The OXIRIS Set device is authorized under EUA200164 (Emergency Use Authorization) to treat patients 18 years of age or older with confirmed Coronavirus Disease 2019 (COVID-19) infection admitted to the intensive care unit (ICU) with confirmed or imminent respiratory failure in need of blood purification, including use in continuous renal replacement therapy. This device has neither been cleared or approved for the indication to treat patients with COVID-19 infection. The device is authorized only for the duration of the declaration that circumstances exist justifying the authorization of the emergency use of the OXIRIS Set under section 564(b)(1) of the Act, 21 U.S.C. §360bbb-3(b)(1), unless the authorization is terminated or revoked sooner.

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Editor’s Message

Clinical Issues of the Day

I am thrilled to present to you this summer 2021 issue of Critical Connections. We begin with a preliminary glimpse of the exceptional program of the 51st Critical Care Congress that will take place in San Juan, Puerto Rico, February 6-9, 2022. Take note of the five extraordinary plenary sessions to be presented by world-renowned experts alongside other award-winning sessions, workshops, panel discussions, and case discussions that promise to delight all critical care professionals. Congress sessions will also cover the current state of the COVID-19 pandemic, particularly highlighting post-COVID sequelae.

SCCM President Greg S. Martin, MD, MSc, FCCM, opens this issue with a discussion of post-COVID symptoms persisting beyond the initial four weeks of infection or acute SARS-CoV-2 infection. COVID-19 symptoms persisting for up to 12 weeks after initial infection can be followed by a longer chronic phase termed long COVID or post-acute sequelae of COVID-19 (PASC). Increasing numbers of patients are manifesting PASC symptoms of fatigue, dyspnea, brain fog, cough, chest pain, joint or muscle pain, headache, dizziness, depression, anxiety, and loss of taste or smell.

Another fascinating article is brought to you by some of SCCM’s Emergency Medicine Section and Surgery Section members highlighting the stark increase in critical injury, particularly violent injury, involving firearms beginning in 2020 and continuing to the present day. Paradoxically they also describe a rise in vehicular crashes and injury during this same time period despite fewer vehicles on the road due to prolonged lockdowns and quarantines. The authors seek social determinants for these near-double injury numbers in the setting of disrupted American societal norms caused by isolation from family and social contacts, rapidly rising unemployment, food insecurity, and resource scarcity bringing about a sense of desperation in many people.

While these tragic trends were happening in many urban American cities, another was taking place in Texas small towns, where authors Commander Michael J. Kavanaugh, MD; Captain Sean A. McKay, MD; and Commander Joseph Zeman, MD, describe how embedded navy critical care teams deployed rapid response assistance to rural communities during this crisis. This is another remarkable example of how, during the past 18 months, military medicine has reached well beyond the call of duty to support civilian medical personnel when disease burden exceeded local hospital systems’ capacity.

Also noteworthy is a captivating discussion on the ethical considerations of mandating COVID-19 vaccination for healthcare workers. Preeti R. John, MD, MPH, FACS, HEC-C, and other authors present opposing viewpoints on the perennial pillars of beneficence, nonmaleficence, autonomy, and justice. Italy and other countries have begun to mandate COVID-19 vaccinations nationally. In the United States, more and more groups and institutions have implemented such mandates. More than 50 healthcare professional organizations are in favor of all healthcare employers requiring employees to be vaccinated against COVID-19 to protect the safety of patients, healthcare workers, and communities.

Finally, an interesting article from the Drug Shortages and Medication Safety Committee addresses the use of extension IV tubing to permit placement of infusion pumps outside patient rooms. This practice limits delays in initiating and adjusting medications while also preventing multiple reentries in and out of patient rooms. While extension tubing was used before the pandemic in the context of the MRI suite, this practice must be implemented with caution to prevent harm to patients.
51st CONGRESS PRELIMINARY PROGRAM

FEBRUARY 6-9, 2022

SMART EVENT FEATURING FLEXIBLE LEARNING OPTIONS

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ONLINE: LEARN VIRTUALLY THROUGH SELECT LIVE SESSION BROADCASTS, SESSION RECORDINGS, AND VIRTUAL Q&A WITH EXPERTS
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- Receive an efficient, high-quality educational experience, perfect for busy professionals and those who cannot get away.
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**DECIDE AT ANY TIME.**

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**REGISTER EARLY TO SECURE YOUR TOP CHOICES AND ACCOMMODATIONS AT THE LOWEST RATES.**

**EARLY RATE:** Register by December 8, 2021
**ADVANCE RATE:** Register by January 12, 2022

View rates and register at sccm.org/congress2022 or contact customer service at +1 847 827-6888.
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**TOP REASONS TO ATTEND:**

**ACCESS**
- training and resources needed to attain your personal and professional goals.

**EXPLORE**
- new tools and technologies and gain knowledge to improve patient care.

**NETWORK**
- and collaborate with colleagues and critical care experts from around the world.

**DISCOVER**
- the latest research, exchange knowledge, and find solutions to common issues.

**CELEBRATE**
- the critical care community and recognize key accomplishments.

**SHARE**
- key takeaways with your critical care team and improve patient care.

---

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PLENARY SESSIONS

Engage in discussions on innovative developments in critical care with world-renowned experts during the unopposed Congress plenary sessions.

Max Harry Weil Memorial Lecture
What Has COVID-19 Taught Us About ECMO?
Peta M.A. Alexander, MBBS, FRACP, FCICM
Staff Physician
Department of Cardiology
Boston Children’s Hospital
Assistant Professor
Department of Pediatrics
Harvard Medical School
Boston, Massachusetts, USA

Peter Safar Memorial Lecture
Health System Readiness 2.0
Brendan G. Carr, MD, MA, MS
Professor and System Chair
Department of Emergency Medicine
Icahn School of Medicine at Mount Sinai
New York, New York, USA

Ake Grenvik Honorary Lecture
The Role of Critical Care Professionals in Allocating Scarce Resources
Douglas B. White, MD, MAS
Professor of Critical Care Medicine, Medicine, and Clinical and Translational Science
Vice Chair for Faculty Development, Department of Critical Care Medicine
Director, Program on Ethics and Decision Making in Critical Illness, CRISMA Center
Chair, Committee on Tenured Faculty Promotions and Appointments
Core Faculty, University of Pittsburgh Center for Bioethics and Health Law
University of Pittsburgh School of Medicine
Pittsburgh, Pennsylvania, USA

Norma J. Shoemaker Honorary Lecture
Cultivating Leadership From Within
Beth A. Wathen, MSN, RN, CCRN-K
President
American Association of Critical-Care Nurses
Clinical Practice Specialist
Pediatric Intensive Care Unit
Children’s Hospital Colorado
Aurora, Colorado, USA

THOUGHT LEADER SESSIONS

Explore hot topics in critical care with distinguished thought leaders.

Lifetime Award Recipient
Philip S. Barie, MD, MCCM

Genetics and Genomics
Karin Reuter-Rice, PhD, CPNP-AC, FAAN, FCCM

The Future of Critical Care: Artificial Intelligence to Zoom Family Meetings
Michelle N. Gong, MD, MS
Rebecca A. Aslakson, MD, PhD

Critical Care Nurses and COVID-19
John J. Gallagher, DNP, RN, CCNS, CCRN-K, TCRN, RRT, FCCM

Prehospital Critical Care
James Houser, MSN, APRN

Critical Care Disparities: The Fierce Urgency of Now
Joy D. Howell, MD, FAAP, FCCM

LATE-BREAKING PLENARY AND THOUGHT LEADER SPEAKERS WILL BE ANNOUNCED IN FALL 2021!
POPULAR CONGRESS EVENTS AND SESSIONS

Educational Leadership Luncheon ⏰ $
Monday, February 7, 2022
Critical care program directors, fellows, members of multiprofessional ICU teams, and those with a passion for critical care education are invited to attend. This year’s luncheon topic, How to Debate Dr. Internet: Dealing With Misinformation and Fake News, will provide attendees with new ideas and strategies to deal with misinformation found while searching the internet.

Advanced Practice Providers Luncheon ⏰ $
Tuesday, February 8, 2022
Critical care advanced practice providers (APPs) are invited to attend and engage in informal networking and roundtable discussions on topics related specifically to APPs and their professional success.

Educational Symposia
Learn about clinical breakthroughs and advances that lead to better patient care during these thought-provoking sessions. Led by critical care experts, each symposium offers a thorough analysis of the developments and controversies affecting most intensive care unit environments.

SCCM ABSTRACT PRESENTATIONS

Research Snapshot Theaters
Authors of abstracts and case reports will present their submissions with time for questions and answers. Presentations will be held in designated sections of the Exhibit Hall from Sunday, February 6, through Tuesday, February 8, 2022.

Star Research Presentations
The top 64 abstracts and case reports will be highlighted during Star Research presentations, held on Monday and Tuesday, February 7 and 8, 2022.

Research Awards Ceremony
Recipients of SCCM’s abstract and case report awards will be recognized during an awards ceremony on Sunday, February 6, 2022, at 3:30 p.m. Atlantic Time.

DON’T MISS THESE POPULAR CONGRESS EVENTS

Critical Care Quiz Show
Gather to watch and root for your team during this friendly competition as contestants show off their critical care knowledge in this fast-paced game show.

Critical Crosstalk Theater
Hear discussion and debate focused on critical care topics in the fields of internal medicine, anesthesiology, surgery, and more.

Roundtable Discussions
Discuss critical care topics led by experienced moderators and network with peers on a variety of professional, career, and leadership subjects.

