectrolytemia. Urine studies revealed urine ph of 6 while being on sodium bicarbonate drip. Urine glucose and amino acid levels were severely elevated. Transtubular potassium gradient (TTKG) was 11.98 suggestive of renal potassium wasting. A diagnosis of FS was made. Discussion: Tenofovir is cleared renally and can accumulate in proximal tubules and inhibit replication of mitochondrial DNA, leading to cessation of oxidative phosphorylation. This stops all active transporters in cells leading to FS. ERADICATE and JON-4 trials, which evaluated effect of Led/Sof on HCV patients co-infected with HIV, found increased serum tenofovir levels without development of FS. To our knowledge, we are reporting one of the first cases of FS in a patient on a combination of Led/Sof and Tenofovir. It is not clear whether addition of Led/Sof in this patient, who was on tenofovir for last 10 yr had any role in development of FS the possibility cannot be ruled out. It should also be noted that when Tenofovir was introduced in 2001, Fanconi’s syndrome was only discovered through isolated case reports and observational studies, highlighting the importance of such case reports.

**NAVY VENTILATION IN THE FORMER PRETERM INFANT WITH RESPIRATORY FAILURE**

Santosh Kaipa, Chhavi Karyal, Jennifer Liedel

**Case Report:** For the former premature infant, chronic lung disease (CLD) with ventilator dependence remains a risk. Damage is not homogeneous with areas of growth and developmental arrest, fibrosis, emphysema and normal lung. These may lead to areas of atelectasis and hyperinflation, impairing the infant’s ability to trigger the ventilator effectively. In the Neurally Adjusted Ventilatory Assist (NAVA) mode of ventilation, phrenic output is detected and utilized to trigger the ventilator, resulting in improved patient synchrony. Studies of premature infants have shown that its use decreases the work of breathing as synchrony improves. Small trials of short periods on NAVA have demonstrated similar benefits in older infants. However, longterm use of NAVA in pediatric patients outside the neonatal period has not been reported. We report a case of a 7 month old male born at 25 weeks gestation now with CLD and severely emphysematous right lung, causing left lung compression, flattening of the diaphragm and impaired respiratory mechanics, who was maintained on NAVA ventilation for several weeks. At 5 mo, he was unable to be extubated and a tracheostomy was placed for chronic respiratory failure. Despite this, his respiratory mechanics were...
significantly altered by right lung hyperinflation and resultant compression atelectasis and impaired diaphragm excursion. He was unable to trigger the ventilator resulting in dysynchrony, air hunger, worsened hyperinflation and atelectasis and carbon dioxide retention. In order to achieve synchrony, he was transitioned to NAVA ventilation. Once on NAVA, the patient was able to maintain minute ventilation, was weaned from sedation and had improvement in overdistension, atelectasis and gas exchange. While there is limited data describing its use in older infants, in the setting of prolonged ventilation, and/or inability to flow trigger the ventilator, the use of NAVA should be considered early to improve patient ventilator synchrony and minimize ventilator associated lung injury.

1268
PSEUDOHEMOPTYSIS FROM SERRATIA MARCESCENS COLONIZATION
Lien-Khuong Tran, RajaNandini Muralidharan, Ravish Singhal, Salama Salama

Case Report: Serratia marcescens, a gram-negative bacilli, is responsible for approximately 2% of nosocomial lower respiratory tract and urinary tract infections. The risk of developing Serratia infections are increased in patients who are admitted to ICUs, immunocompromised, treated with long-term broad-spectrum antibiotics, and have had instrumentation, such as indwelling catheters and tracheostomy tubes. The most striking feature of this member of the Enterobacteriaceae family, is its ability to produce prodigiosin, a red pigment that is responsible for the documented manifestation of pseudohemoptysis in patients who have Serratia pneumonia. We report a case of an 88-year-old man with chronic tracheostomy secondary to a history of intracranial hemorrhage, admitted to our institution for hemoptysis of one day’s duration without signs of systemic infection. Upon admission, blood was noted in both the oropharynx and tracheostomy tube. Vital signs were normal without signs of SIRS or infection and laboratory data showed mild leukocytosis and borderline urine analysis for which he was started on antibiotics. Lung examination and chest radiograph were unrevealing for pneumonia. On day 2, a bronchoscopy was performed that did not reveal a source of bleeding. On day 3, direct laryngoscopy performed by ENT also did not reveal a bleeding source in upper respiratory tract. Bronchial-veolar lavage washings which had been sent for culture ultimately grew Serratia marcescens and Providencia. While there have been published cases of pseudohemoptysis associated with Serratia pneumonia, there has been no report, to our knowledge, of Serratia colonization causing pseudohemoptysis. Clinical awareness of this finding may help deter unnecessary antibiotics and procedures in these patients and reduce length of hospitalization.

1269
INTRAVENOUS HEROIN USE RESULTING IN MULTIPLE ORGAN SYSTEM DYSFUNCTION MIMICKING SEPTIC SHOCK
Eileen Bishop, Athos Rassias

Case Report: Heroin use has increased significantly in the United States over the last decade. In addition to the infectious and overdose risks associated with intravenous drug abuse (IVDA), clinicians must be aware of potential side effects of adulterants and synthetic drugs. We report a case of Multiple Organ Dysfunction Syndrome (MODS) secondary to IVDA. A 21-year old male presents with acute abdominal pain radiating to his back and discoloration of his nose, cheeks, and left foot 5 days following injection. He arrived hemodynamically unstable and proceeded to exploratory laparotomy. Operative findings were notable for >1 liter of hemoperitoneum and a ruptured spleen. He made a full recovery following splenectomy. Gross and histologic assessment of the spleen was otherwise normal. SDC or defibrillation causing spleen rupture has never been reported. Case reports of spleen rupture following ECT exist, with proposed mechanism of muscle contraction causing sudden increase in intraabdominal pressure. Our patient had no recent trauma or other perceivable causes, although the use of apixaban may have contributed. In our case SDC is understood to be the inciting event, and thus is the first report of SDC causing ruptured spleen.

1270
SPLEEN RUPTURE FOLLOWING SYNCHRONIZED DIRECT CURRENT CARDIOVERSION
David Ferraro, Christopher White

Case Report: Rupture of the spleen is not uncommon following blunt abdominal trauma. Less recognized is atrumatic rupture of the abnormal spleen, where underlying pathology such as infection, neoplasm, or inflammation is the inciting cause. However, atrumatic rupture of the normal spleen is rare. Various described causes include coughing, vomiting, seizure, electroconvulsive therapy (ECT), and colonoscopy: We present a patient who underwent synchronized direct current cardioversion (SDC) for hemodynamically unstable atrial flutter (AFL). He then developed an acute abdomen 2 hr later with operative findings of hemoperitoneum and a ruptured spleen. This 65 year old man was hospitalized in our medical ICU for eosiophilic pneumonia. He had a history of AFL with two prior ablation procedures and was receiving apixaban for stroke prevention. Although improving clinically with corticosteroids, he acutely developed AFL with rapid ventricular rate of 150 BPM, hypotension (BP 80/57 mmHg), and altered mentation. He received SDC once with 250J and immediately converted to normal sinus rhythm. His blood pressure and mental status returned to normal. Two hours later he noted diffuse sharp abdominal pain and was tender on exam. A lactic acidosis (pH 7.10, lactate 8 mmol/L) arose at this time. Focused ultrasound revealed free fluid in the splenorenal recess. He became hemodynamically unstable and proceeded to exploratory laparotomy. Operative findings were notable for >1 liter of hemoperitoneum and a ruptured spleen. He made a full recovery following splenectomy. Gross and histologic assessment of the spleen was otherwise normal. SDC or defibrillation causing spleen rupture has never been reported. Case reports of spleen rupture following ECT exist, with proposed mechanism of muscle contraction causing sudden increase in intraabdominal pressure. Our patient had no recent trauma or other perceivable causes, although the use of apixaban may have contributed. In our case SDC is understood to be the inciting event, and thus is the first report of SDC causing ruptured spleen.

1271
KAPOSI’S SARCOMA AS THE INITIAL MANIFESTATION OF AIDS: DIAGNOSED IN THE ICU
Navitha Ramesh, David Nesheim, Jason Filipoei, Erica Bang

Case Report: Kaposi’s sarcoma is a low-grade mesenchymal tumor involving blood and lymphatic vessels. It is the most common tumor among patients with HIV infection, occurring predominantly in homosexual or bisexual men. A 55-year-old male with no known medical history, presented with weakness and malaise, worsening over the course of 6 mo. He had no toxic habits, and he was a homosexual. He was tachycardic (155 bpm), tachypneic (25 bpm) and hypoxic (89% on room air). He appeared cachectic with temporal wasting and labored breathing. Purple nodules and plaques were present diffusely throughout the face, trunk, extremities and oral mucosa. Initial lab work revealed hyponatremia (131meq/l), hyperkalemia (5.5meq/l), hypoalbuminemia (1.4g/kg), anemia (Hg 12 g/dL), thrombocytopenia (90,000 platelets). He was treated for sepsis secondary to pneumonia. HIV screening test was reactive followed by confirmatory testing. Chest x-ray showed bilateral, patchy, nodular opacities concerning for Pneumocystis jiroveci Pneumonia and the patient was started on Trimethoprim / Sulfamethoxazole and Prednisone. On hospital day 3 the patient was found unarousable, hypotensive (63/44 mmHg), in acute hypercapnic/hypoxemic respiratory failure requiring intubation and initiation of vasopressors. A punch biopsy of the skin lesions confirmed the diagnosis of Kaposi Sarcoma(KS). CT scan of the chest showed planolobar, bronchocentric, ill-defined nodules with superimposed ground glass opacities. Bronchoscopy showed flame shaped patchy hemorrhagic lesions extending from the lung.
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1272
CATASTROPHIC ANTIPHOSPHOLIPID SYNDROME COMPLICATED BY TAKOTSUBO CARDIOMYOPATHY
Arthur Holzclaw, Harris Baloch, Steven Older, Maura Watson, Anthony Ramage

Case Report: The catastrophic antiphospholipid syndrome (CAPS) is a rare phenomenon with fewer than 500 cases reported in the CAPS registry. It is an accelerated form of antiphospholipid antibody syndrome (APS) with high mortality from rapid multi-organ failure due to widespread vascular occlusion. We present a case of CAPS complicated by a Takotsubo, or stress-induced, cardiomyopathy, an association not previously described. A 53-year-old female with a history of hypothyroidism, depression, and chronic pain presented with progressive confusion. Laboratory evaluation revealed a creatinine of 8.4 mg/dL and urinalysis consistent with infection and positive for benzodiazepines, cannabinoids, and opiates. CT head and renal ultrasound were normal. She was admitted for suspected overdose with worsening delirium and intermittent aphasia but no ischemia on MRI brain. On hospital day 4, she developed flail pulmonary edema requiring intubation and new blue toe syndrome with livedo reticulare. TTE showed an ejection fraction of 25% with hyperdynamic bases and mid to apical LV chamber hypokinesis, consistent with Takotsubo cardiomyopathy. Left heart catheterization was aborted due to partial occlusion of the distal aorta and duplex ultrasound was consistent with widespread thrombosis in the aorta, renal and iliac arteries. Review of records revealed positive cardiolipin antibodies and lupus anticoagulant seven yr prior, supporting the diagnosis of CAPS. Plasmapheresis, pulse dose steroids and systemic anticoagulation were initiated with resolution of her multi-organ failure. Less than 1% of patients with APS develop CAPS, which has a 48% mortality rate despite aggressive therapy. Current diagnostic criteria include evidence of involvement of three or more organs, systems or tissues simultaneously or in less than a week and laboratory confirmation of the presence of antiphospholipid antibodies. This case is unique in that while cardiac involvement is common with LV thrombus and valvular vegetations, CAPS-induced Takotsubo cardiomyopathy has never been reported in the literature.