Luminary Lounge
Join past SCCM presidents as they share their experience and wisdom about critical care and SCCM.

BE ON THE LOOKOUT FOR A VARIETY OF NEW OPPORTUNITIES FOR SMALL GROUP INTERACTION AND LEARNING THROUGHOUT CONGRESS.

SCCM.ORG
PRE-Congress Educational Opportunities

Each course is packed with essential clinical information to keep you well informed on various critical care topics. Course prices vary. Many courses sell out; register early to secure your seat!

FRIDAY, FEBRUARY 4, OR SATURDAY, FEBRUARY 5, 2022

Critical Care Ultrasound: Adult

Critical Care Ultrasound: Pediatric and Neonatal

FRIDAY, FEBRUARY 4, AND SATURDAY, FEBRUARY 5, 2022

Advanced VV ECMO Workshop

Held in partnership with the Extracorporeal Life Support Organization

Airway and Mechanical Ventilation

Current Concepts: Adult

Current Concepts: Pediatrics

ICU Liberation Simulation

Become a qualified instructor!

SATURDAY, FEBRUARY 5, 2022

Fundamental Critical Care Support: Crisis Management

Master Class: Cardiovascular Physiology

Half-day course

Master Class: Saving the Kidneys

Half-day course

Advanced Critical Care Ultrasound: Adult

(select morning or afternoon course)

*Skill stations only. The session content will be provided via self-directed course. Attendees should complete the self-directed course before attending the skill stations.

FOR COMPLETE DETAILS ON THESE COURSES, PLEASE VISIT SCCM.ORG/CONGRESS2022.

For complete details on Congress events, visit sccm.org/congress2022.

FOR A MORE DETAILED LIST OF PROGRAM TOPICS AND SESSIONS, VISIT SCCM.ORG/CONGRESS2022.

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**HOTEL ACCOMMODATIONS**

Take advantage of discounted Congress hotel rates by making your reservation through the SCCM Housing Bureau. All reservations are subject to availability.

*The deadline for booking at discounted SCCM rates is Friday, January 7, 2022. Visit sccm.org/congress2022 to make your reservation.*

**Congress Headquarters Hotel**

Caribe Hilton  
1 San Geronimo Street  
San Juan, Puerto Rico

Set on 17 acres of lush tropical gardens, the ever-iconic Caribe Hilton is a paradise resort destination located just seven miles from Luis Muñoz Marín Airport and a short distance from historic Old San Juan, the lively Condado district, and the Puerto Rico Convention Center. Guests are welcomed through an expansive open-air lobby and will enjoy colorful guest rooms inspired by this island of enchantment. Birthplace of the famous piña colada, an oceanfront pool complex, exclusive beach, full-service spa, and choice of 11 dining options, provide a delightful respite right on the property.

**Other Official Congress Hotels**

Condado Plaza Hilton  
DoubleTree by Hilton San Juan  
Fairmont El San Juan Hotel  
Royal Sonesta San Juan  
San Juan Marriott Resort & Stellaris Casino  
Sheraton Old San Juan Hotel  
Sheraton Puerto Rico Hotel & Casino  
Verdanza Hotel

**AIR TRAVEL**

SCCM has arranged for discounted airfare of up to 10% off with United Airlines and Delta Airlines for travel to San Juan, Puerto Rico, for the 51st Critical Care Congress.

**United Airlines**  
*Website*: united.com  
*By phone*: +1 800 426-1122  
*By email*: groupmeetings@united.com  
*Discount Booking Code*: ZK4D830186

Please note: When booking online, select “Advanced search” to find the offer code field. Booking by phone or email may incur an additional service fee per ticket. Such service fee is nonrefundable and applies to all itineraries, one-way or round-trip. Please allow 24 hours for email requests to be processed.

**Delta Airlines**  
*Website*: delta.com  
*By phone*: +1 800 328-1111  
*Discount Booking Code*: NMUY3

**CAR RENTAL**

SCCM has negotiated special car rental rates for Congress attendees.

**Enterprise**  
*Website*: enterprise.com  
*Phone*: +1 800 736-8222  
*Promotion Code*: XZP1SCC

**National**  
*Website*: nationalcar.com  
*Phone*: 1-877-222-9058  
*Promotion Code*: XZP1SCC

**CHILDCARE SERVICES**

SCCM has secured complimentary childcare services through KiddieCorp. Children aged 6 months to 12 years can attend KiddieCorp at the Sheraton Puerto Rico Hotel & Casino in San Juan, Puerto Rico, on a first come, first-served basis. Space is limited.

Childcare services will be available during the following times:
- Sunday, February 6, 2022: 6:00 a.m. – 10:00 p.m.
- Monday, February 7, 2022: 6:30 a.m. – 10:00 p.m.
- Tuesday, February 8, 2022: 6:30 a.m. – 10:00 p.m.
- Wednesday, February 9, 2022: 6:30 a.m. – 5:00 p.m.

For more information, visit sccm.org/congress2022.
Come together with the critical care community for the Society of Critical Care Medicine's (SCCM) 51st Critical Care Congress and dive into the latest knowledge and research.

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- Access programming from anywhere for one year

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The critical care community has made an incredible impact on the world. SCCM looks forward to recognizing these key accomplishments and the opportunity to reconnect with our members, colleagues, and friends.

Register today to receive the best rates! Visit sccm.org/congress2022
Critical Care
ECHOCARDIOGRAPHY
Review Course

November 9-11, 2021
OLC Education & Conference Center
Rosemont, IL

Held in partnership between the Society of Critical Care Medicine and the American Society of Echocardiography, the Critical Care Echocardiography Review Course will educate attendees in all aspects of echocardiography for critically ill patients and will prepare attendees for the critical care echocardiography board examination offered by the National Board of Echocardiography. The course is intended for critical care practitioners who are already familiar with ultrasound and echocardiography.

SCCM offers a smart event experience with flexible learning options. Attend in person or access the programming online from anywhere.

Course benefits include:
• Preparation for the critical care echocardiography board examination led by highly skilled multiprofessional faculty
• Valuable information for staying up to date on the latest in team-based care and ultrasound and echocardiography education
• Access to published guidelines, expert consensus, and evidence-based recommendations
• CE/Accredited Continuing Education (ACE)* and MOC available

Register early to secure your spot and receive the lowest rates. For more information and to register, visit sccm.org/echoreview.
COVID-19: A Clinical Issue With Lasting Effects

An exploration of post-COVID, post-acute sequelae of COVID-19, and post-intensive care syndrome

The novel SARS-CoV-2 coronavirus and the global COVID-19 pandemic are the clinical issue of the year, of the decade, and very possibly (hopefully) will be the major clinical issue of the 21st century. COVID-19 has affected people on all continents and challenged healthcare in every country, with critical care medicine being among the most impacted professions. As critical care professionals, we are very familiar with COVID-19. We know that about 1 in 5 individuals infected with SARS-CoV-2 who develop symptomatic COVID-19 will be hospitalized, and that 1 in 4 of these hospitalized patients may become critically ill and require care in an intensive care unit (ICU). The most common forms of critical illness with COVID-19 are manifestations of infection-related organ dysfunction, making COVID-19 a viral form of sepsis, with patients often experiencing acute respiratory distress syndrome (ARDS), coagulopathy, acute kidney injury, encephalopathy, and shock.


Long COVID is the term used to describe signs and symptoms that continue or develop after the acute phase of SARS-CoV-2 infection or COVID-19 illness. Acute COVID is limited to the first 4 weeks of infection, while the post-COVID syndromes encompass two groups, either with ongoing symptomatic COVID-19 (generally between 4 to 12 weeks after the onset of COVID-19) or the post-acute sequelae of COVID-19 (PASC) or long COVID, that describe individuals with signs and symptoms that persist beyond 12 weeks from the acute infection or illness. PASC may involve any organ system and also includes other late sequelae of SARS-CoV-2 infection besides persistent symptoms, such as the delayed syndromes known as multisystem inflammatory syndrome in adults (MIS-A) and children (MIS-C).

Together, the post-COVID syndromes include a variety of symptoms that can last weeks or months after the initial infection or illness or may appear as new problems weeks after the initial infection. PASC, identified by the persistence of symptoms several weeks after the initial illness, occurs in 30% to 70% of people who develop COVID-19, with rates as high as 90% at 2 months after COVID-19. PASC is most strongly predicted by the presence of chronic comorbidities and advancing age and may be more common in people of color, and it appears to be more common in those who experienced symptomatic COVID-19 versus asymptomatic SARS-CoV-2 infection.

The most frequent symptoms of long COVID are fatigue, dyspnea, “brain fog,” cough, chest pain, joint or muscle pain, headache, dizziness, depression, anxiety, and loss of taste or smell. It is noteworthy that prior coronavirus epidemics such as severe acute respiratory syndrome and Middle East respiratory syndrome identified frequent persistence of symptoms or decrements in long-term health, while brain fog and other neuropsychiatric sequelae of severe viral infection were reported after the 1880s and 1918 influenza pandemics. Importantly, PASC or long COVID may be more common in people who...
experienced the more severe forms of COVID-19 including critical illness.  

**Post-Intensive Care Syndrome**
In the past decade, SCCM and the THRIVE initiative have made the post-intensive care syndrome (PICS) part of our daily ICU vocabulary. PICS is particularly common among those with acute respiratory failure requiring mechanical ventilation or circulatory shock, with 3 out of 4 patients experiencing new or worsened impairments in physical, cognitive, mental health, or occupational functioning. While many of the manifestations of PICS overlap with those of long COVID and PASC, the risk factors have several similarities as well, such as illness severity, chronic comorbidities, and medications. The key now is to disentangle the post-COVID syndrome to better understand PASC, as we do PICS—both the similarities and differences. In the process, we will increase our understanding of both conditions and improve outcomes not just for COVID-19 but for all critically ill patients. The resources we have for PICS are a valuable head start on the post-COVID syndromes such as PASC.

**The Path Forward**
We are fortunate to know much more about COVID-19 now than we did a year ago, and equally fortunate to know so much more about PICS than we did a decade ago. For patients with COVID-19 who experience critical illness, the similarities between PICS and long COVID are unmistakable, and our experience with PICS and the THRIVE initiative shines a light to show the path forward. We must: 1) increase our understanding of the pathogenesis of PASC and of the group and individual manifestations of the post-COVID syndrome after critical illness; 2) determine the predictors of PASC, together and separately from PICS, and develop screening tools to identify patients at higher risk; and 3) develop prevention and treatment strategies that address the underlying causes and manifestations.

In the meantime, patients will continue to benefit from established evidence for how best to care for critically ill patients, and we must redouble our efforts at delivering the highest-quality care to every patient. COVID has challenged us to implement our core quality processes that improve survival and meaningful outcomes for our critically ill patients, such as the ICU Liberation Bundle (A-F). As we have done with sepsis and for PICS, we will develop the research and quality improvement projects that guide the future for post-COVID, PASC, and PICS. The nature of critical care medicine to work collaboratively and deliver team-based care lends itself to the creation of multiprofessional post-COVID clinics to address the complex combination of physical, cognitive, mental health, emotional, spiritual, and other elements that provide indispensable post-COVID care.

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References and disclosures: see page 45
During the COVID-19 pandemic, overwhelmed hospital systems required intensivists of all specialties to care for critically ill patients with COVID-19. All types of patients treated and admitted to hospitals had significant variations from baseline. As part of statewide, regional, and national systems, trauma centers use an all-hazards approach to disaster preparedness and are poised to respond to situations such as pandemics. This article covers trends and care of injured patients in the United States during the pandemic as well as a look into possible trends for the future.

Changing Patterns of Injury

Amid the emerging public health crisis of COVID-19, overall trauma volume increased, and two major epidemiologic trends emerged in the care of injured patients during 2020 and 2021—marked increases in gun violence and traffic injuries. Observational data from large urban centers revealed an increase in firearm injuries early in 2020.1,2 By year-end, the increase in gun violence had become stark. New York City Police recorded a 97% increase in shootings during 2020 (over 1500 victims),3 and Chicago shootings increased 35% (4033). A preliminary analysis of 2020 data from 800 U.S. trauma centers that submit injury and outcome data to the Trauma Quality Improvement Program (TQIP) revealed an increase in trauma volumes overall, a sharp rise in the percentage of patients sustaining a firearm injury, and an increase in injuries associated with alcohol.

Firearm injury and mortality data are difficult to trend nationally because of federal restrictions on funding and research. The independent data repository gunviolencearchive.org has tracked firearm statistics since 2013 using open-source, database-driven reporting from state and national sources. Their data show a nearly 25% increase in gun-related homicides in 2020 (3955 additional victims, totaling 19,402 victims).4 Furthermore, this trend in increased gun violence has continued as we entered the summer of 2021.

Paradoxically, traffic fatalities rose 7.2% overall during 2020 according to the National Highway Traffic Safety Administration (NHTSA) statistics despite fewer overall drivers on the roads, work-from-home orders, and prolonged lockdowns. The types of vehicular crashes during the pandemic changed, with increased single-vehicle crashes (up 9%), rollover crashes (up 9%), passenger ejection injuries (up 20%), and alcohol-related accidents (up 9%).

Clinical Spotlight: Clinical Issues of the Day

Care of the Critically Injured Patient

Trends Expected for 2021 and Beyond
over the previous year, coupled with less frequent use of seat belts (down 15%). Likely contributing to these shifts is an increase in impaired operation of vehicles. An observational study from NHTSA showed that there were statistically significant increases in traffic injuries and deaths involving alcohol, THC, and opioids (especially fentanyl) after March 2020.\textsuperscript{6,7,8}

The social determinants contributing to interpersonal gun violence, substance abuse, and traffic crashes are vast and varying. The prolonged lockdown only served to uncover the stress fractures underlying the disrupted American societal norms. Strictly enforced home quarantines caused isolation from family and social contacts, rapidly rising unemployment revealed food insecurity and resource scarcity, homelessness subsequently rose, insecurity caused a surge in firearm sales, and lack of access to mental health services caused destabilization and desperation. Compounded by continual fear of an emerging pandemic and a polarized media landscape spreading often-conflicting narratives to their captive home audiences, changes in risk taking-behavior and desperation are not surprising. As the COVID-19 pandemic recedes and America reopens, the trends in injury epidemiology will likely continue to change in unexpected ways.

Trauma Centers Step Up in a Crisis

Trauma centers form the backbone of disaster preparedness. On any given day in the United States, mass casualty events cause an unexpected surge of patients—whether due to gun violence, motor vehicle collisions, natural disasters, or other incidents. Trauma centers and their personnel who contribute to the care of injured patients—trauma surgeons, emergency physicians, intensivists, advanced practice providers (APPs), nurses, pharmacists, respiratory therapists, and others—stand ready for a potential disaster from the moment they arrive at the hospital each day. Thus, it only makes sense that many trauma centers have been at the forefront of the COVID-19 pandemic.

An example of a trauma center’s ability to adapt and surge is the R. Adams Cowley Shock Trauma Center at the University of Maryland Medical Center (UMMC) in Baltimore, Maryland, USA. The Program in Trauma was at the forefront of the State of Maryland’s COVID-19 response. With a robust regional trauma system serving as the framework for the state’s critical care network, triage systems were revamped to distribute patients across the 14-hospital network based on resource availability, with only the most critically ill patients brought to the Shock Trauma Center.

The lung rescue unit (LRU) is a preexisting intensive care unit (ICU) at the Shock Trauma Center that is dedicated to veno-venous extracorporeal membrane oxygenation (VV ECMO). The LRU expanded to a 32-bed biocontainment unit (BCU) with capabilities for 16 ECMO patients at a time. The critical care resuscitation unit, the only ICU in the United States dedicated to the interhospital transfer of patients, also served a major role in the triage and resuscitation of these patients.

While the BCU was a collaborative effort by a multidisciplinary team of individuals throughout UMMC, the trauma center’s surgeons, intensivists, APPs, nurses, and pharmacists primarily staffed it. The Shock Trauma Center’s experience with disaster preparedness allowed it to adapt to deliver time-sensitive critical care while trauma volumes dipped during the initial surge in spring 2020.

As of mid-June 2021, the Extracorporeal Life Support Organization (ELSO) reported a total of 7223 COVID ECMO runs, with 4550 in North America, and an additional 1644 in Europe and the rest of the world. The current survival rate to discharge is 51%. To date, at the Shock Trauma Center, more than 400 VV ECMO consults were triaged, with nearly 100 patients having received ECMO therapy for COVID-19, the most in the United States. The current survival rate to hospital discharge is 67%. At the peak of the COVID-19 surge in May 2020, 29 patients were on ECMO at a single time at UMMC.

“We were able to rapidly get the right patient to the right place in the right amount of time. In the final analysis, we made a clear, unwavering commitment to do whatever was necessary to provide care for the sickest of the sick and then delivered on that commitment,” said Thomas M. Scalea, MD, MCCM, physician-in-chief of the R. Adams Cowley Shock Trauma Center.

Preparing for the Future

Following lockdowns implemented in many U.S. states, injury volumes temporarily decreased but then emerged at high levels in 2020. Injury volumes in 2021 continue to surpass those of 2020 overall, with violence-related and vehicular injuries remaining high. Along with COVID-related hospitalizations declining since early 2021, increasing vaccination rates have allowed many locales to reopen to pre-COVID activity. It remains to be seen whether we will witness an additional surge in COVID-19 hospitalizations. In the meantime, it is important that we develop best practices to prepare for the next local, regional, national, or worldwide disaster. The adaptability and preparation of trauma centers and trauma systems involving multiple trauma and non-trauma center hospitals is uniquely structured to care not only for injured patients but also for adults and children who require care as a result of potential future man-made and natural disasters.
Throughout the COVID-19 pandemic, military medicine has been called on to support medical personnel when the high disease burden exceeded the hospital or medical system’s capacity. The traditional military deployment plan is based on trauma response with a stepwise increase in capabilities at higher levels, referred to as echelons. Echelons 3 and above provide care at the level of the intensive care unit (ICU). The initial military response in March and April 2020 used these large echelon 3 level teams such as the hospital ships USNS Mercy and USNS Comfort in Los Angeles and New York as well as a large Army alternative care facility at the Jacob K. Javits Center in New York. This article describes our experience with the transition to the smaller embedded care response teams.

From June to July 2020, the number of positive COVID-19 tests in Texas increased from 3000 per day to over 15,000 per day. ICUs and hospital wards were overwhelmed. In addition to the outstanding work of healthcare professionals in Texas, contract agencies augmented hospital staff. Support from the federal government was also requested, so Federal Emergency Management Agency (FEMA) played a major leadership role, but additional manpower was needed. The military responded with a joint operation lead by U.S. Army North, which is the military command in charge of all U.S. military land-based forces in North America. Several teams provided embedded response in Texas,

The Rural Rapid Response Team

How embedded Navy teams provided COVID-19 response in small South Texas hospitals
RRRT Starr County Experience (July to September 2020)

One RRRT team of seven responded for both Eagle Pass and Del Rio, Texas. Two 14-member teams responded for Rio Grande City, Texas, which was the most resource-limited site of the group. Rio Grande City has a population of approximately 15,000 and is the largest city in Starr County, with a population of approximately 50,000. Starr County Memorial Hospital (SCMH) had 36 medical-surgical beds and no ICU capability. Historically, they transferred anyone with ICU-level acuity to Hidalgo County, which is approximately an hour away and has multiple hospitals with ICU beds.