1273
A RARE CASE OF PNEUMOMEDIASTINUM IN A FIRST-TIME HEROIN USER
Ruwan Gamarallage, Twinkle Chandak

Case Report: Pulmonary complications are well-known with the use of intravenous (IV) drugs. The extent and clinical significance of drug induced lung complications depends on the route of use (i.e. inhaled vs injected). Pneumomediastinum as a rare complication of heroin use and healthcare providers should be aware of this condition. We present a 26 year old athletic male without prior history of IV drug use, found unresponsive on a street after reportedly injected an unknown substance. Upon arrival to emergency room he was noted to be in hypoxic respiratory distress. His respiratory rate was 32/min and SpO2 was 79% on room air with blood pressure and temperature in normal range. On exam, he was noted to have subcutaneous emphysema in his neck, and coarse breath sounds bilaterally. CT chest revealed bilateral extensive pulmonary infiltrates, pneumomediastinum, subcutaneous emphysema along the chest wall extending into the neck and paraspinal musculature, and extensive alveolar and interstitial airspace disease bilaterally. Urine toxicology screening was positive for opiates. He was admitted to the ICU and treated with high flow oxygen, IV fluids and antibiotics. He did not require intubation. Interval chest imaging indicated resolving lung infiltrates and pneumomediastinum. With supportive management, hypoxemia resolved and he was discharged home on room air on day 4. On our literature review, we found only two other reported cases of non-traumatic pneumomediastinum as a direct consequence of heroin injection. Mattos et al suggested that the mechanism leading to development of pneumomediastinum is alveolar rupture from Valsalva maneuver at the time of heroin injection. The more common manifestation in new opioid users is non-cardiogenic pulmonary edema from hypoxia-induced increases in pulmonary capillary permeability, which was also noted in our patient. For both conditions, supportive management is adequate.

1274
RARE CASE OF ANCA VASCULITIS WITH ALVEOLAR HEMORRHAGE IN NON- HODGKIN LYMPHOMA
Alok Surana, Reena Bansal

Case Report: Incidence of malignancy is increased in ANCA vasculitis. How- ever vasculitis can also be a part of the paraneoplastic syndrome. Although there have been isolated case reports of leucocytoclastic vasculitis in the setting of lymphoma, ANCA vasculitis in the setting of lymphoma has been rarely reported. We report a case of ANCA vasculitis with alveolar hemorrhage in a patient with non-Hodgkin lymphoma. A 61 year old Caucasian male with a history of hypertension and non-Hodgkin lymphoma presented to the ER with worsening dyspnea and hemoptysis for 2 days. He did not have any history of fever, recent travel, leg swelling or chronic lung disease. He was being seen by oncologist for his non-Hodgkin lymphoma after his recent PET scan showed increased size and metabolic uptake of spleen. On exam he had tachycardia, tachypnea and oxygen saturation of 98% on 2 liters oxygen with nasal cannula and crackles present on both sides. Labs were significant for WBC 39900 with atypical lymphocytes 40%, Hemoglobin of 6 from 9.7, a month ago and creatinine 1.9. Chest radiograph showed Nodular opacities throughout both lungs. The differential diagnosis included multilobar pneumonia with common or opportunistic organisms like pneumococcus jiroveci, alveolar hemorrhage and infiltrative lymphoma. He underwent bronchoscopy, which showed alveolar hemorrhage. He was started on Pulse steroids after which his clinical status improved. His autoimmune work up was positive for ANCA with high myeloperoxidase. Renal biopsy was positive for vasculitis. After a discussion with oncologist and nephrologist he was started on rituximab, which would treat both lymphoma and vasculitis. He was discharged home and after 6 mo continues to do well. Vasculitis is considered a paraneoplastic syndrome. Typically Leucocytoclastic vasculitis has been reported with lymphoma. Rarely ANCA vasculitis can also be associated with non-Hodgkin lymphoma. Fortunately at times, both these disorders may be amenable to treatment with single agent like rituximab.

1275
LOCKED IN: A PEDIATRIC CASE OF ACUTE MOTOR AND SENSORY AXONAL NEUROPATHY
Grace Oei

Case Report: Guillain Barre syndrome (GBS) can cause acute flaccid paralysis in children. GBS can also rarely present with findings stemming from axonal injury. A 3 year old male with a history of asthma was hospitalized for dyspnea attributed to the emergency room two days later for increased lethargy and acute onset of anosmia. On initial evaluation the patient was stridulent and obtunded with anisocoria. On initial evaluation the patient was stridulent and obtunded with anisocoria. On exam he had tachycardia, tachypnea and oxygen saturation of 98% on 2 liters oxygen with nasal cannula and crackles present on both sides. Labs were significant for WBC 39900 with atypical lymphocytes 40%, Hemoglobin of 6 from 9.7, a month ago and creatinine 1.9. Chest radiograph showed Nodular opacities throughout both lungs. The differential diagnosis included multilobar pneumonia with common or opportunistic organisms like pneumococcus jiroveci, alveolar hemorrhage and infiltrative lymphoma. He underwent bronchoscopy, which showed alveolar hemorrhage. He was started on Pulse steroids after which his clinical status improved. His autoimmune work up was positive for ANCA with high myeloperoxidase. Renal biopsy was positive for vasculitis. After a discussion with oncologist and nephrologist he was started on rituximab, which would treat both lymphoma and vasculitis. He was discharged home and after 6 mo continues to do well. Vasculitis is considered a paraneoplastic syndrome. Typically Leucocytoclastic vasculitis has been reported with lymphoma. Rarely ANCA vasculitis can also be associated with non-Hodgkin lymphoma. Fortunately at times, both these disorders may be amenable to treatment with single agent like rituximab.
dysfunction (anisocoria). It is important for critical care clinicians to be aware of this condition, the treatment of which requires prolonged intensive care and close attention to supportive therapies.

1276
SIMULTANEOUS LVAD THROMBOSIS AND ISCHEMIC STROKE TREATED SUCCESSFULLY WITH ALTEPLASE
Adriana Kritic, Cumara O’Carroll, Louis Lanza, D. Eric Steidle, Linda Staley, Rodrigo Carlin-Ceba
Case Report: Left ventricular assist devices (LVADs) have been shown to improve survival, functional capacity and quality of life in patients with advanced heart failure refractory to medical therapy. Complications such as pump thrombosis can result in pump malfunction or catastrophic thromboembolism. We describe a unique case of a patient with a HeartWare LVAD that developed simultaneous evidence of pump thrombosis and ischemic stroke both of which were successfully treated with the use of intravenous alteplase. A 72-year-old man with history of chronic systemic heart failure secondary to ischemic cardiomyopathy is admitted to the ICU with lethargy, dysarthria, and right-sided weakness. Patient had undergone HeartWare LVAD implantation as destination therapy 18 mo prior to presentation. Initial vital signs were stable but his physical examination was remarkable for abnormal auscultation of his LVAD (grinding sound), and neurologic findings consistent with a left cerebral hemispheric stroke. His pump showed evidence of dysfunction including unexpected power increases and elevated flow estimation beyond that predicted from power consumption. Emergent head computed tomography (CT) showed no intracranial hemorrhage or early ischemic changes. Pertinent laboratory evaluation identified an INR of 1.4 and findings of intravascular hemolysis (elevated LDH and hemoglobinuria). Given absence of contraindications for intravenous use of alteplase, he received thrombolytic therapy within the three hour window. His pump dysfunction resolved within min of alteplase administration with normalization of flows and power. His neurologic symptoms also significantly improved with resolution of the aphasia, dysarthria and right sided deficits. A head CT performed after 24 hr showed multifocal infarctions involving bilateral thalami and the left cerebellum. The use of LVADs in patients with advanced heart failure is rapidly increasing and early recognition of complications such as pump thrombosis and thromboembolic phenomena is very important in order to provide timely interventions.

1277
UNUSUAL SKIN LESIONS LEADING TO SEPTICEMIA: A RARE SEQUENCE OF EVENTS
Muznay Khawaja, Asim Mohammed, Vivek Mehta, Uzma Khan, Ankush Asija, Nicholas Pozzessere, Manzoor Rather
Case Report: A 75 year old male with history of hypertension, critical aortic stenosis, prostate cancer and chronic hiventricular systolic heart failure who presented with crusted lesions on his legs, starting at ankles and spreading upwards. His skin lesions remained untreated at home. Although at baseline he had immunocompromised patients, we describe a case of a previously healthy 33 year old male pilot recently arrived to the US from Africa. The patient presented to our ED febrile, disoriented, with multi-organ failure. He was later found to have severe malaria with a high level parasitemia. On a warm spring afternoon, paramedics demanded biobehavioral containment unit forms transported a severely ill patient to a busy urban ED. The patient was found wandering around his hotel naked, disoriented, febrile, with projectile coffee-ground emesis. The patient was found to have severe malaria, 42% parasitemia. He developed multi-organ failure, including acute respiratory failure and acute kidney injury requiring hemodialysis. Due to the severity of his illness, the patient was immediately initiated on the intravenous anti-malarial medication quinidine and red blood cell (RBC) exchange transfusion. Within 12 hr from the start of quinidine therapy, the patient developed severe cardiotoxicity. The patient’s QTc went from 410 msec to 563 msec, a 37% increase from baseline. The quinidine infusion was stopped and the patient was enrolled in an emergent investigational new drug protocol for artesunate. Within less than 48 hr from presentation, the patient’s parasitic load was reduced from 42% to 0.4%. By hospital day 4 the patient was extubated and awake, alert, and oriented. After a 19-day hospital stay, he was discharged neurologically intact at baseline and off hemodialysis. We report a rare case of severe cerebral malaria treated with intravenous artesunate and RBC exchange transfusion in a US hospital. While RBC exchange transfusion is controversial in its utility for the treatment of severe malaria, it appears to have been highly effective in combination with IV artesunate for our patient.

1278
TREATMENT OF SEVERE MALARIA UTILIZING ARTESUNATE AND EXCHANGE TRANSFUSION
David Zodda, Gabrielle Procopio, Kevin Hewitt, Bindu Balani, Andrew Parrish, Joseph Feldman
Case Report: Tropical infections such as malaria, West Nile virus, dengue fever, Lassa fever, and Ebola are appearing with more frequency in patients presenting to emergency departments (ED) in the United States (US). We describe the case of a previously healthy 33 year old male pilot recently arrived to the US from Africa. The patient presented to our ED febrile, disoriented, with multi-organ failure. He was later found to have severe malaria with a high level parasitemia. On a warm spring afternoon, paramedics demanding biobehavioral containment unit forms transported a severely ill patient to a busy urban ED. The patient was found wandering around his hotel naked, disoriented, febrile, with projectile coffee-ground emesis. The patient was found to have severe malaria, 42% parasitemia. He developed multi-organ failure, including acute respiratory failure and acute kidney injury requiring hemodialysis. Due to the severity of his illness, the patient was immediately initiated on the intravenous anti-malarial medication quinidine and red blood cell (RBC) exchange transfusion. Within 12 hr from the start of quinidine therapy, the patient developed severe cardiotoxicity. The patient’s QTc went from 410 msec to 563 msec, a 37% increase from baseline. The quinidine infusion was stopped and the patient was enrolled in an emergent investigational new drug protocol for artesunate. Within less than 48 hr from presentation, the patient’s parasitic load was reduced from 42% to 0.4%. By hospital day 4 the patient was extubated and awake, alert, and oriented. After a 19-day hospital stay, he was discharged neurologically intact at baseline and off hemodialysis. We report a rare case of severe cerebral malaria treated with intravenous artesunate and RBC exchange transfusion in a US hospital. While RBC exchange transfusion is controversial in its utility for the treatment of severe malaria, it appears to have been highly effective in combination with IV artesunate for our patient.
of such cases and consider this diagnosis in the differential of significant thoracic bleeding.