In July 2020, SCMH went from four inpatients to six to completely full and they were unable to transfer any of them because the accepting facilities were also over capacity. Overnight, SCMH created a 29-bed COVID-19 unit by building two sets of double doors surrounded by plywood and insulation. All 29 COVID-19 patient beds were full, and 13 to 20 patients a day had ICU-level acuity, typically due to respiratory failure requiring advanced support.

The Navy RRRT 34 arrived in July with two ICU physicians, 10 ICU nurses, and two respiratory therapists, who provided 24-hour support. Over the seven-week course, the SCMH team cared for 189 patients with COVID-19, of which 114 met ICU criteria. There were 42 intubations, 142 ventilator days, 275 bilevel positive airway pressure days, and seven central lines and three chest tubes placed, with an overall 91% survival rate to transfer or discharge.

Resource-Limited Focus

The military has a long history of operating in resource-limited environments for trauma. On the battlefield, equipment, medication, staff, and time for medical interventions are all limited. Battlefield or disaster triage is based on a utilitarian ethical theory: perform the greatest good for the group by spending resources on the critically ill as opposed to the expectant or the walking wounded. During the RRRT response in Texas, each team created a site-specific battlefield triage script prospectively for the management of limited resources to include disease-modifying experimental medications (e.g., remdesivir).

Table 1. Remdesivir Triage Script for Starr County Memorial Hospital, July 2020

<table>
<thead>
<tr>
<th>Positive</th>
<th>Neutral</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>&lt; 55</td>
<td>55-65</td>
</tr>
<tr>
<td>Days after admission</td>
<td>1-5</td>
<td>5-10</td>
</tr>
<tr>
<td>Type of oxygen support</td>
<td>HFNC, BiPAP</td>
<td>NRB, SFM, NC</td>
</tr>
<tr>
<td>Number of comorbidities</td>
<td>0-1</td>
<td>2</td>
</tr>
<tr>
<td>Disease complications</td>
<td>Low or no risk</td>
<td>Moderate or no risk</td>
</tr>
<tr>
<td>Disease severity (CFS)</td>
<td>&gt;6</td>
<td>4-5</td>
</tr>
</tbody>
</table>

Abbreviations: BiPAP, bilevel positive airway pressure; CFS, Clinical Frailty Scale; HFNC, high-flow nasal cannula; NC, nasal cannula; NRB, nonrebreather; SFM, simple face mask.

The views expressed in this presentation are those of the authors and do not necessarily reflect the official policy or position of the Department of the Navy, Department of Defense, or the United States Government.

We are military service members. This work was prepared as part of my official duties. Title 17 U.S.C. 105 provides that “Copyright protection under this title is not available for any work of the United States Government.” Title 17 U.S.C. 101 defines a United States Government work as a work prepared by a military service member or employee of the United States Government as part of that person’s official duties.

Commander Michael J. Kavanaugh, MD, is a naval officer and infectious diseases/critical care physician who serves as the director of the Military Tropical Medicine Course. He also serves as associate program director for the Walter Reed National Military Medical Center internal medicine program. In 2020, he deployed as the Officer in Charge of Rural Rapid Response Team 34 with Expeditionary Medical Facility Lima under Task Force 46 to Rio Grande Valley, Texas, USA, in support of COVID-19 pandemic care. He is a member of the Society of Critical Care Medicine who is actively involved as a course director and consultant for both Fundamental Critical Care Support (FCCS) and FCCS: Resource Limited.

Captain Sean A. McKay, MD, serves as the consultant to the Navy Surgeon General for Pulmonary and Critical Care Medicine. He is board certified by the American Board of Internal Medicine in internal medicine, pulmonary medicine, and critical care medicine. Captain McKay is also a diplomate of the American Association of Bronchology and Interventional Pulmonology and is a member of the Murtha Cancer Center’s Thoracic Oncology Team at the Walter Reed National Military Medical Center in Bethesda, Maryland, USA. In 2020, he deployed as the Officer in Charge of a rural rapid response team with Expeditionary Medical Facility (EMF) Lima under Task Force 46 to the Texas-Mexico border in support of domestic COVID-19 pandemic operations.

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Clinical Spotlight: Clinical Issues of the Day

equipment (e.g., ventilators), and staffing (e.g., ICU vs. ward nurses). The triage scripts used previously validated COVID-19 risk assessment models that estimated prognosis based on demographics, comorbidities, disease complications, and severity of disease at presentation. An example of a sample triage script for remdesivir is shown in Table 1. By prospectively designing triage scripts for the use of equipment and medications, the RRRT could transparently discuss resource management and expectations with the native hospital staff and with patients’ family members during a stressful COVID-19 surge.

In addition to creating triage scripts that the native hospital could use for limited-resource management, one of the RRRT’s main missions was to ensure that the hospital could sustain the care of patients with COVID-19 after the military teams departed. Toward this goal, the military ICU nurses and physicians took time to teach the native nursing and physician staff how to create and maintain an ICU. They wrote 16 distinct site-specific standard operating procedures for the use and maintenance of ventilators, vasoactive medications, patient feeding, and COVID-19 management. In addition, more than 10 training sessions were provided on ICU care and COVID-19-specific considerations such as the donning and doffing of personal protective equipment (PPE). Cardiac arrest team roles were assigned with combinations of native and visiting staff to ensure experience and sustainment of critical care skills. Cardiac arrest carts were reformatted and rapid sequence intubation kits were created to assist in standardizing COVID-19 care during emergency patient scenarios.

Additional resource-limited innovations occurred with RRRT 1 in Del Rio, Texas. When the team arrived at the hospital, RRRT 1 supported the hospital’s newly created 17-bed COVID-19 isolation ward and 12-bed COVID-19 ICU. But there was a staff shortage because several staff members had tested positive for COVID-19. On review, the RRRT determined that the staff required further training on PPE donning and doffing procedures and that the wards were not negative pressure. The RRRT met with hospital leadership and environmental services and were able to create isolated negative-pressure wards using plastic sheeting and duct tape, strategically removing certain windows, and purchasing industrial fans at a local hardware store. This construction was based on the recommendations set forth in the Centers for Disease Control and Prevention and the State of Minnesota’s Airborne Infectious Disease Management guidelines. The team also put together a nursing skills fair on critical care processes, policies, and procedures and were able to train all of the staff caring for patients with COVID-19. With these changes and training, they were able to expand ICU bed capacity to 20, reduce COVID-19 exposures by 96%, and care for 160 critically ill patients with COVID-19, with a survival rate of 70%.

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ARDS: Will Precision Approaches Move the Needle?

In the 2006 animated Pixar movie *Cars*, there is a scene where the tow truck Mater shows off his backward driving to Lightning McQueen. In the dark of night, Mater drives in reverse through streets and around obstacles, never once crashing into anything. When Lightning asks him how he does it, Mater says, “Ain’t no need to watch where I’m going. Just need to know where I’ve been.”

What does an animated movie about talking cars have to do with acute respiratory distress syndrome (ARDS)? The onset of COVID-19 brought renewed attention to ARDS, so it is important to recognize the history of the condition and how the management of ARDS with mechanical ventilation has evolved during the past 50 years. To look forward to better treatment of ARDS, it is first necessary to look back.

Daniel S. Talmor, MD, MPH, chair of the Department of Anesthesia, Critical Care and Pain Medicine at Beth Israel Deaconess Medical Center in Boston and a professor of anesthesiology at Harvard Medical School, addressed the past, present, and future of ARDS treatment in one of the most highly attended sessions of the Society of Critical Care Medicine’s (SCCM) 50th Critical Care Congress, held virtually in 2021.

The Peter Safar Memorial Lecture, ARDS: Will Precision Approaches Move the Needle? sought to identify COVID-19’s link to ARDS, reveal the failings in past approaches to ARDS treatment, and describe current and future opportunities for individualizing therapy for patients with ARDS. “COVID-19 manifests itself in ARDS,” Dr. Talmor said at the beginning of his presentation. “This is a disease that’s been around for more than 50 years, one that we’ve battled with often, and one in which we’re making great progress.”

**The Past**

ARDS occurs when fluid leaks into the lungs, which decreases oxygen delivery into the bloodstream, leading to hypoxemia. A 1963 article in *The New England Journal of Medicine* stated that continuous use of large tidal volumes or periodic deep breaths were essential in preventing hypoxemia. The first mention of ARDS was in a 1967 article in *The Lancet* that described ARDS and described how positive end-expiratory pressure (PEEP) improved the mechanical ventilation of patients with ARDS and increased survival rates. In a subsequent 1971 article in *Chest*, Petty and Ashbaugh recognized the importance of large numbers of deep breaths combined with PEEP in ARDS management. “We have learned that a high-volume ventilation with both inspiratory plateau and positive end-expiratory pressure (PEEP) improves oxygen transport across the lung,” the authors said.

According to Dr. Talmor, this was the state of knowledge surrounding ARDS and its management until the mid-1980s, when critical care physicians realized that the large tidal volumes used by ventilators could cause lung injury and actually exacerbate ARDS. Further research led to the discovery that outcomes improved with lower tidal volumes rather than higher tidal volumes. Dr. Talmor explained that this discovery led to a paradigm shift. Instead of focusing on obtaining normal oxygenation numbers, physicians began focusing on preventing further injury by implementing 6 mL/kg tidal volume as a standard practice.