1280
PROLONGED PARALYSIS AND RESPIRATORY FAILURE AFTER ADMINISTRATION OF SUCCINYLCHOLINE
Bryan Emerick, Juan Morales

Case Report: A 55 year old male with a history of squamous cell carcinoma of the neck underwent elective laryngoscopy and biopsy of a laryngeal tumor under general anesthesia which required endotracheal intubation. He was given 200 mg of propofol, 120 mg (1.6 mg/kg) succinylcholine, and 20 mg (0.3 mg/kg) of rocuronium intravenously to induce sedation and paralysis. The patient did not have any complications during the procedure. However, after the procedure, the patient was not able to spontaneously breathe on his own so he was transferred to the ICU for further management. A prolonged half-life of paralytics secondary to pseudocholinesterase deficiency was suspected. Therefore a butyrylcholinesterase level was drawn. The level came back at 1,197 mcg/L (range 1,800–7,700) indicating the patient was indeed deficient. The patient was liberated from the ventilator 16 hr later. Succinylcholine, a depolarizing neuromuscular blocking agent, is one of the drugs of choice to facilitate endotracheal intubation because of its fast onset of action and short half-life due to hydrolysis by the enzyme butyrylcholinesterase. Patients with a deficiency of this endogenous enzyme, albeit rare, will have prolonged paralysis after the administration of succinylcholine. A dibucaine inhibition test can be done to differentiate between including but not limited to organophosphates, cocaine, aspirin, and in this case linesterase. Patients with a deficiency of this endogenous enzyme, albeit rare, will have prolonged paralysis after the administration of succinylcholine secondary to the inability to metabolize the drug. Pseudocholinesterase deficiency is a genetic or acquired condition that may affect the metabolism of certain medications including but not limited to organophosphates, cocaine, aspirin, and in this case succinylcholine. A dibucaine inhibition test can be done to differentiate between a genetic versus an acquired condition. This deficiency may not be identified until the patient receives an offending agent such as succinylcholine and experiences either adverse effects or prolonged paralysis. In the case of our patient, we listed succinylcholine as intolerance in the allergy section of the chart to prevent him from receiving this drug in the future.

1281
SEVERE, NON-INFECTIVE SIRS, SHOCK, AND END ORGAN DYSFUNCTION AFTER ZOLEDRONIC ACID ADMINISTRATION
Sangita Trivedi, Alaa Al-Nofal, Seema Kumar, Sandeep Tripathi, Robert Kahoud, Peter Tebben

Case Report: Objective: Zoledronic acid is an intravenous bisphosphonate used to increase bone mineral density and reduce the risk of fractures. Its safety profile compares well with pamidronate in pediatric patients. We describe a severe, acute, life-threatening, inflammatory reaction in a child after its infusion. Methods: A 7-year-old male was admitted to the PICU for zoledronic acid infusion and subsequent monitoring due to his complex medical history, which was significant for hypoxic-ischemic encephalopathy at birth, quadriplegic cerebral palsy, seizure disorder, ventilator dependence, pulmonary hypertension, hypothyroidism, and secondary osteoporosis with multiple fractures since 2 yr of age. He was previously treated with four infusions of pamidronate without any infusion-related adverse events. He received zoledronate 0.013 mg/kg. Beginning three hr after completion of the infusion, he had progressive tachycardia, fever, hypotension, and increased oxygen requirements. The laboratory work showed leukopenia, thrombocytopenia, high C-reactive protein, abnormal coagulation profile, metabolic acidosis and negative blood and urine cultures. The following day, he developed moderate ARDS, pulmonary hemorrhage, and subsequently diarrhea and abdominal distension. Beginning of clinical resolution was seen from the third day onward and he was discharged on the 6th day after zoledronate administration. Results: Our pediatric patient demonstrated a severe, non-infective, systemic inflammatory response syndrome (SNSIRS) to zoledronic acid administration requiring cardiorespiratory support without an underlying pre-existing inflammatory disorder. Conclusion: This is the first report of occurrence of SNSIRS temporally related to zoledronate infusion. The case highlights the importance of careful monitoring of children following zoledronic acid therapy. Children and their parents should be thoroughly counseled on the potential risks of bisphosphonate treatment, which can sometimes be severe, acute and life threatening as in our case.

1282
METFORMIN-INDUCED LACTIC ACIDOSIS—DID THAM DO THE TRICK?
Abhinav Gupta, Bogdan Tiru

Case Report: THAM (Also known as tromethamine) is an alternate buffer that acts as a proton acceptor and can be used both for metabolic and respiratory acidosis without carbon dioxide generation. Optimal buffering capacity occurs with intact renal function. Potential clinical indications in ICU include severe respiratory acidosis in ARDS, Shock with refractory acidosis, intoxications etc. We present a 42-year-old male brought to hospital after intentional ingestion of 270 grams of metformin (270 tablets of 1000 mg each). After intubation, he received activated charcoal and subsequently Golytely. On initial labs, 2 hr post overdose, serum bicarbonate was 16 meq/L. Anion gap 22 and Lactate 6.2 mmol/L. Emergent hemodialysis was initiated with a diagnosis of metformin induced lactic acidosis and anuric acute kidney injury. While on hemodialysis, he continued to worsen with bicarbonate of 9 meq/L and lactate of 23 mmol/L at 12 hr post overdose. 19 hr post overdose, bicarbonate reached a nadir of 3 meq/L and anion gap peaked at 54. 24 hr post overdose, he has developed Shock with escalating doses of vasopressors, Multiorgan dysfunction with Renal failure, Respiratory failure and DIC with lactate peaking at 31.4 mmol/L. Considering profound metabolic acidosis despite receiving more than 24 hr of high dose hemodialysis, extremely high minute ventilation of 30 L/min, we decided to use THAM at 42 hr post overdose. 3700 ml of THAM was given over 16 hr despite anuric renal failure on HD. Within hr, his hemodynamic parameters, vasopressor requirements, lactate level (6.2 mmol/L) and bicarbonate level (19 meq/L) improved. Patient made significant recovery, was extrabated and discharged from ICU on day 7 and his kidney injury resolved before hospital discharge. To our best knowledge, this case is unique due to large amount of ingested metformin (270 grams), largest amount reported and use of full dose hemodialysis and THAM in the presence of anuric renal failure.

1283
ATYPICAL PRESENTATION OF POSTERIOR REVERSIBLE ENCEPHALOPATHY SYNDROME (PRES) AFTER IVIG THERAPY
Janine Elizabeth Zee-Cheng, Kamal Abulebda

Case Report: Posterior reversible encephalopathy syndrome (PRES) is characterized by neurologic symptoms such as headache, confusion, seizures, and visual disturbance; and by radiographic lesions seen predominantly in the posterior part of the brain. Lesions may occur in other distributions with varying imaging appearances. Early recognition of atypical PRES as a complication of different childhood diseases and therapies may facilitate precise diagnosis and appropriate treatment. We describe a case of an 11-year-old male who presented with atypical PRES following IVIG administration. The patient had a history of behavior disorder and had been started on lamotrigine three weeks prior to presentation. Presenting symptoms included fatigue; vomiting; diarrhea; and a coalescent, erythematous, blistering rash over his face and shoulders. The rash progressed over the next several days to involve his entire body, including mucous membranes of the eyes and mouth. He was also noted to have transaminites. He was admitted to the ICU and treated with intravenous immunoglobulin (IVIG) at a dose of 1g/kg/day for 3 days’ duration for a presumptive diagnosis of Stevens-Johnson syndrome (SJS). Due to the nature of the rash and profound eosinophilia, however, a definitive diagnosis of DRESS was made. Seven days after admission, he developed sudden elevated blood pressure, altered mental status, and seizures. MRI revealed patchy, symmetric edema in the gray and white matter involving the frontal, temporal, parietal, and occipital lobes, consistent with atypical posterior reversible encephalopathy syndrome. A nicardipine infusion was initiated, with subsequent improvement in hypertension and mental status. The patient was discharged home ten days later with intact neurologic status. In pediatric patients, PRES is precipitated by acute elevations in blood pressure associated with renal disease, connective tissue disorders, neoplasms, and immunosuppressive drug treatment. PRES associated with administration of IVIG has been infrequently reported.
1284

NOT EVERY FILLING DEFECT ON A CHEST CT ANGIOGRAM IS A PE

Faiza Hashmi

Case Report: Non thrombotic causes of filling defect seen on a Chest CT angiogram. A 24 year old woman with a known factor V Leiden heterozygous mutation was transferred for further management of a Sub-Massive Pulmonary embolism. She had been diagnosed with bilateral PE about a month ago after experiencing shortness of breath and pleuritic chest pain. She was started on anticoagulation with warfarin with which she had been compliant with and had therapeutic INR. However she continued to experience shortness of breath and required supplemental oxygen. Two weeks after the initial diagnosis she suffered a syncopal event at home and then was readmitted to the hospital where a chest CT demonstrated the large central PE as well as bilateral segmental emboli. An Echocardiogram was performed which showed severe pulmonary hypertension associated with severely dilated right ventricle and estimated RVSP >100. The patient’s hypoxic respiratory failure continued to worsen and her mobility was severely restricted by SOB and hypoxemia. She was evaluated by Vascular interventional radiology as well as Cardiovascular surgery for further management. As she was hemodynamically stable at the time the plan was to thrombolysie via PA catheter directed tPA infusion. Unfortunately after thrombolytic infusion for 24hr along with therapeutic systemic heparin there was no improvement in PA pressures or on the appearance of the lesion on relook angiogram. The patient had worsening tachycardia, increasing oxygen requirements and ultimately decompensated later that night with a bradycardiac arrest. An autopsy was requested which showed a pulmonary artery intimal sarcoma (CPM gene amplification) arising from the left side of main pulmonary artery as a lobulated mass as well as tumor emboli in right pulmonary artery branches associated with infarcts. PA sarcoma is a very rare disease, often masquerading as Pulmonary embolism and hence has a delayed diagnosis most often at autopsy. This case illustrates that not all filling defects are thrombotic in nature.

1285

A RARE COMPLICATION OF APIXUBAN: DIFFUSE ALVEOLAR HEMORRHAGE

Chieh Loh, Matthew Miles

Case Report: Alveolar hemorrhage from novel anticoagulants are rare but have been reported. Non vitamin K antagonists have lower major bleeding risk and case fatality in comparison with warfarin. Our case is a 50 year old female who presented with worsening exertional dyspnea and coughing pink frothy secretions. PMH: atrial fibrillation, hypertension, diastolic heart failure, TIA. She denied any fevers, chills, recent travel or sick contacts. She had been taking apixaban 5mg twice daily since 4 weeks ago. She was tachypneic and had sats 80% on 6 liters nasal cannula. There was no response to furosemide. She was started on anticoagulation with warfarin with which she had been compliant with and had therapeutic INR. She continued to experience shortness of breath and require oxygen supplementation. Labs showed WBC 10.7, platelets 223, INR 1.11, creatinine 0.92, BNP 147. Urinalysis, UDS and RVP came back negative. Chest CT showed extensive multifocal areas of groundglass attenuation and consolidation bilaterally with crazy paving appearance. (Fig 1) Her TTE showed a normal LV EF. Bronchoscopy showed bloody secretions in her airways. BAL of the lateral segment of right middle lobe with serial aliquots had bloody return on successive lavage. (Fig 2) BAL cytology showed hemosiderin-laden macrophages on a Prussian blue special stain. Microbiology cultures including fungal stains were negative. ANA, ANCA and anti-GBM were negative. Her hemoglobin dropped slightly from 11.3 to 10.3. She was managed supportively and extubated on day 3. Her CXR on day 7 showed markedly improved airspace opacities and she was on room air by day 5. This is the second reported case of alveolar hemorrhage from apixaban. Compared to the previous case, our patient was younger, had been on apixaban longer, had more severe hypoxic respiratory failure requiring intubation. While reversal agents for novel anticoagulation are being developed, and 4 factor PCC have been shown to reverse steady state effects of apixaban ex-vivo, there is still limited data on how these fare clinically. These two reported cases of DAH associated with apixaban have been managed conservatively without significant morbidity.

1286

CHRONIC THROMBOEMBOLIC PULMONARY HYPERTENSION (CTEPH) AND INHALED ILOPROST THERAPY IN PREGNANCY

Michelle Horng, Insaf Mohammad, Zach Smith, Rana Awdish, Hector Cajigas

Case Report: Chronic thromboembolic pulmonary hypertension (CTEPH) is a subset of pulmonary hypertension caused by acute and recurrent pulmonary emboli. Pulmonary endarterectomy (PEA) is the treatment of choice. However, 10–50% of patients are ineligible for this procedure. We report a case of an inoperable, morbidity obese (228kg, BMI 83.5) pregnancy patient. A 25-year old female (G3, P2) presented at 24 weeks gestation with a four day history of dyspnea. A right heart catherization revealed a mean right atrial pressure (mRAP) of 14 mmHg, pulmonary artery pressures of (S/D/m) 82/26/45 mmHg, and pulmonary capillary wedge pressure (PCWP) of 30 mmHg. Pulmonary vascular resistance (PVR) using Fick cardiac output (CO) was calculated to be 4.67 Wood units (CI 1.61 l/min/m2). Bilateral pulmonary angiography revealed filling defects and confirmed the diagnosis of CTEPH. The patient was evaluated by cardiothoracic surgeons and deemed to be high risk for PEA, so a multidisciplinary team initiated medical therapy and scheduled a cesarean section delivery for 32 weeks of gestation. After week 24 of pregnancy, sildenafil was initiated. In order to optimize the patient’s hemodynamic status prior to surgery, inhaled iloprost was added at 26 weeks of gestation, titrated to 5 mcg inhaled every 2 hr while awake with a maximum of 9 inhalations per day. One week after initiation iloprost, a repeat TTE revealed an estimated sPAP of 63 mmHg (day 29) RAP of 8 mmHg, PVR of 5 Wood units, PCWP of 5 mmHg, and CO of 6.09 l/min (CI 2.04 l/min/m2). At 32 weeks of gestation, her sPAP was 77 mmHg, RAP was 15 mmHg, and PCWP of 16 mmHg. A healthy 1.741 gram male infant was delivered via cesarean section. The patient was transferred back to the medical ICU in stable condition and discharged home 9 days following the procedure with instruction to continue the regimen of sildenafil and iloprost. She will pursue thromboendarterectomy following weight loss to below 181 kg. To date, this is the first case report of a pregnant patient with CTEPH with successful delivery after medical management.

1287

TOXIC EPIDERMAL NECROLYSIS AFTER PEDIATRIC MULTIVISCERAL TRANSPLANT TREATED WITH PLASMA EXCHANGE

Amanda Alladin, Marisa Defreitas, Jennifer Garcia, Thiago Beduschi, Akin Tekin, Chryso Katsoufis, Carolyn Abitbol, Michael Nares

Case Report: Toxic Epidermal Necrolysis (TEN) is rare in the pediatric population. There is evidence for genetic susceptibility in certain populations but this process is thought to be mainly a T-cell immune mediated reaction to an offending drug. We describe the case of a four year old African-American male with a history of gastrochisis and subsequent intestinal failure who underwent a multivisceral transplant consisting of liver, stomach, pancreas, small and large intestines. Splenectomy was performed at the time of operation. He showed a lengthy period with multiple bacterial and viral infections. Approximately 4 mo after his transplant he began to develop bullae on his face and mouth which gradually progressed over the next 2 mo to cover an estimated 60% of his body including his scalp, face, chest, limbs and abdomen. These lesions would blister and slough easily with any type of contact. He was investigated for infectious etiologies, which were negative. Biopsy of the lesions showed apoptotic keratinocytes with epidermal necrosis. The reaction was thought to be secondary to ibuprofen, intravenous Tylenol or piperacillin-tazobactam. When conservative management with frequent wound care failed, the decision was made to pursue therapeutic plasma exchange (TPE) along with replacement of intravenous immune globulin (IVIG). He received five sessions of TPE over eight days with two infusions of IVIG. There was almost immediate improvement in the appearance of his lesions. Wound care was continued and by the time of discharge 2 mo later his skin was completely healed with only patches of hypopigmentation. Interestingly, this patient displayed a severe leukemoid reaction after completing TEN. A healthy 1,741 gram male infant was delivered via cesarean section. The patient was transferred back to the medical ICU in stable condition and discharged home 9 days following the procedure with instruction to continue the regimen of sildenafil and iloprost. She will pursue thromboendarterectomy following weight loss to below 181 kg. To date, this is the first case report of a pregnant patient with CTEPH with successful delivery after medical management.
exchange in addition to conventional therapies in the treatment of refractory TEN in pediatrics.

1288

ARE CHILDREN JUST LITTLE ADULTS–THE CONTROVERSY OF PEDIATRIC ISCHEMIC STROKE TREATMENT

David Berger, Rita Morad, Paras Khandhar

Case Report: Pediatric stroke is rare with estimated incidence of 2.3–13 pediatric strokes per 100,000 children. Pediatric ischemic-type stroke confers 6–10% mortality, 75% neuro-morbidity and 20% chance of recurrent stroke. While alteplase (tPA) and neuro-interventional (IR) procedures are not FDA-approved in children, our objective is to describe an ischemic stroke where both were utilized. This is the case of a 9-year-old previously healthy male who presents to Emergency Department (ED) with symptoms that began 76 min prior to arrival and witnessed by family. Initially he felt right sided headache, then difficulty ambulating and inability to move left side of body. Upon arrival, NIHSS was 11 notably with left hemiparesis and left facial droop. Stroke team was activated and emergent cat scan (CT) was negative. Emergent magnetic resonance imaging (MRI) occurred revealing right middle cerebral artery (MCA) thrombus with occlusion at the M1/M2 junction. The clinical pharmacist rapidly prepared tPA at a dose of 0.09 mg/kg bolus followed by 0.81 mg/kg infusion; this was started at 202 min after symptom onset and 126 min after ED arrival. With tPA infusing, IR performed cerebral angiogram with successful thrombectomy of an occluded supraclinoid carotid. This child was in hospital for ten days, first five being in ICU. At discharge he had 2/5 strength in LUE and 3/5 strength in LLE. The etiology of his stroke remains uncertain since had negative cardiac and hypercoaguable workup. Twelve days after discharge he now has 3/5 strength in his LUE as well. Hypercoaguable workup reassessed and remains negative and he continues to progress well. Stroke is in the top five causes of adult mortality. This has led to an increasing number of hospitals being designated stroke centers. Pediatric stroke is highly variable in presentation and may be missed by ED providers. Although rare, pediatric stroke confers mortality and morbidity that is alarming. This case report occurred at tertiary care center which utilized multidisciplinary approach.

1289

PLASMA EXCHANGE IN REFRACTORY MULTI-ORGAN DYSFUNCTION SECONDARY TO HYPERTERMIA

Katherine Irby, Joana Mack, Amber Morse, Jennifer Pham, Stephen Schexnayder

Case Report: Exertional heat stroke is defined as exercise that results in excessive heat production by muscle with the body unable to effectively dissipate the heat. The patient will present with core body hyperthermia, central nervous system dysfunction, and hypovolemic shock. The inflammation associated with this presentation leads to multi-organ dysfunction syndrome (MODS) and is potentially life-threatening. This case report describes a 17 year old with exertional heat stroke who developed MODS resulting in cardiac arrest with return of spontaneous circulation (ROSC). She demonstrated marked improvement in organ dysfunction with the implementation of continuous veno-venous hemodialysis (CVVHD) and plasma exchange. On arrival to the emergency room, she was cooled with saline during a 15 minute transport. Her vitals were documented with a temperature of 39.4°C, HR 200, and BP of 70/40. She was intubated and required epinephrine and nonpneumephrine infusions. On arrival to the Pediatric Intensive Care Unit, labs demonstrated a coagulopathy with Prothrombin Time 28.2 seconds, International Ratio 2.8, and Partial Thromboplastin Time 69.1 seconds. Urine output was minimal. A creatine kinase level at presentation was 584 U/L (peaking at 21585 U/L). She required escalation of her ventilator settings and vasoactive support. She went on to develop hypotension leading to bradycardic arrest. She received 3 doses of epinephrine and 1 dose of vasopressin with ROSC. She was then started on a vasopressin infusion. She had a hemodialysis catheter placed and was started on CVVHD and daily plasma exchange for a total of 5 days. Within 24 hr of her first plasma exchange, she had marked improvement in her vasoactive requirement and coagulopathy. Over the next 48 hr, her ventilator settings were weaned, vasoactive infusions were discontinued, and coagulopathy resolved. This is one of four case reports describing treatment with supportive care with the addition of plasma exchange to mediate the inflammatory response known to occur with heat stroke.

1290

HEREDITARY ANGIOEDEMA PRESENTING AS FOREARM COMPARTMENT SYNDROME

Kiran Kumaran Bhoosektra, Sheila Hanson

Case Report: Compartment syndrome secondary to arrhythmic etiologies are extremely rare in pediatric age group. We present a case of a 13 year old female who presented with swelling involving the dorsal aspect of her right hand for one day, which progressed to involve her right forearm in next few hr. There was no history of any recent trauma including insect or animal bites, puncture wounds or abrasions. She was afibrile and hemodynamically stable on arrival. She had a normal white cell and differential count with a normal ESR and CRP. Plain radiographs were negative except soft tissue swelling. Ultrasound Doppler, magnetic resonance imaging (MRI) and computed tomographic angiography (CTA) of right upper extremity (RUE) ruled out vascular etiologies. On serial neurovascular examinations, she had worsening RUE edema and erythema which extended through proximal forearm to elbow with worsening pain on passive range of motion and compartments that felt tense. She underwent emergent right hand and forearm fasciotomies in view of findings in view of compartment syndrome with compartment pressures of 50 mmHg. Further investigations revealed that her complement C4 levels were undetectable with severely low C1 esterase levels (7 mg/dl; normal range 21 – 39mg/dl) and borderline low C1 esterase activity. She was thus diagnosed with Hereditary Angioedema, type 1 and received a dose of plasma derived purified C1-Esterase inhibitor (C1-INH) before she was discharged home. In view of relatively frequent symptoms of angioedema on follow up, she was started on a regimen of Icatibant, a bradykinin receptor antagonist to be used as needed at the onset of symptoms of angioedema and twice weekly intravenous administrations of C1-INH for prophylaxis. We highlight a rare but serious complication of a hereditary disease not commonly seen by the pediatric community. With the advent of new therapies available to manage this problem effectively in last few yr, potentially limb-threatening complications of this disorder are now avoidable.