Later research found that a one-size-fits-all approach to tidal volume was not the best approach to ARDS management. In 2016, Bellani et al found that clinicians often did not subscribe to the 6 mL/kg standard anyway, opting instead to initiate a rate based specifically on each patient’s condition and body type. “While we focused on prevention of ventilator-induced lung injury, we didn’t necessarily do it in the smartest way,” Dr. Talmor said. “We
used one-size-fits-all approaches that were neither what clinicians did in practice nor what made sense from a physiologic standpoint.”

**The Present and the Future**

ARDS is heterogeneous, appearing in different forms in different patients. Patients’ reactions to it also vary based on individual traits. Researchers have identified ARDS phenotypes based on mechanical factors, clinical factors, and imaging; these phenotypes can be used to personalize mechanical ventilation. Dr. Talmor explained methods for individualizing ARDS treatment, such as ventilating at different levels of PEEP to calculate ideal transpulmonary pressure. Dr. Talmor also discussed the challenges of identifying patient-ventilator dyssynchrony by observation alone and how automated dyssynchrony detection can help by using neural network pattern recognition to suggest ventilator setting modifications.

One tool that helped push forward the understanding of ARDS was CT, but CT is not practical at the bedside. Electrical impedance tomography (EIT), however, can be performed at the bedside. Dr. Talmor said that EIT can be used to assess ventilation and perfusion in patients with ARDS. “We can view the ventilated and perfused areas of the lung, we can identify areas of collapse and overdistention, and . . . identify the optimal PEEP, which minimizes overdistention and minimizes collapse,” he said.

Great progress has been made in the past 10 years in identifying biomarkers associated with hypoinflammatory and hyperinflammatory ARDS. It is hoped that these biomarkers will be used to distinguish subgroups of patients based on their subphenotype and their corresponding risk of mortality.

Eventually, closed-loop ventilation systems will be developed, which will measure and automatically respond to a patient’s needs, Dr. Talmor said. This type of personalization is not available yet, but it is the wave of the future, he added. As technological advances continue to play a greater role in the process of ventilation and patient care, Dr. Talmor implored listeners not to get complacent. “Use of technology in closed-loop systems is not an abdication of responsibility,” he said. “It actually increases our responsibility because we need to be able to supervise all these new systems and know exactly what they’re doing and exactly how to deal with any issues that may come up.”

Dr. Talmor likened the responsibilities of a critical care physician to those of a pilot. Not all pilots can explain the specific function of each button in the cockpit and the details of every machine on an aircraft, but they know how all the different functions work together and can identify when there is a problem. The same should be true of critical care physicians. “We always need to be the pilot,” he said. “There is no substitute for a keen, intelligent, and dedicated physician at the bedside. That’s the number one monitor for any patient.”
Mandate to vaccinate or nudge if there is no budge? COVID-19 vaccines remain a key weapon in the fight against the deadliest modern-day pandemic the world has seen. In this article, we summarize key facts and ethical considerations for healthcare organizations when considering a COVID-19 vaccine mandate for U.S. healthcare workers (HCW).

Vaccination Mandates for HCW

Federal and State Regulations

Since the advent of vaccines, mandates have been used to achieve herd immunity both in the general population and amongst HCW.1,2 Current federal regulations do not include any mandatory vaccination programs; rather, vaccine mandates are generally within the purview of state and local governments. State vaccine requirements for HCW vary widely. Some states have laws requiring HCW to be vaccinated against diseases such as measles, mumps, and rubella, with opt-out provisions for when the vaccine is medically contraindicated or against the person’s religious or philosophical beliefs.3 Mandatory requirements for influenza vaccination among HCW exist only in three states: Alabama, Colorado, and New Hampshire.4

Healthcare Organizations

Many professional organizations endorse the proposition that HCW have a professional and ethical responsibility to help prevent the spread of infectious pathogens. The Society for Healthcare Epidemiology of America recommends annual influenza vaccination as a condition of employment and professional privileges for HCW.5 The American College of Physicians policy suggests that influenza vaccination be mandated for all HCW, unless there is a medical or religious objection.6

In 2004, Virginia Mason Medical Center in Seattle, Washington, became the first healthcare system in the United States to make influenza vaccination a condition of employment. Within three years, the hospital reported 98% staff coverage. The remaining 2% of the staff who refused for medical or religious reasons were required to wear surgical masks when in the hospital during the flu season.7 This influenza vaccine mandate is now followed by more than 400 healthcare organizations.8

COVID-19 Vaccines

Currently, all COVID-19 vaccines are being used under Emergency Use Authorization (EUA) granted by the U.S. Food and Drug Administration (FDA). An EUA requires fewer safety and efficacy data than full Biologics License Application (BLA) approval, which may result in less trust in the vaccines because administration could be considered “ongoing medical research.”9 Under an EUA, vaccine recipients must be informed of “the option to accept or refuse administration of the product.”10,11 It is unclear whether COVID-19 vaccines can be legally mandated while operating under an EUA prior to official FDA approval, as courts have not yet ruled on this issue. Once COVID-19 vaccines receive BLA approval, healthcare facilities may implement mandates for COVID-19 vaccination more broadly (as with influenza vaccination).

The U.S. Equal Employment Opportunity Commission (EEOC) states that employers should follow COVID-19 vaccine guidelines specified by the Centers for Disease Control and Prevention (CDC) and state or local public health authorities. Employees may also be subject to certain legally protected exceptions for disabilities under the Americans with Disabilities Act and for sincerely held religious beliefs under Title VII of the Civil Rights Act.12

According to CDC recommendations, COVID-19 vaccines are not mandated under EUAs; however, they allow for local mandates: “whether a state, local government or employer may require or mandate COVID-19 vaccination is a matter of state or other applicable law.”13

As of May 2021, Italy is the only country that has required HCW to be vaccinated against COVID-19.14 Most healthcare organizations in the United States have not yet broadly mandated COVID-19 vaccination. Exceptions
include Indiana University Health, the New York-Presbyterian healthcare system and Houston Methodist Hospital. The latter hospital was sued over this mandate, but the lawsuit was subsequently dismissed by a US District judge.\textsuperscript{15}

The risk for transmission of infections is high among vulnerable persons in healthcare settings: patients, HCW, and third parties with whom they may come in contact. The goal of a vaccine mandate would be community protection or ‘herd immunity.’

**Ethical Analysis**

The root of the ethical dilemma behind a vaccine mandate is the conflict between public health ethics and the right to individual liberty and autonomy. Utilitarian arguments for vaccine mandates claim that higher immunization rates result in greater good for all (lives saved, morbidity avoided). According to this view, mandating universal vaccination is morally justified because of the consequences: community protection and reduction in virus transmission, resulting in lower rates of infections, hospitalizations, and deaths. Critics of utilitarianism contend that it is limited to “value monism” or that utility is the only fundamental “super-value” and that other values (eg, individual liberty) do not have the same moral value.\textsuperscript{16} Conversely, appealing to self-interest and individual liberty via lotteries and offering payment for vaccination\textsuperscript{17} (inducement) could erode the sense of solidarity with public health and the willingness to take risks for the common good.

**Advantages of a Mandate**

- **Beneficence, nonmaleficence:** Healthcare institutions have a legal and ethical obligation to ensure a safe environment for patients, HCW, and visitors. Vaccination would reduce viral transmission and thereby promote health, enhance patient safety, and provide a sense of security. HCW have an ethical/moral obligation to provide care for patients and to do no harm; vaccination would limit the spread of COVID-19 infection.

- **Justice:** Vaccines prevent hospitalizations and may reduce HCW shortages and protect health system capacity. This would enhance distributive justice and enable healthcare organizations to fulfill their obligations to the sick and vulnerable.

**Disadvantages of a Mandate**

- Administration of a vaccine requires verbal, informed consent. Mandates eliminate the right to informed consent or refusal of treatment. A mandate with no exemptions would infringe upon personal autonomy and likely has implications for privacy and confidentiality.

- If basic requirements for HCW, such as personal protective equipment, are not met, a vaccine mandate may be counterproductive, negatively affecting staff morale and violating trust when stress levels among HCW are already high.

**Issues to Consider**

- **Availability of vaccines:** A vaccine mandate requires unrestricted access to vaccines; therefore, considerations for a mandate would apply only to areas where COVID-19 vaccines are freely available and supply is unlimited. Of note, the World Health Organization (WHO) does not presently support mandates for COVID-19 vaccination, instead favoring a focus on educational campaigns and universal availability of vaccines.\textsuperscript{18}

- “**Dynamic justification**”: The relative weightiness of reasons for mandating vaccines varies under different circumstances and epidemiological conditions (eg, background vaccination rate, infectivity rate, and rate of hospitalizations).\textsuperscript{19} Evidence for reduced viral transmission following COVID-19 vaccination is emerging. The incidence of new infections and hospitalizations in the United States has been steadily decreasing as more adults, adolescents, and now children have been vaccinated.\textsuperscript{19}

- **Availability of other options:** If the use of personal protective equipment, physical distancing, and physical barriers prevent the spread of COVID-19 and these options are available to HCW, mandating vaccinations may not be ethically warranted. Additionally, imposing a mandate may not be necessary for those who do not interact physically with patients or can work from home. When other alternatives exist, coercion\textsuperscript{20} in the form of a mandate, specified threats, or significant negative consequences for refusal may not be justified.