1291

EARLY VENOVENOUS ECMO FOR REFRACTORY STATUS ASTHMATICUS IN A PEDIATRIC ADOLESCENT

Dominick Figueroa, Jose Hernandez Rivera, Fernando Beltramo

Case Report: Status asthmaticus can be a severe, life-threatening disease and is one of the most common diagnoses requiring emergency department (ED) visits and hospital admissions. It is estimated that about 30% of patients admitted to the ICU will require intubation and mechanical ventilation. It is extremely rare for a patient to have persistent hypercapnia despite mechanical ventilation. We report the case of an adolescent female that developed status asthmaticus requiring venovenous extracorporeal membrane oxygenation (VV ECMO). A 12-year-old female seen at an outside hospital ED with severe status asthmaticus. She had a history of mitral valve prolapse, allergies, and asthma with multiple ED visits. On exam, she was tachypneic with severe retractions and absent breath sounds on auscultation. She was placed on oxygen and received multiple albuterol and ipratropium nebulizations, methylprednisolone, and ceftriaxone. Magnesium sulfate, continuous albuterol, and terbutaline drips were initiated. An arterial blood gas showed a pH 7.08, pCO2 88.7, pO2 154.5, HCO3 25.6, and a base excess of -6.4. She was intubated, placed on mechanical ventilation, and transferred to our ICU. A chest x-ray showed a pneumomediastinum. Serial blood gases continued to show severe respiratory acidosis, with pH values as low as 6.95 and the pCO2 greater than 115. The patient was placed on Heliox. Due to persistent hypercapnia, the patient was placed on VV ECMO using a bicaval, dual-lumen catheter. An endotracheal tube culture grew StrepEpococcus pneumoniae and she received 14 days of antibiotics. A viral panel PCR was positive for rhino Enterovirus. Six days later, ECMO was discontinued and she remained on mechanical ventilation. On day 11, she was extubated and was discharged home on day 21. Asthma is a serious, sometimes fatal condition especially in the pediatric population. A very small percentage of these patients do not respond to conventional management. Early initiation of ECMO is effective in treating refractory acute respiratory failure.
A NOVEL ICU STAFFING MODEL WITH INTENSIVISTS AND SELECT HOSPITALISTS IN A COMMUNITY HOSPITAL
Scott Davis, John Olsen, Holly Peterson, Roberta Basol, Linda Chinmielewski

Learning Objectives: Board Certified Intensivist staffing of an ICU has been shown to improve clinical and financial outcomes. There is a nationwide shortage of Intensivists to staff ICUs. We propose an ICU staffing model that integrates Intensivists and select Hospitalists to staff a 28 bed community hospital ICU.

Methods: St. Cloud Hospital has an open 28 bed ICU staffed by dedicated Intensivists during daytime hours 7 days a week and on-call Intensivists 24 hours a day. A staffing model was trialed that included select Hospitalists working alongside board certified Intensivists in the ICU during daytime hours. The Hospitalists were required to be credentialed in certain ICU procedures, ventilator management and to complete FCCS certification. The Hospitalists participated in ICU rounds and ICU quality improvement projects. All patient care was overseen by the Intensivists during twice daily rounds with additional periodic consultation. The model eliminated financial competition for patients. Clinical outcomes of sepsis mortality (ICD-9 codes 995.92, 785.52), average ventilator hours and total mortality were compared to historical outcomes. Financial outcomes were also measured.

Results: In the baseline period of FY2012 2064 patients were cared for in the ICU. In 2014 there were 2474. Severe sepsis/septic shock mortality (23.7 to 23.4%), mean ventilator hours (59 to 67), total ICU mortality (3.97 to 4.04%) and case mix index (3.15 to 3.23) were relatively unchanged between the two time periods. The percent of patients who had been on mechanical ventilation and discharged home increased slightly from 20.7% to 23.0%. Financial analysis of operational costs revealed a saving of $344,236. The change also resulted in 9 hr of additional ICU physician presence per day.

Conclusions: A novel ICU staffing model integrating select Hospitalists with Intensivists oversight allowed for more patients to be cared for by the Intensivist program and for increased physician presence. Analysis of key patient outcomes and financial measures revealed considerable cost savings with improved or maintained patient outcomes.

A SYSTEM-WIDE APPROACH TO DRUG PRICE INFLATION AND THERAPEUTIC ALTERNATIVES
Jennifer Anderson, Jennifer Raynor, Leo Rotello

Learning Objectives: Cost savings without compromising care is essential. Partnering with pharmacy to discuss frequently used medications, those on national shortage or whose cost has increased is critical to developing a timely response for change. This approach could decrease acquisition costs on high profile medications. We suggest this method as part of a system-wide approach to the evaluation of high profile medications in all institutions.

Methods: We queried our pharmacy cost profile to identify areas of savings. We targeted medications noted to have increased in price and/or those with an effective, less expensive alternative. Nitroprusside (Nipride) met both criteria. We found in the past 2 years the price for a 50ml vial of nitroprusside increased 11,000% with an average daily cost of $1400. A review of nitroprusside use revealed the majority was for cardiothoracic (CT) patients undergoing open heart surgery. Our practice was to pre-mix the infusion prior to surgery and to discard any unused drug. We met with the surgeons and anesthesiologists and agreed to substitute nicardipine (Cardene) for nitroprusside and to abandon our practice of pre-mixing the medication. In April 2015, the pharmacy began to substitute nicardipine in open heart cases. Post-operative orders were changed to reflect nicardipine as the IV antihypertensive of choice. Nitroprusside use for hypertension in other critical care areas was monitored and to abandon our practice of pre-mixing the medication. In April 2015, the pharmacy began to substitute nicardipine in open heart cases. Post-operative orders were changed to reflect nicardipine as the IV antihypertensive of choice.

Results: Partnering with pharmacy to discuss frequently used medications, those on national shortage or whose cost has increased is critical to developing a timely response for change. This approach could decrease acquisition costs on high profile medications. We suggest this method as part of a system-wide approach to the evaluation of high profile medications.
of resources. Dedicated CCB educational resources may be indicated to help maximize potential lost ED revenue opportunities.

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COMPARISON OF APP AND PHYSICIAN FINANCIAL REIMBURSEMENT IN AN ACADEMIC TRAUMA/SURGICAL ICU
Scott Sherry, Kyle Hart, Kate Kenemer, Samantha Underwood, Kelly Kiraly

Learning Objectives: With the increased use of Advanced Practice Providers (APPs), Physician Assistants, and Nurse Practitioners in ICU roles, the financial reimbursement of these providers must be considered and fully understood with respect to their utilization. Reimbursement for APP billing for Medicare / Medicaid is ~ 85% of physician reimbursement for similar services such as evaluation/management (E/M) and procedures. Commercial insurance does not always follow this pattern and in most cases reimburses at 100% physician reimbursement. The authors sought to understand the true financial reimbursement differences of APPs and physicians for a Trauma/Surgical ICU in an academic university hospital. The null hypothesis is that there is overall no significant difference in APP reimbursement compared to physician reimbursement across a variety of common E/M and procedure codes as well as insurance carriers. Methods: We obtained a sample of 19670 services (1727 provided by APPs and 17943 provided by physicians) from the hospital financial database. To evaluate the difference between APPs and physicians in the proportion of bill recovered, we used a linear regression model to analyze 1494 procedures performed by PA/NPs and 3722 procedures performed by physicians, matched on propensity score (probability of a procedure being performed by an APP versus a physician) in a 1:3 ratio using a nearest-neighbor approach. We used a matching caliper of 0.02 standard deviations. Results: After matching on propensity score, the model predicts a difference in proportion of bill recovered to be on average 1% lower for APPs compared to physicians (see Table 1). Conclusions: This study showed a statistically significant difference in reimbursement of only 1% for all payers for our payer mix (39% commercial, 29% Medicaid, 32% Medicare). The difference across all insurance carriers may not be meaningful over the total financial reimbursement due to the smaller number of billing done by the APP only. Economic value and ability of physician to perform other services was not evaluated. Further study of APP reimbursement is warranted.

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COST EFFECTIVENESS OF INTENSIVE CARE IN THE UK
Michael McLaughlin, Joanne McPeake, John Kinsella, Tara Quasim

Learning Objectives: In the UK the National Institute for Health and Care Excellence requires a new treatment to reach a cost effectiveness threshold of between £31200 and £46900 per Quality Adjusted Life Year (QALY) to be considered for implementation in the NHS. A 2007 UK study suggested that the incremental cost per QALY gain of treatment in ICU was ($1091) and was not cost effective. This analysis was based on a health utility score of 0.66 and no increase in health care utilization after ICU. This current study modelled the cost-effectiveness of ICU using 4 different scenarios. Methods: Previous work in our hospital has shown that QoL and health utility scores, after ICU are affected by work status (employed 0.77 vs retired 0.62 vs unemployed 0.08 vs long term sick 0.05). Using the standardized UK costs, we ran 4 models. Assuming the status quo with updated UK healthcare costs, QoL is poorer after ICU but no increase in healthcare utilization, increased health care utilization after ICU (2.3 or 5 times the population norm) but QoL is 0.66, both QoL is poorer and health care utilization is increased. Results: With the updated status quo the cost per QALY is $15049. When the population is divided into the employed, retired, unemployed and the chronically sick the costs per QALY are $12917, $16019, $121124 and $187400. If the health utility is assumed to be 0.66 but we assume increased healthcare utilization of 2, 3 and 5 times the population norm the costs per QALY are $20036, $25021, $34995. If there is both a poorer QoL and increased healthcare utilization the costs per QALY range from $17195 to $435783. Conclusions: Whilst many patients return to an acceptable level of health, many struggle physically, financially, socially and psychologically. Although potentially the minority of patients, these groups are of working age and pose a significant economic burden to society. Small, targeted changes are required to improve QoL and the cost per QALY for ICU services. A holistic approach with generic and vocational rehabilitation is required if we are to prevent recurrent ill health and dependency.

1298

CRITICAL CARE PREPAREDNESS IN LAW ENFORCEMENT: TALES OF TWO TYPES OF CITIES
Philip Walker, Niels Martin, Steven Allen, Jose Pascal L., Lewis Kaplan

Learning Objectives: Learning Objectives: To describe law enforcement officer (LEO) preparedness for crisis events requiring critical medical care intervention and to determine what factors influence their preparedness. We hypothesized that state capital (C) vs non-capital (NC) LEOs would carry more equipment on their person and have more training in equipment use. Methods: Methods: A single interviewer conducted telephone interviews with Police Department (PD) leadership in each capital (n = 50) as well as a randomly selected non-capital area (suburban; n=50). The query used a template questionnaire assessing equipment, portability, storage location, training as well as impediments to acquiring equipment and training. Comparisons were by X2 as appropriate. Results: Results: 37 C and 25 NC PDs responded for an overall response rate of 62%. Gloves (C 97.2%, NC 100%; p=0.78), gauze (C 91.4%, NC 95.6%; p=0.39) and CPR masks (C 85.7%, NC 83.3%; p=0.79) were most commonly issued. No LEO had 14G catheters for pleural decompression, and only NC carried O2 tanks (4.4%; p=0.001). Most supplies were stored in the vehicle trunk (C 83.3%, NC 86.9%; p=0.69). Medical kits were less frequently carried on the LEO vest, belt or “go bag” (C 37.8%, NC 48%; p=0.14). Many, carried tourniquets (C 77.1%, NC 65.2%; p=0.14) but few had training in their use (C 2.7%, NC 0%; p=0.001). In comparison, most had training in CPR and AED use (C 94.5%, NC 84%; p=0.25). Conclusions: Conclusions: Capital and NC city PDs are similarly equipped and trained for emergent first provider care. PDs infrequently outfitted LEO with portable rescue equipment kits that are easily deployable, instead primarily sequestering them in a vehicle trunk. Despite the high penetrance and well-known benefits of tourniquets, LEOs are rarely trained in their application. LEO preparedness for immediate critical care interventions needs improvement and offers opportunities for Intensivists to partner with PDs to augment training to enhance deployable skills.
adapted to research, along with careful clinical bedside assessment facilitated efficient screening, consenting and patient enrollment in 55 academic critical care studies over 10 years.