**“Mandatory” Vaccines and Exemptions**

Contemporary forms of “mandatory” vaccination compel vaccination by direct or indirect threats of restrictions in cases of noncompliance.\textsuperscript{21} Adverse action or termination of employment as a result of vaccine refusal could be considered coercion,\textsuperscript{22} and the employer could be subject to legal action.

According to the U.S. EEOC and CDC guidance documents, vaccine mandates are subject to medical and religious-based exemptions.\textsuperscript{12,13} Providing exemptions would reduce HCW concerns and help them feel more empowered in their vaccination decision.

Facilities that opt for strict vaccine mandates should specify exemptions and offer alternatives to employment termination (ie, teleworking when feasible, staying home without pay).

**Alternatives to Implementing a Mandate**

Alternatives include education campaigns, inducement in the form of incentives and “nudge strategies.” Some states have offered huge monetary incentives to encourage people to get vaccinated.\textsuperscript{7} No EEOC guidance specifies which vaccination incentives can be offered by employers. Thus, these kinds of inducement may be legally problematic, given the potential for “undue inducement” and the different effects they have on persons who may see increased benefit from monetary compensation.\textsuperscript{22}
Nudges change behavior by means of ‘choice architecture’ by organizing the context in which people make decisions.\textsuperscript{23} Tax breaks or enhanced benefits packages and health insurance premiums for HCW who get vaccinated are nudge strategies that can be considered by healthcare systems.\textsuperscript{23}

**Conclusions**

Most people would agree that healthcare organizations are obligated to routinely offer COVID-19 vaccines to all HCW. Considerations for a mandate (even under EUA) would depend upon the local context, and the decision-making process should ideally involve discussions with state and local public health authorities. Deliberations and ethical analyses by institutional policy makers (including organizational ethics experts) should be transparent. Given existing information about COVID-19 vaccines and current EEOC/CDC guidelines, the question faced by healthcare organizations once the vaccines receive full FDA approval is not so much whether vaccination can be mandated legally, rather whether it is ethically justifiable to do so.

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An SCCM Member Responds to a Call for Volunteers

BEFORE THE COVID-19 PANDEMIC, TINA R. SHAH, MD, MPH, FOCUSED HER WORK ON TWO QUESTIONS: How can technology help improve the United States health system and, more specifically, how can it be used to improve patient and practitioner well-being?

The arrival of COVID-19 made these questions more important—and more pressing—than ever before. As medical director of virtual health at Wellstar Health System in Georgia, Dr. Shah spearheaded her company’s COVID-19 telemedicine plan and helped Wellstar go from zero to 50,000 virtual visits in just six weeks. Dr. Shah also helped implement virtual rounds in the intensive care unit (ICU), which allowed more family members to interact with their loved ones than would have otherwise been possible. And it reduced the time nurses had to spend on the phone with loved ones, increasing the time they could be at the bedside.

“It takes so long to get into the room of a COVID-19 patient because of personal protective equipment, and nurses were struggling with family members calling all the time,” Dr. Shah said. “Technology was a huge boon to help with the moral distress we were having in the hospital, because we could have crucial conversations in a more meaningful way.”

Dr. Shah remembers being able to create a virtual room for one critically ill patient so that his wife, who lived nearby; a daughter, who worked at a different hospital; and another daughter, who lived in a different state could all connect by video to see the patient and each other.

“We’ve never been able to deliver care like that before,” Dr. Shah said. “Usually if someone is in the ICU, whoever comes in to visit can get other family members involved via speakerphone a few times, but now every single day we had all the family members come in virtually and decide what the plan of care was for their dad.”

It was not the first time Dr. Shah used technology to improve patient care. She served as a White House Fellow and Special Advisor to the Secretary of Veterans Affairs from 2016 to 2017 and as the U.S. Department of Veterans Affairs first Director of Clinician Wellbeing. In that role, she focused on electronic medical record (EMR) optimization that helped physicians reduce time spent on the EMR and increase the amount of time they could dedicate to patients. This optimization allowed physicians across the country to care for tens of thousands more veterans each week.

In October 2020, after two years at Wellstar, Dr. Shah was ready for a change. Although the pandemic had not abated, she was comfortable with Wellstar’s digital presence and how the system was handling patients with COVID-19. She was also confident that her colleagues would take on her responsibilities and continue to strive for digital growth moving forward.

What Dr. Shah wanted was to find a way to aid a community that was particularly vulnerable to COVID-19. An email from the Society of Critical Care Medicine (SCCM) started her on that path. She opened the message and clicked a link to help deliver critical care to Indigenous communities living on tribal lands through the Indian Health Service, a federally run health system under the U.S. Department of Health and Human Services.

During the first three months of the pandemic, American Indians and Alaska Natives had COVID-19 infection rates that were more than 3.5 times higher than non-Hispanic whites¹ and had higher mortality rates at younger ages than non-Hispanic whites.²

The opportunity Dr. Shah signed up for did not materialize, but it sent her on a path that has her now providing critical care as well as improving technological health systems for these communities. In her current role, Dr. Shah leads an initiative with TribalEM to rapidly increase the Indian Health Service’s capacity to care for critically ill patients with COVID-19.

While Dr. Shah credits SCCM with exposing her to an opportunity to aid Native Americans during COVID-19, she also says SCCM is to thank for her ability to persuade others and be a team leader. Some of that leadership experience was cultivated while serving as an SCCM delegate to the American Medical Association, a role that has allowed her to act as a voice for thousands of constituents.

Now, more than a year since the pandemic began, Dr. Shah said the medical community has learned a number of lessons. They saw the value of having multiprofessional teams care for patients with COVID-19, and she thinks this is something critical care practitioners should continue to emphasize moving forward. Beyond that, her focus is the same as it was before the pandemic as she continues to explore new ways to use technology to help improve patient and clinician experience.

“There is a lot we can do to make our systems work for us as patients and as practitioners,” Dr. Shah said. “We learned how to do it in a crisis situation, and I want to be able to take that speed and now apply it to healthcare after the pandemic. My aim is to continue to use technology to connect the dots at the same speed as we did when we innovated during the pandemic.”

Because nobody knows what will come next, SCCM needs your ongoing support to be ready when the next disaster, epidemic, or pandemic strikes. Please consider a donation of any size to help support SCCM’s work at home and around the world. SCCM’s global disaster response would not be possible without you! Visit sccm.org/donate.
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2. This reduction was seen when times after collection of stool sample were compared.  
7. “22 Targets” is specific to the BioFire® Respiratory 2.1 Panel only.  
9. Study performed using the BioFire® FilmArray® Respiratory Panel.
Drug Shortages

Infusion Pumps Outside Patient Rooms: Clinical Considerations and Medication Safety

IN EARLY 2020, WE WITNESSED THE EMERGENCE AND UNPRECEDENTED IMPACT OF THE COVID-19 PANDEMIC. The disease has a high transmission and mortality rate, which led to a worldwide lockdown. Supply chains were cut because of decreased production and lack of transportation. Hospitals were faced with the prospects of running out of personal protective equipment (PPE). Patient care needs had to be addressed while simultaneously conserving PPE and preserving healthcare workers’ safety by minimizing the number of times they entered patient rooms.

With the need to keep patient doors closed and to don required PPE prior to entry, clinicians could not enter patient rooms easily to attend to patient care needs or to manage the multiple lines and infusions. For critically ill patients, even a brief pause in a life-sustaining infusion can have dire consequences.

Unlike most adults, who can lie still for the duration of magnetic resonance imaging (MRI) with minimal sedation, most children need to be sedated for the procedure. Since most infusion pumps are not compatible with MRI machines, an astute clinician came up with the idea of drilling a hole in the wall of the MRI suite. The patient could be connected to an infusion pump outside the room via an elongated intravenous (IV) tube that went through the hole. This allowed for continuous sedation with minimal interruption to the procedure.

During the pandemic, use of extension tubing sets permitted positioning of infusion pumps outside of patient rooms to promote patient safety by limiting delays in initiating and adjusting medications and exchanging infusion bags. It also allowed nurses to better hear and attend to IV alarm sounds. This practice has been permitted by the U.S. Food and Drug Administration during the pandemic under Emergency Use Authorization. However, this technique should be carefully implemented to prevent harm to patients.

Safety and Clinical Considerations
Here are some recommendations and lessons learned from using infusion pumps outside the rooms of patients with COVID-19 for rate accuracy performance.
A central line should be utilized for administration of IV infusions through extended tubing sets to ensure line patency.

Small-bore extension tubing, three sets with a total length of 15 feet, are attached to the pump’s primary administration set.

- Macrobore tubing may be too large to fit under the door.
- Resistance can occur with high infusion rates.
- Use triport and Y-site connectors if more than one medication is infused; cover all connectors with port protectors.

The following measures should be used to minimize high pressures in the IV line by reducing unnecessary resistance:

- Avoid extraneous loops of pump tubing.
- Limit extension set additions as much as possible.
- Infuse through a large catheter.
- Ensure that all clamps and connections are open, when appropriate.
- Hang the IV bag 20 inches above the pump using a large-gauge catheter.

Prime the fluid through the extended tubing set before connecting to the patient to facilitate prompt medication delivery. If high flow rates are required, macrobore tubing may be considered, but the decision to use wider tubing should be balanced with drug supply considerations because of the high priming volume required.

Implement strategies to minimize tripping hazards posed by extended tubing and power cords on the hallway floor.

Secure tubing and closely observe it to maintain its integrity and organization, especially if tubing from multiple pump channels and pumps is being used.

Ensure an adequate number of outlets in the hallway to keep pumps charged.

Label each IV line inside and outside the room with different colors for each unique line.

Follow infection prevention protocols closely to avoid increased central line-associated bloodstream infection rates due to changes in workflow and potential colonization of tubing from outside the room.

Medication Safety Considerations

Depending on the length of tubing, approximately 20–50 mL of drug volume may be needed for priming. Medication bag sizes may need to be increased to account for the dead space associated with the extra tubing and to decrease nursing and pharmacy workload of frequent bag changes.6 If bag sizes are increased, drug utilization must increase as well, and higher concentrations must be balanced with ongoing drug shortages. Drug stability must also be considered when increasing medication bag sizes and/or changing concentrations to prevent adverse drug events.

Medication-specific considerations with tubing must be kept in mind. Certain drugs such as insulin, tacrolimus, cyclosporin, and nitroglycerin require polyvinylchloride-free tubing to avoid adsorption interactions.7-9 Other drugs such as propofol and clevidine require tubing changes every 12 hours to prevent bacterial growth.10,11 As always, medication compatibilities should be checked when several drugs are being infused through the same line.8

Increased dead space in the tubing elevates the risk of delayed administration of medications, which could be problematic in emergencies such as acute desaturations and hypotension requiring rapid administration of boluses. To help mitigate this risk, flushes should be given at a volume sufficient to overcome the dead space with the caveat that certain medications such as potassium should not be administered too rapidly.12,13

New concentrations, bag sizes, and boluses should be incorporated into smart pump libraries and electronic health records while old entries should be removed or hidden to prevent medication errors. Medication bins within the pharmacy as well as automated dispensing cabinets should also be updated. Existing bar code scanning processes should be modified to maintain a level of medication safety. Placing the patient’s bar code near the pump instead of only at the bedside and labeling IV pumps with the patient’s name and date of birth can help reduce medication errors.

Conclusion

Placing infusion pumps outside patient rooms has become common practice during the COVID-19 pandemic. This practice can potentially be implemented for other infections requiring isolation. The impact of this practice, however, is unknown. While it has many advantages, caution must be exercised to ensure patient safety.
THE SOCIETY OF CRITICAL CARE MEDICINE’S (SCCM) ICU LIBERATION COLLABORATIVE aims to liberate patients from the harmful effects of pain, agitation/sedation, delirium, immobility, and sleep disruption (PADIS) in the intensive care unit (ICU). Studies have shown that the individual elements of the ICU Liberation Bundle (A-F) improve patient outcomes and that the greatest benefits occur when these interventions are combined. The A-F elements of the ICU Liberation Bundle are:

- **A element**: Assess, Prevent, and Manage Pain
- **B element**: Both Spontaneous Awakening Trials (SATs) and Spontaneous Breathing Trials (SBTs)
- **C element**: Choice of Analgesia and Sedation
- **D element**: Delirium: Assess, Prevent, and Manage
- **E element**: Early Mobility and Exercise
- **F element**: Family Engagement and Empowerment

Still, ICU Liberation is not a one-size-fits-all approach, and subspecialized critical care populations may warrant discrete attention to individual bundle elements to be successful. This article highlights unique aspects of ICU Liberation in relevant patient populations and provides guidance toward successful liberation. Three separate teams in neurologic and cardiovascular ICUs share their experiences with implementing the ICU Liberation Bundle:
What have you found to be the easiest and hardest aspects of implementing the ICU Liberation Bundle with your patients?

**Rush University Medical Center**

The concept of interprofessional care is the easiest to implement in a neuro ICU. This contributed to our success with implementing the bundle in our neuro ICU and I believe this would also be true for other neuro ICUs. We were able to have team members present on the unit daily for interprofessional rounds and to contribute to patient care.

The hardest thing about implementing the bundle in the neuro ICU is using the currently available evidence of the bundle elements to justify the potential benefits that may be seen in neurocritically ill patients. Some evidence for the ICU Liberation Bundle can be easily applied in any neuro ICU because pain management and family engagement are essential quality improvement practices for patient care. However, most of the evidence used to perform other bundle elements excludes patients with traumatic brain injury, hemorrhagic stroke, and ischemic stroke. We are trying to extrapolate practices from trials that were performed in medical and surgical ICUs and apply them to our neuro ICU. This requires a more nuanced approach when implementing the bundle. There is evolving evidence in neurocritically ill patients, especially with respect to delirium screening and early mobility that has been published since the inception of the bundle, so this will help guide us in the future.

**Rush University Medical Center**

One of the easiest aspects of implementing the ICU Liberation Bundle was the introduction and early adoption of evidence-based practices, which is part of our ICU culture. We also had parts of the bundle elements in place, just not in a structured format. The timing of the project also coincided with the increased use of extracorporeal membrane oxygenation (ECMO) for our pre-lung transplant patients and the requirement that we ambulate them intubated or extubated. We made it into a team event, with family members playing the Rocky movie theme, for example, as we ambulated in the hallway. Once we were ambulating ECMO patients, anything was seen as possible!

The hardest part of implementation in our CTICU with a large nursing team was ensuring that everyone was informed and understood the bundle elements and new protocols and, more importantly, felt safe following them. When the nurses are confident, they pass that on to the patients, the families, and the interdisciplinary team members.

**Atrium Health**

The easiest thing about the ICU Liberation Bundle is attention to analgesia, sedation, and delirium since the assessments and interventions are often limited by the patients’ current state, procedures, and other complex issues. For instance, if a patient is sedated for seizure control or is experiencing delirium from vasospasm, how does the clinician score delirium and intervene? The bundle is therefore not one-size-fits-all. We constantly educate each other on how best to do this, and adjust our approach as best as we can.

**Rush University Medical Center**

Sometimes our own perceptions can be a barrier to using the bundle. The expectation is that every bundle element is performed daily, but that is not always possible because the goals of care change constantly for each patient. Therefore, performing the bundle means reviewing our checklist every day with the entire team to determine whether we can perform every element. All bundle elements are interrelated, and using a checklist is important to maximize the benefit of the bundle. For example, with
The ICU Liberation website has some great resources and can get you started. Still, you will likely need to adapt the tools locally and practice them to see how they fit. Engage the team in the process, including your neurology and neurosurgical colleagues. Share the evidence and key articles as well as any performance data on a regular basis. Most importantly, celebrate all the wins, and do not forget to focus on team building. ICU Liberation is, after all, not just a bundle but part of a journey for your patients, your unit, and your teammates. 

Learn more at sccm.org/iculiberation

bundle elements A and C, choice of sedation/analgesia is tied to performance of B, D, E, and F. If a neurocritically ill patient requires deep sedation at a Richmond Agitation-Sedation Scale score of -5 to keep intracranial pressure under 20 mm Hg, it would be unsafe to lift sedation and perform an SAT. Therefore, a respiratory therapist would not perform an SBT. The patient could not be assessed for delirium because of the pharmacologically induced coma and the patient could not have early mobility performed at the bedside. However, if the patient begins to improve over the course of the ICU stay and the daily bundle checklist is used for lightening sedation and performing SATs and SBTs, these elements could eventually be performed.

Role changes are a potential barrier for us compared to other units. For instance, our pharmacists often aid in sodium and hypertension management or dive deeper into drugs that may worsen encephalopathy, perhaps more than in other units. Because we have fewer patients on ventilators, the role of the respiratory therapist is often taken for granted. Still, respiratory therapist input is key for many of our patients during their journey since issues such as elevated intracranial pressure can affect sedation and breathing trials or critical care transport. So these are not roadblocks per se, just aspects that might work a little differently.

**Ronald Reagan UCLA Medical Center**
The bundle elements are discussed in daily rounds and applied to every patient every day in our CTICU, so we have identified barriers to the use of the ICU Liberation Bundle specific to CTICU. First, the patient population in our CTICU is somewhat heterogeneous (cardiac surgery, ECMO, assist devices, transplants, thoracic surgeries) and has diverse needs. The protocols related to some bundle elements such as SATs and SBTs may be challenging to apply across all these CTICU patients. For example, non-complicated cardiac surgical patients are extubated within a few hours of arriving in the operating room. On the other hand, for long-term mechanically ventilated patients in the CTICU, there are some practice variations among practitioners in SATs and SBTs as there are no formal protocols in place. In addition, the safety screens for SATs and SBTs are not incorporated in the electronic health record. Also, some of the bundle element protocols (analgesia/sedation, delirium) are slightly modified for our CTICU patient population, but they are still in draft format and are not yet widely in use.

What advice would you offer similar units who are implementing the ICU Liberation Bundle for this specialty population?

**Rush University Medical Center**
It is helpful to develop a plan for performing the bundle elements as a daily part of patient care. A checklist can help with making it a daily activity. In addition, using the electronic medical record systems to develop flowsheets to help document bundle-related activities and goals helps create consistency in performance of bundle activities. Promoting the bundle practices and highlighting successes helps too! It improves morale and gives team members more autonomy in performing patient care activities. We implemented daily SATs and SBTs (when passing a safety screen), performed daily multidisciplinary huddles to discuss early mobility, and engaged families during our involvement with the collaborative. We were able to engage all members of the healthcare team in our neuro ICU and reduce time on the ventilator by 1 day. To this day, we continue to perform the bundle in our neuro ICU.

**Atrium Health**
I suggest relying on your teams, empowering your nursing colleagues and others to lead the effort. The ICU Liberation website has some great resources and can get you started. Still, you will likely need to adapt the tools locally and practice them to see how they fit. Engage the team in the process, including your neurology and neurosurgical colleagues. Share the evidence and key articles as well as any performance data on a regular basis. Most importantly, celebrate all the wins, and do not forget to focus on team building. ICU Liberation is, after all, not just a bundle but part of a journey for your patients, your unit, and your teammates.