1300 ECONOMIC IMPACT OF VITAMIN D LEVELS LESS THAN 18 NG/ML ON HOSPITALS AND THIRD PARTY PAYERS
Leslie Matthews, Kenneth Wilson, Yusuf Ahmed, Diane Dennis-Griggs, Carol Thomas, Ed Childs, Carolyn Moore, Omar Danner

Learning Objectives: Vitamin D3 levels less than 18 ng/ml is associated with increased mortality rate of 30% from all causes. The economic impact of vitamin D3 deficiency has been unknown. We hypothesize that a vitamin D3 less than 18 ng/ml increases the financial burden on hospitals in terms of ICU cost, Hospital ward cost, ventilated associated pneumonias, myocardial infarctions, and total hospital days. Methods: We looked at 2 groups of patients at Grady Memorial Hospital from 2009 - 2012. Those with vitamin D levels less than 18ng/ml and those with vitamin D levels greater than 18ng/ml. Primary outcomes were ICU cost, total hospital cost, VAP, MI, and total hospital days. Results: Of the 565 patients included in the study, 26.7% (n=162) were female vs. 71.3% (n=403) males, 31.3% (n=177) patients were Caucasian and 66.4% (n=375) were African American. 20.2% (n=114) developed ventilated assisted pneumonia, 5.8% (n=33) suffered Myocardial infarction during the hospital stay. Comparing between the two groups; patients with vitamin D levels less than 18ng/ml suffered more VAP (24.3% vs. 15.5%, P= 0.024), MI (7.6% vs. 2.8%, P= 0.031), stayed longer in ICU (11.4 a 0.95 vs. 8.11 ± 1.1 days, P= 0.03), hospital ward (23.4 ± 1.96, vs. 15.27 ± 1.5, days P=0.005), as well as increased ICU financial cost ($43,965 ± 3,683 vs. $31,274 ± 4,311, P=0.033) and Hospital ward cost ($29,780 ±2,501 vs. 19,418 ± 1,923, P=0.005). VAP and MI’s added $40,000 and $70,000 to hospital costs, respectively. Conclusions: Vitamin D3 deficiency is associated with a significant financial impact on hospital and third party payers. Further studies are needed to calculate the full economic impact on hospitals, states, countries, and third party payers.

1301 FORMAL POST-GRADUATE CRITICAL CARE TRAINING FOR ADVANCED PRACTICE PROVIDERS CAN RESULT IN MEASURABLE
Tara Collins, Corrina Sicinouris, Danielle Callahan, Georgiana Telford, Heidi Elgort, Deborah Becker, Kathleen Burke, Niels Martin

Learning Objectives: Advanced Practice Providers (APPs) (Nurse Practitioners and Physician Assistants) continue to have an increasing presence in the Intensive Care Unit (ICU) workforce. However their graduate training provides broad scope in acute care and does not prepare them to care for highly specialized critically ill patients in an academic medical center. This leads to prolonged onboarding and training when APPs are hired into the ICU for their first job. We hypothesize that a post graduate fellowship can bridge this gap with demonstrable performance metrics both clinically and academically. Methods: We designed a novel 10 month critical care APP fellowship in partnership with our health system and local university. This included both intensive clinical immersion and protected academic time for a post-Master’s APP Critical Care certificate program. This program included formal didactics and hands-on training relevant to ICU care. Fellowship educational value was assessed via pre and post fellowship administration of the Multidisciplinary Critical Care Knowledge Assessment Program (MCCKAP), self-evaluations performed at 5 months and at completion of the fellowship, and core competencies evaluation by clinical instructors. Results: 9 APPs successfully completed the fellowship and earned the Postmasters certificate. MCCKAP score trended higher from 69.89% (SD: 6.41) to 78.00% (SD: 11.08) (p=0.076). Self-evaluations revealed a 63% decrease in self-ratings of novice (48 vs 18) and a 16.7% increase in self-competency ratings (181 vs 215). All 9 fellows were hired into the health system with little or no needed orientation. Conclusions: APP critical care fellowships developed in partnership with hospital and university stakeholders can effectively train APPs for practice in an ICU. Not only are formal metrics improved, but onboarding time into their ultimate job is expedited.

1302 HEALTHCARE PROVIDERS KNOWLEDGE OF AND OPINIONS REGARDING MEDICATION COSTS IN CRITICALLY ILL PATIENTS
Drayton Hammond, Tiffany Chiu, Nikhil Meena, Rajani Jagana, Jacob Painter

Learning Objectives: Medication cost is frequently overlooked when treating critically ill patients. Because stewardship of healthcare resources in a setting of high utilization is imperative, we sought to determine the extent to which healthcare providers (HP) who care for critically ill patients are aware of and consider medication costs. Methods: HPs (nurses, medical students and residents, and pulmonary fellows and attendings) in a single medical intensive care unit (MICU) completed a validated, 27-item survey in January-May 2015. The survey queried cost-limiting strategies and most and least expensive medications in 8 classes, medication price ranges, and intravenous-to-oral (IV-to-PO) comparisons for medications commonly prescribed in the MICU. These strategies and cost evaluations were analyzed using descriptive statistics and compared between HPs using Fisher exact tests. Results: Among 98 HPs surveyed (67% resident, 17% nurse, 7% fellow, 5% attending, 3% student), 60% believed pharmacists limit the use of expensive medications, particularly senior physicians (58% resident vs. 86% fellow vs. 100% attending, p=0.007). When ordering a medication, 49% consider its cost. A quarter (25%) of HPs considered themselves knowledgeable about cost with no difference between HPs (p=0.174). In the 16 most and least expensive medication questions, there was a difference in correct answers between attendings (9.6), fellows (7.6), residents (8.5), students (6.7) and nurses (8.3) (p=0.044). Attendings were most familiar with the most expensive Gram positive (p=0.042) and least expensive Gram negative (p=0.002) antibiotics. The correct price ranges for the 8 medications were chosen infrequently (11% to 36%) with no differences between HPs (p=0.373). HPs identified the 4 IV-to-PO relative costs infrequently (3% to 49%) with no differences between HPs (p=0.596). Conclusions: In spite of a goal of cost consideration, most non-pharmacist HPs are unaware of the costs and thus fail to include them in decision-making. These knowledge gaps should inform future efforts focused on increasing knowledge of medication costs.

1303 HIRING AND RETENTION CHARACTERISTICS OF ADVANCED PRACTICE PROVIDERS (APP) IN THE ICU
Vishal Bakshi, David Carpenter, Vanessa Moll, Sara Gregg

Learning Objectives: Physician Assistants and Nurse Practitioners (collectively referred to as APPs) make up a significant portion of the ICU workforce. Given the demanding nature of the ICU, hiring and retention is an ongoing concern. This study sought to characterize features associated with successful hiring and retention. Methods: This is a retrospective descriptive study which examined all APPs hired between 9/1/2010 and 9/1/2014 in two hospitals containing 9 ICUs. This included 2 CVICUs, 2 Neuroscience ICUs, 1 SICU, 2 MICUs, 1 ICCU, and 1 Transplant/SICU. Data was extracted from resumes of all APP hires during this time. Data included APP experience, APP ICU experience, any clinical ICU experience, and length of employment. Data was stratified by new graduates (new grad) vs. experienced APPs and length of service as well as motives for departure. Results: During the four year period, a total of 62 APPs were hired. During this time, a total of 27 APPs departed (44%). Reasons were broadly categorized as job dissatisfaction, performance issues and personal issues. For the entire population, job dissatisfaction was 33%, performance issues 26%, and personal issues 41%. For new grads, job dissatisfaction was 42%, performance issues 26%, and personal issues 33%. For experience APPs, job dissatisfaction was 27%, performance issues 27% and personal issues 47%. There was a significant difference between APPs with ICU exposure and departure, with 55% without ICU exposure departing versus 39% with ICU exposure. The association was strongest for experienced APPs with 63% of APPs without ICU exposure departing vs. 34% with ICU exposure. There was no association between length of service and departure. Conclusions: When selecting applicants, prior ICU experience and enhancing job satisfaction appears to be a key element in predicting ICU career longevity. Differences also exist between new grads and experienced APPs regarding reasons for departure with job dissatisfaction playing a significant role for new grads. Hiring and retention strategies should focus on leveraging previous ICU experience and enhancing job satisfaction.
1304

IMPACT OF DEPRESSION ON RECOVERY AND COSTS OF SEVERE SEPSIS WITHIN THE ADOLESCENT POPULATION

Christina Tyron, Jody Huber, Benson Hsu

Learning Objectives: Depression as a comorbid condition impacts the course of critical illness. Specifically, depression has been shown to increase both the duration of illness and mortality for the adult population. Additionally, studies have noted a degree of immune system dysregulation in patients with Major Depressive Disorder (MDD). However, existing studies are sparse within the pediatric population.

Methods: A retrospective study of hospitalized children using the Agency for Healthcare Research and Quality (AHRQ) 2009 Kids’ Inpatient Database. Diagnosis of sepsis was based on an All Patient Refined Diagnosis-Related Groups (APR-DRG) of 720: “Septicemia and Disseminated Infections.” APR-DRG validated severity classes segmented severity of illness into four classes. Those in the highest severity class were included in the study. AHRQ Comorbidity Software classification was used to identify those patients with Depressions. Those with age greater than 10 (adolescence) were included in the study.

Results: Study population included 1,650 un-weighted observations representing 2,307 weighted discharges within the highest severity class of sepsis. 2,163 (94%) without depression and 144 (6%) with depression. Comparing those without depression to those with depression: Age (16.8 ± 17.6 years of age; p = 0.002), Gender (45.6% ± 42.5% female; p = 0.54), Length of Stay (11.4 ± 17.3 days; p = 0.01), Number of Procedures Performed (3.7 ± 41 ± 0.27), Costs per Day ($4,046 ± $3,091; p = 0.001), Total Costs ($41,977 ± $57,766; p = 0.13) and Mortality (10.9% ± 7.8%; p = 0.26). Conclusions: Teenagers admitted with the highest severity of sepsis with a co-morbidity of depression had a longer length of stay by almost six days. Interestingly, those with depression had relatively higher total costs (p = 0.13) but almost 25% lower costs per day (p > 0.001). Otherwise, mortality rates were statistically similar. Overall, this study suggests that depression as a co-morbidity may contribute to longer hospitalization stays without changes in mortality but the economic impact is yet unclear.

1305

IN AN ICU WITH A HIGH-INTENSITY STAFFING MODEL, IS A NOCTURNAL INTENSIVIST NECESSARY?

Kokosyńska Marta, James Kinsley

Learning Objectives: While the model of intensivist-led multidisciplinary teams using evidence-based protocollized care is associated with improved outcomes of critically ill patients, recent literature has not confirmed the incremental value of on site nocturnal intensivist presence in the ICU. This investigation examines severity adjusted mortality, stratified by time of day of admission to the ICU, of a cohort of medical ICU patients before and implementation of a high-intensity staffing model.

Methods: This is a retrospective analysis of prospectively collected data, abstracted from the ICU database of a university-affiliated teaching hospital, comparing medical service patients admitted 7/1/06–6/30/10 (PRE, n = 2222) and 7/1/10–6/30/14 (POST, n = 2437). On 7/1/10 care shifted from a mandatory consult model to an on site intensivist presence and management from 7AM – 7PM, or later as necessary. We calculated Observed:expected (OE) mortality, using evidence-based protocolized care is associated with improved outcomes of critically ill patients, recent literature has not confirmed the incremental value of on site nocturnal intensivist presence in the ICU. This investigation examines severity adjusted mortality, stratified by time of day of admission to the ICU, of a cohort of medical ICU patients before and implementation of a high-intensity staffing model.

Results: Comparing PRE and POST MORT’ decreased from 21.9% to 16.9% (p<0.0001) and APIV PM decreased from 26.6% to 23.1% (p<0.0001), yielding reduction in OE from 0.82 to 0.73. Among patients admitted during Night OE decreased from 0.88 to 0.72. In the POST era, OE for Night admissions was similar to that for Day and Evening admissions even when stratified by severity of illness (APIV PM 0–10%, 10–25%, > 25%) or ICU LOS (< or > 2.0 days).

Conclusions: Implementation of a high intensity staffing model, but without overnight intensivist coverage, was associated with a decrease in severity adjusted mortality in this cohort of medical ICU patients. The decrease was independent of time of admission to the ICU; OE of patients admitted during overnight hours was similar to those admitted earlier. These data support the recent recommendations of the ACCCM Task Force on Models of Critical Care (CCM 2015; 43:14520-1525).

1306

LIMITED RAPID RESPONSE SYSTEM (RRS) COULD REDUCE UNEXPECTED HOSPITAL MORTALITY IN JAPAN

Shinsuke Fujiwara, Shigeki Fujitani, Asuka Furukawa

Learning Objectives: In Japan, the recognition of RRS and its practice are gradually spreading. However, the cultural differences in healthcare settings between Japan and the Western countries might vary the appropriate way to manage the RRS. We studied the effect of an RRS on the incidence of cardiac arrests and unexpected death.

Methods: The RRS implementation was introduced to a 424-bed rural public hospital in Japan. The RRS included the induction of a medical emergency team (MET) and the use of a single-parameter track and trigger system. The MET was available during office hours. Ninety minutes educational program was mandatory for the medical staff and optional for the medical staff. For the implementation, a hospital-wide campaign was conducted to educate medical and nursing ward staff on trigger criteria, team roles and responsibilities.

Results: In three years, a total of 27,175 patient admissions were evaluated. During this period, 78 calls were made with respiratory abnormalities (22 activations, 28%) being the most common triggers. Concern about a patient condition was the trigger for 17 (22%) activations. Most patients cared for by MET remained in wards (41%); some required transferred to critical care units (29%). Over this period, total hospital mortality did not change, but non-ICU cardiopulmonary arrests decreased from 2.57 (the early period) to 1.22 (the latter term) per 1,000 hospital admissions (p = 0.015, Cochran-Armitage trend test). Conclusions: Although the number of MET call was low compared to the Western countries, the RRS implementation could reduce unexpected in-hospital mortality.

1307

MILITARY CRITICAL CARE RESOURCE UTILIZATION: RESULTS FROM AN ADMINISTRATIVE SURVEY

Raymond Fisher, John Melvin, Elizabeth Mann-Salinas, Adam Bostick, Cristin Mount, James Aden, Kevin Chung, Jeremy Pamplin

Learning Objectives: Healthcare expenditures represent a significant worldwide economic cost with critical care services constituting a large portion. The Military Health System (MHS) represents a large, global healthcare system. This research was undertaken to describe the differences in daily clinical practice and critical care resource utilization between high and low capacity treatment facilities (TFs) within the MHS.

Methods: We surveyed 26 MTFs representing 38 critical care services or intensive care units (ICUs). The survey collected information about organizational structure, resourcing, unit characteristics, patient populations, and facility staffing during a 24 hour period. The survey was anonymous and Protected Health Information (PHI) was not collected. Statistical analysis was performed using Wilcoxon’s test or Fisher’s Exact test. Results: 18 TFs (69%) and 27 ICU services/units (71%) returned surveys. TFs were divided into high capacity (≥ 200 beds, n = 4) and low capacity (< 200 beds, n = 14) TFs. High capacity TFs represented 13 ICU services/units. High capacity TFs averaged more patients per ICU (7.85 vs 3.68, p =1), reported more closed or modified closed ICUs vs. open ICUs (77% vs. 29% p = 0.02), had more nursing staff available per unit (51.2 vs 18.2, p =0.0001) and had fewer respiratory therapists per ICU (7.2 vs 11.1, p =0.03) with more RRT certification (60% vs 50%, p = 0.18) than low capacity TFs. High capacity centers reported more effective protocols and checklists on a daily basis (62% vs. 29%, p = 0.12). Low capacity centers were more likely to have daily multidisciplinary rounds (79% vs 15%, p=0.002). ICU leadership structure was similar among TFs.

Conclusions: This is the first comprehensive report about MHS critical care services. It highlights significant differences between organizational structure and resourcing between high and low capacity TFs. Whether or not these differences have clinical implications (i.e. impact patient outcomes) requires further study.

1308

MILITARY CRITICAL CARE SERVICES: RESULTS FROM A 24-HOUR PREVALENCE SURVEY

Raymond Fisher, John Melvin, Elizabeth Mann-Salinas, Adam Bostick, Cristin Mount, James Aden, Kevin Chung, Jeremy Pamplin

Learning Objectives: Healthcare expenditures represent a significant worldwide economic cost with critical care services constituting a large portion. The Military
Health System (MHS) represents a large, global healthcare system. This research was undertaken to describe MHS critical care services and patient characteristics.

**Methods:** We surveyed 26 treatment facilities (TFs) representing 38 critical care services or intensive care units (ICUs). The survey collected information about organizational structure, resourcing, unit characteristics, and patient populations during a 24 hour period. The survey was anonymous and Protected Health Information (PHI) was not collected. Results: 18 TFs (69%) and 27 ICU services/units (71%) returned surveys. 4 TFs (22%) reported bed capacities of ≥200 beds and are termed “Large TFs.” Participants submitted characteristics about 151 patients; 27 TFs did not submit patient data including 1 Large TF. Large TFs reported 67% of the patient characteristics. Reported ICU types were: mixed medical/surgical (33.8%), medical (21.2%), surgical (18.5%), trauma (11.9%), and burn (6.0%). Top medical admissions were: cardiac (30.3%), general medical (21.2%), and pulmonary (13.6%) reasons. Top surgical admissions included: trauma (30.1%), cardiothoracic surgery (15.7%), vascular surgery (10.8%), burns (10.8%), and general surgery (10.8%). 70.3% of patients had an APACHE II Score less than 15. Less than 50% of ICU admissions required life support including mechanical ventilation (21.2%), non-invasive mechanical ventilation (7.9%), and continuous vasoactive medications (6.6%). During the study period, 18.5% of patients considered eligible for transfer were not transferred. Complications were reported in 19.2% of patients, the most common of which were acute kidney injury (9.9%), hemorrhage (4.6%), sepsis (4.0%), and ventilator associated pneumonia (3.3%). Conclusions: This is the first comprehensive report on MHS critical care services. It describes a low acuity patient population, concentrated at larger TFs. This data may inform decisions about critical care organization and resourcing.

**MODELS OF ACADEMIC SURGICAL CRITICAL CARE: IS THERE A BEST OPTION?**

Aisha Shaheen, Claudia Lozano, Kevin Chen, Pankaj Patel, George Koenig, Michael Weinstein

**Learning Objectives:** Intensivist staffing in the ICU setting has been demonstrated to improve clinical outcomes. There is debate regarding the optimal staffing model. Data regarding ICU models of care have not been quantified especially for surgically oriented ICUs. We seek to characterize models of care in ICUs with surgical critical care fellowships. **Methods:** A 25-question internet-based survey was sent to the program directors of all surgical critical care programs through the Surgical Critical Care Program Directors Society. Participants were queried on the setting of their ICU, their current management models, and asked their opinion of the optimal model of care for an ICU. **Results:** Fifty of 102 (49%) completed the questionnaire. Respondents were largely affiliated with academic medical centers (82%) with primary training for fellows based in surgical ICUs (64%). All programs were affiliated with a Level 1 Trauma Center. Over half of the intensive care units employed a semi-closed model of care (56%) with a mandatory intensive consultation. Twenty-eight percent of programs had a closed model. Interestingly, for ICUs reporting a closed model, 85.7% had orders placed by only the ICU team, but only 21.4% always transferred patients to the ICU service. For ICUs without a closed model 28.6% had orders placed by only the ICU team and none always transferred services. The majority (78.6%) of respondents based in closed units opined theirs was the optimal model, while 68.6% respondents in other models of care favored a semi-closed model. For units without closed models, 34.3% of respondents preferred a closed model of care and 14.3% of programs had plans to “close” their ICU. **Conclusions:** The majority of surgical critical care programs describe their units as semi-closed with mandatory consultation, though there seems to be a trend towards the closed model. The definitions of models of ICU care in terms of closed, semi-closed and open are subject to interpretation and need better definitions for future investigative efforts.

**PICU VOLUME AND OUTCOME: A SEVERITY-ADJUSTED ANALYSIS**

Barry Markowitz, Irina Kukuyeva, Gerardo Soto-Campos, Robinder Khemani

**Learning Objectives:** We sought to determine the relationship between Pediatric Intensive Care Unit (PICU) volume and severity-adjusted mortality in a large, national dataset. **Methods:** The VPS database (VPS, LLC), a national multicenter clinical PICU database, was queried for patient discharge dates between September 2009 to March 2012 for all patients with valid PIM2 and PRISM III scores, who were not transferred to another ICU and were seen in an ICU that collected at least three quarters of data. Anonymized data received included ICU mortality, hospital and patient demographics, PIM2 and PRISM III scores. PICU volume/quarter was determined (VPS sites submit data quarterly) per PICU and was divided by 100 to assess the impact per 100 discharges per quarter (VOL). A mixed effects logistic regression model, accounting for repeated measures of patients within ICUs was performed to assess the association of volume on severity-adjusted mortality, adjusting for patient and unit characteristics. **Results:** We analyzed 186,643 patients from 92 PICUs, with an overall ICU mortality rate of 2.6%. VOL ranged from 0.24 to 8.89 per ICU per quarter; the mean VOL was 2.61. The mixed effects logistic regression model found a small, but non-linear relationship between volume and mortality that varied based on severity of illness. When severity of illness is low, there is no clear relationship between volume and mortality up to a PIM2 risk of mortality of 10%; for patients with a higher severity of illness, severity of illness adjusted mortality is inversely proportional to a unit’s volume. **Conclusions:** For patients with low severity of illness, ICU volume is not associated with mortality. As patient severity of illness rises, higher volume units have higher severity of illness-adjusted mortality. This may be related to differences in quality of care, issues with unmeasured confounding, or calibration of existing severity of illness scores.
to the use of telemedicine. **Methods:** “RoboDoc” is a robotic telepresence program for multidisciplinary team rounding and assessments of deteriorations by intensivist physicians during the night-shift. Critical care nurses and respiratory therapists in two community non-teaching hospitals were invited to complete voluntary anonymous surveys (10-item Likert scale with five reverse-coded items) to describe their opinions related to communication, concerns and efficacy of the “RoboDoc” program. **Results:** Communication, concerns and comfort with robotic telepresence for the care of critically ill adult patients were rated by 21 night-shift clinicians. 95% of the surveyed clinicians agreed that communication with intensivists via remote presence was “easy”, and 76% preferred remote presence over telephone use. Comfort ratings and satisfaction scores were similarly positive across all age groups (21–60 years). Younger clinicians (21–30 years) were more likely to provide neutral or negative ratings compared to older clinicians (41–60 years) (20% vs 5%, p<0.01). **Conclusions:** Previous surveys related to robotic telepresence have provided information from patients and families. This is the first survey to document satisfaction data from direct-care clinicians. Most night-shift clinicians rated interactions with intensivists using robotic telepresence positively. Generational differences in the use of the technology were not statistically significant. While the overall ratings were positive, when concerns with the “RoboDoc” technology were present, they were related to perceptions of physician caring and technical capabilities inherent to telemedicine. These results provide preliminary data to further explore technology adoption related to telemedicine program training and acceptance by clinicians.

1313 SCREENING WEEKS: A PILOT TRIAL MANAGEMENT METRIC
Lois Saunders, France Clarke, Lori Hand, Marnie Jakab, Irene Warpool, Jennifer Good, Diane Heels-Ansdell

**Learning Objectives:** Estimated completion of randomized clinical trials (RCTs) in the ICU typically depends on active screening for eligible patients over most weeks in a calendar year. Predictions of patient recruitment in RCTs are often inaccurate due to overestimated accrual rates. Our objective was to document the proportion of weeks during which patients were screened for eligibility during a pilot RCT testing probiotics (Lactobacillus rhamnosus GG) versus placebo on infectious outcomes during critical illness (PROSPECT Pilot Trial, clinicaltrials.gov NCT01782755). **Methods:** Research Coordinators were asked to prospectively self-report the weeks following ethics approval during which patients were actively screened and when they were not, for any reason. We projected the number of additional patients who might have been enrolled during non-screening weeks based on mean recruitment during active screening weeks. **Results:** Across 14 participating centers, there was staggered start-up for the PROSPECT Pilot trial, extending to the Vanguard phase. 285 patients were enrolled over 715 potential screening weeks, of which 108 weeks (15.1%), did not involve screening for eligible patients. Reasons included holidays, conferences, and other research activities including site visits, close-out visits and a Health Canada audit. Had it been possible to screen patients during those weeks, based on pro-rated accrual during other weeks, an estimated 49 additional patients may have been recruited. Thus, 334 patients rather than 285 would potentially have been enrolled in the Vanguard phase of this trial. **Conclusions:** Documentation of non-screening weeks helps to better plan and transparently document patient recruitment in critical care RCTs. Such an approach may assist with more accurate timeline estimates when grant writing, and may inform the logistic and financial operations for clinical trials research. Funded by the Technology Evaluation in the Elderly Network, Physicians Services Incorporated of Ontario, Hamilton Academic Health Science Organization, and the Canadian Institutes for Health Research.

1314 SIMULATION OF AN ALTERNATE IN-HOUSE ATTENDING CALL SCHEDULE TO OPTIMIZE INTENSIVIST STAFFING
Alon Geva, Adrienne Randolph

**Learning Objectives:** The majority of large academic intensive care units have in the past decade implemented in-house overnight attending staffing. In-house call was typically added to existing service time without assessing the effects on continuity of care, academic productivity, or caregivers’ family life. We hypothesized that a schedule that pairs overnight call with daytime service obligations and divides weeks on service between attendings would increase continuity of care, contiguous academic time, and personal weekend time. **Methods:** We simulated implementation of an alternate schedule in which 2-week service blocks for 2 teams were each divided between 2 attendings. We assumed a unit staffed by 12 attendings. The 4 on-service attendings split 12 overnight calls, including all weekend calls. Two weekday calls were covered by off-service attendings. The alternate schedule guaranteed one full day off (not post-call) every 3 - 4 days, 3 - 4 days off (including 1 weekend day) over the 2 weeks, and 24-hour maximum shifts. We compared this schedule to a 7-day continuous coverage schedule, with night call randomly distributed across off-service attendings. Simulating 100 1-year cohorts of attendings, we compared median service obligations. Continuity of care was compared using the usual provider of care index. **Results:** Under both models, median attending service time, including calls, was 15 weeks. Under the alternate schedule, attendings gained a median of 5 weeks of uninterrupted protected academic time and 3 full as well as 7 partial weekends off. Patient continuity increased by approximately 10% when length of stay (LOS) was 5 days but by as much as 25% when LOS was 15 days. **Conclusions:** Simulation of intensivist staffing models can allow explicit consideration of trade-offs, optimization of work-life balance and protected off-service time, and maximization of continuity of care. Testing models to evaluate effects on patient outcomes, academic productivity, and physician burnout is required for validation.

1315 USE OF FUNCTIONAL RESONANCE ANALYSIS (FRAM) AS A NON-BIASED INCIDENT ANALYSIS METHOD IN A PICU
Jordan Goldman, Kimia Rafie, Tony Thomas, Corey Chartan, Pamela Marshall, Tonita Footenoor, Eric Williams

**Learning Objectives:** High-Reliability Organizations have efficient operation and resilience. Variation can both positively and negatively influence safety; inquiry methods must understand both. FRAM helps minimize hindsight bias by considering multiple sources of variability in everyday operations of a complex socio-technical system. We hypothesized FRAM could be incorporated into the incident analysis process of our morbidity, mortality and improvement structure to identify system variation, learning opportunities, and resilient behaviors. **Methods:** Using the Model for Improvement, we performed serial PDSA cycles to determine best practice around FRAM. The team included physician and nursing quality leaders, fellowship trainees, and a biomedical engineer. The standard operating procedure included: identifying an incident analysis case, developing a model of successful care delivery, and creating an instantiation of FRAM to identify areas of variation. **Results:** Variation themes were sorted into categories and proportions of resilient behaviors were compared using Fisher’s Exact Test. *p<.05.** **Conclusions:** To develop standard practice, we performed five PDSA cycles and identified seven variation categories. Frequencies of the variation themes were knowledge gap (100%), hand off reports(40%), resilient behaviors(60%), patient ownership(40%), closed loop communication(20%), geographically(60%), and systems(60%). Within PDSA cycles, resilient behavior (taking responsibility, recognizing limitations, asking for help, seeking data) was identified in 60% of cases. Within variation categories, identification of resilient behavior vs. unnecessary variation was 16% vs. 84%*. **Conclusions:** We developed an infrastructure to identify resilient characteristics and variation within the complex socio-technical system of the PICU. Performance variation is seen as a strength and is purported to be the reason socio-technical systems perform well. Specifically, humans routinely overcome problems during “normal” work and this feature leads to safety and productivity. FRAM can be successfully introduced as the new standard for which performance can be reviewed.

1316 VARIABLE COSTS IN NEONATES AND CHILDREN SUPPORTED WITH EXTRACORPOREAL MEMBRANE OXYGENATION
Bianca Agustin, David Faraoni, Viviane Nast, Dionne Graham, Vanessa Young, James DiNardo, Susan Bratton, Ravi Thagajaran

**Learning Objectives:** Neonates and children treated with extracorporeal membrane oxygenation (ECMO) generate large hospital costs. We hypothesized that the cost for ECMO equipment (fixed) did not contribute to a significant
proportion of the overall cost for ECMO. **Methods:** We identified all neonates and children supported with ECMO in the Pediatric Health Information Systems (PHIS: 2013 – 2014). Patients were sorted into 7 predefined diagnostic categories: cardiac surgery, non-surgical heart disease, congenital diaphragmatic hernia, neonatal respiratory failure, pediatric respiratory failure, sepsis, and others. We recorded hospital length of stay (LOS), in-hospital mortality, and the incidence of complications (e.g. acute kidney injury, neurologic and thromboembolic complications). We also recorded total and specific (pharmacy, imaging, laboratory, intensive care units (ICUs), surgery, ECMO management and supplies) costs. We categorized hospital cost into 4 groups based on quartiles, and used multivariate ordinal regression analysis to adjust for confounders (e.g. center volume, hospital region, diagnostic group, length of hospital stay, and the incidence of complications). **Results:** Median hospital cost for neonates and children supported with ECMO (n=1,362) was $953,609 ($538,864-$1,889,997). The median cost for ECMO equipment was $4,357 ($1,258-$11,766), while the cost associated with ECMO management was $58,693 ($32,663-$116,719). Other costs included imaging ($41,160, ($22,575-$79,097)), pharmacy ($112,534, ($50,539-$261,765)), laboratory ($171,738, ($90,944-$351,333), and ICUs ($240,129, ($108,784-$482,967)). After adjustment for confounders, equipment cost (fixed) did not explain the variability in ECMO cost (p=0.88), while variable costs including ECMO management (p=0.01) and all other services did (p<0.01). **Conclusions:** Although hospitalization cost for neonates and children supported with ECMO is high, the cost associated with ECMO equipment (fixed) did not significantly contribute to the overall cost when compared to the cost for ECMO management, and other associated services (variable costs).

**WHAT DOES THE NATIONAL QUALITY FORUM HAVE TO SAY ABOUT CRITICAL CARE MEDICINE?**
Ulrich Schmidt, Henry Stelfox, Brendan Wanta, Joseph Hyder

**Learning Objectives:** The United States Department of Health and Human Services contracted the National Quality Forum (NQF) to, “establish a portfolio of quality and efficiency measures that will allow the federal government to more clearly see how and whether healthcare spending is achieving the best results for patients and taxpayers”. By 2017, at least 25% of Medicare revenue must be tied to value-based payment models for providers to qualify for higher reimbursement rates. In 2012 financial costs of critical care medicine (CCM) were estimated to account for 17 % to 39% of hospital costs, and between 5.2 to 11.2 % of national health expenditures. Given these extensive costs we hypothesized that CCM plays an important role in NQF-endorsed quality and efficiency measures. **Methods:** Critical Care Medicine was defined as pertaining to patient care in the intensive care unit. Two authors independently scrutinized the current library of 641 NQF performance measures. The measures listed include important outcome and performance measures. However these measures do not provide a portfolio that will allow to value the investment in ICU care.

**WHAT IS AN INTENSIVIST FTE? A DESCRIPTIVE ANALYSIS OF ICU ATTENDING PHYSICIAN STAFFING AND SERVICE**
Zhijin Jessie Chai, Stephen Pastores, J. Perren Cobb, George Consonis, Jonathan Sevransky

**Learning Objectives:** There is wide variance in intensive care unit (ICU) attending physician staffing and service obligations. To describe contemporary workloads and practice, we surveyed a national sample of ICU staff across a broad variety of settings. **Methods:** Surveys were sent to United States Critical Illness and Injury Trials Group members and an ad hoc working group of clinicians preparing for Ebola virus disease patients, with a total of three mailings. The survey included hospital and ICU descriptive information and physician clinical and non-clinical activities. The study was designated as “exempt” by the Emory University Institutional Review Board. Statistical analysis was performed using SPSS version 22 (IBM, 2013). Data were analyzed using Student’s t-test and Pearson chi-square tests for descriptive and categorical variables, respectively. **Results:** There were a total of 68 responses from the two Listservs with over 200 members; 52 were complete and 16 were partially complete. The majority (75%) of hospitals were urban, private not-for-profit (63.2%), and teaching-focused (95.6%). Medical ICUs comprised the largest group of ICUs surveyed (41.2%). The median daily ICU census was 18 [interquartile range (IQR) 14–23]. These clinicians worked a median of 169 days per full-time equivalent [FTE] (IQR 0–32.5). Medical ICUs compared with non-medical ICUs had similar days and weekends worked, but were more likely to have 24 hour resident coverage (100% vs 80%, p = 0.012). Many intensivists were responsible for triage (63.2%), code response (61.5%), rapid response (53.8%), and management intermediate care units (50.0%). Surveyed physicians also reported involvement with research (84.6%), training program administration (80.8%), and hospital committees (94.2%) **Conclusions:** In primarily academic, urban institutions, the median number of days worked for an intensivist FTE was 169 days, including weekend days but no nighttime in-house coverage. Medical and non-medical critical care physicians had similar hours and non-clinical responsibilities.
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Abbreviations used in this volume include:

ACO Academy of Critical Care Nurses
AgA American Geriatrics Society
AGA American Gastroenterological Association
AGS American Geriatrics Society
AHA American Heart Association
AHCPR Agency for Health Care Policy and Research
AJCP Annals of the Association for Critical Care Nurses
AJKD American Journal of Kidney Disease
AJN American Journal of Nursing
AJR American Journal of Roentgenology
AKA American Kidney Association
AKD American Kidney Disease
AKI Acute Kidney Injury
AKSA American Kidney and Sleep Association
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