**Ronald Reagan UCLA Medical Center**
While cardiac patients do have some specialty considerations, they are still critically ill and benefit from the patient-centered holistic approach the ICU Liberation Bundle brings. An open-minded approach to new concepts helps to change the embedded norms in an ICU. For example, an endotracheal tube, Swan-Ganz catheter, or femoral ECMO should not prohibit mobilization. Strong protocols for sedation, awakening, and analgesia give all ICU clinicians the backup they need to feel comfortable getting their patients interactive. In our experience, a closed- or semi-closed ICU structure affords for a limited set of order writers and a captive audience to have good knowledge of the culture. As the bundle rolled out, people became more and more comfortable with doses of vasopressors, inotropes, and activity. People gravitate and adopt the bundle because they see the results quickly.
Plasma volume status is vital in testing critically ill patients but is extremely difficult and costly to obtain, particularly as a point of care test. Plasma volume assessment affects almost every aspect of a patient’s care, including giving IV fluids, diuresing, starting vasopressors, initiating renal replacement therapy, deciding on transfusion requirements and intubation and extubation.\textsuperscript{1,2}

Nova’s Prime Plus\textsuperscript{®} blood gas analyzer automatically calculates patient plasma volume status using the Strauss formula, which requires measured hemoglobin (Hb) and measured hematocrit (Hct) in order to calculate ePV (estimated plasma volume). Prime Plus reports ePV as part of a comprehensive panel including tests for kidney function, electrolytes, metabolites, gases, and acid/base. It also stores prior ePV values and displays them as a patient trend (∆ePV) graph.

Implicit Versus Explicit Limitation of Scarce Critical Care Resources

AN INTENSIVE CARE MEDICINE ATTENDING PHYSICIAN WORKS AT A TERTIARY CARE HOSPITAL. Six weeks into the COVID-19 pandemic, the medical intensive care unit (MICU) has been operating at an average of 95% capacity. All the hospital beds that could be transitioned to ICU-level to accommodate the overflow of critically ill patients were transitioned weeks ago. Elective admissions and surgeries are going forward on a case-by-case basis. The hospital created a resource allocation algorithm at the beginning of the pandemic but it has not been used because the state’s governor has not declared an official state of emergency.

The physician is called to the bedside of an 84-year-old man admitted four days ago with acute respiratory failure due to COVID-19. The patient is being supported on noninvasive positive pressure around the clock on the acute care ward. He has a history of hypertension, chronic kidney disease, and diabetes. The physician is being consulted because the medical team believes the patient’s condition is worsening and he needs intubation and ICU transfer. The patient had previously communicated his wishes to pursue all life-sustaining treatments, including intubation and cardiopulmonary resuscitation, but is currently too obtunded to undergo a repeat goals-of-care discussion.

Almost all the beds in the MICU are full but the governor has still not declared a state of emergency and the hospital has not enacted its crisis standard-of-care plan. The physician believes that the patient is a poor candidate for intubation and mechanical ventilation because of his age and comorbidities and believes that he is unlikely to survive no matter what interventions are offered. Additionally, the physician fears that transferring the patient to the ICU will take away a much-needed bed from a younger patient with a better chance of survival. The physician tells the medical team that he is rejecting the request for ICU transfer and transitions the patient’s status to do not resuscitate/do not intubate.

The next day, the patient sustains a cardiac arrest and dies without attempts at intubation or cardiopulmonary resuscitation.

Ethical Analysis
This scenario reflects the reality of limited resources that hospital staffs have faced during the COVID-19 pandemic of the past year. At odds in this case are physicians’ responsibilities to their individual patients and the realities of resource scarcity. During a public health crisis, it is widely accepted that physicians may need to shift from a patient-centered focus of care to one that is population-centered—when decisions are made to maximize outcomes across an entire community. The medical institution described in this case recognized the possible need for such a paradigm shift by creating an algorithm to allocate scarce resources.

If there were truly no more ICU beds available in the hospital or surrounding facilities, then enacting the algorithm and making...
the resultant change in the patient’s status would be ethically defensible. However, in this scenario the institution has not officially enacted its crisis allocation plan. Rather, the MICU attending physician made implicit bedside allocation decisions that were not transparently explained to the patient, his family, or hospital staff.

To the MICU attending physician, the decision to keep the patient on the acute care ward must have seemed to be the most appropriate action in the moment. But this approach leads to several problems. First, when rationing decisions are made by a single practitioner alone at the bedside, unconscious biases may lead to poor allocation of resources. Because of these unconscious biases, such as those toward patients of advanced age or those with serious preexisting conditions, physicians frequently underestimate one patient’s likelihood of survival while overestimating other patients’ likelihood of survival. This is particularly true when physicians feel an obligation toward patients they know.

Additionally, in a crisis, individual physicians may not have the full picture of available resources and may prematurely conclude that resources are exhausted when in fact there may be excess capacity elsewhere of which the physician at the bedside is simply not aware. A first step in this case might be to search for open ICU beds at nearby hospitals and to facilitate potential transport for either this patient or a different MICU patient who can be cared for safely at a different institution.

If transfer is not possible and there is definitely no excess capacity to care for this patient, physicians must engage upper-level administration to enact the hospital’s resource allocation algorithm instead of taking on these decisions themselves on an ad hoc basis. Crisis standards must be transparently communicated to patients and the community at large and implemented with uniformity and consistency. Otherwise, hospitals and physicians risk unnecessarily limiting medical care, undermining public trust, and exposing themselves to civil—and even possibly criminal—liability.

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David A. Oxman, MD, HEC-C, is an associate professor of medicine at Sidney Kimmel Medical College and an intensivist at Thomas Jefferson University Hospital, where he cochairs the ethics committee.
Pay Attention When Coding Critical Care

Government agencies and payers, including the Office of Inspector General, are watching closely and data mining to uncover errors.

IT IS IMPORTANT TO REVIEW YOUR DOCUMENTATION PERIODICALLY TO ENSURE COMPLIANCE WITH CORRECT CODING PROCEDURES, DOCUMENTATION, AND MEDICAL NECESSITY SUPPORT FOR THE SERVICE PROVIDED. Critical care services are currently on the Office of Inspector General Work Plan and under government and payer scrutiny. Between October 1, 2016, and March 31, 2018, Medicare paid $1.6 billion for critical care services. An audit of critical care services was performed on clinical practices at the University of Pennsylvania because it was one of the 10 highest-paid providers. Of the 150 claims reviewed, 14 did not comply with Medicare requirements for reporting critical care services.

Medicare coverage of critical care services is defined as “medical care delivered directly by a physician or a qualified nonphysician practitioner for a critically ill or critically injured patient. A critical illness or injury is one that acutely impairs one or more vital organ systems such that there is a high probability of life threatening or imminent deterioration of the patient’s condition. Critical care involves high complexity decision making to assess, manipulate, and support vital system functions to treat single or multiple vital organ system failure and prevent further life-threatening deterioration of the patient’s condition.”

Soon, we will most likely see payers audit critical care services more frequently to uncover coding and documentation errors and recover overpayments for incorrect reporting. All payers, including Medicare and Medicaid, are watching your claims. Payers have the capacity to data mine your claims and identify outliers. What is data mining? It is the practice of examining large databases to pull claims data for a practice, facility, or provider.

Pay close attention to the procedures and services you report on the claim. The Centers for Medicare and Medicaid Services (CMS) uses various programs to audit and monitor claims, such as the Comprehensive Error Rate Testing (CERT) program, which CMS established to monitor the accuracy of claim payment in the Medicare Fee-For-Service (FFS) program. CERT is designed to protect the Medicare Trust Fund by identifying errors and assessing error
rates at both the national and regional levels. Findings from the CERT program are used to identify trends that are driving the errors, such as errors by a specific provider type or service, and assist with allocation of future program integrity resources.

The purpose of the CERT program is to reduce improper payments. Claims are randomly selected for which CERT will request documentation identifying individual claims for review. Improper payment rates are calculated based on these reviews. Table 1 is an excerpt from the CMS CERT data that identifies upcoded error rates by type of service. Upcoding is billing a higher level of service that is not supported by either documentation and/or medical necessity.

Table 1. Excerpt of CERT Type of Services With Upcoding Errors for Medicare Part B Claims

<table>
<thead>
<tr>
<th>Type of Service</th>
<th>Projected Improper Payments</th>
<th>Improper Payment Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital visit, initial</td>
<td>$346,464,248</td>
<td>12.0%</td>
</tr>
<tr>
<td>Hospital visit, subsequent</td>
<td>$241,116,405</td>
<td>4.4%</td>
</tr>
<tr>
<td>Hospital visit, critical care</td>
<td>$141,603,408</td>
<td>13.2%</td>
</tr>
</tbody>
</table>


Only hospital inpatient and critical care services are included in Table 1. It is noteworthy that, of the claims that CERT reviewed, 13.2% were upcoding errors for critical care services.

Physicians and other qualified health care practitioners file claims under Medicare Part B for professional claims. In 2020, Part B documentation errors reported by CERT included:

1. Missing or inadequate documentation to support medical necessity
2. Missing or inadequate documentation to support the service billed with the CPT code
3. Missing order for the service or missing intent to order the service
4. Missing or inadequate plan of care

Table 2 shows that the improper payment rate for critical care services is 19.7%. The rate for insufficient documentation errors is 22.9%, and 72.2% of critical care claims reviewed were improperly coded. In many cases the critical care services should have been reported as subsequent hospital visits. Now is the time to run your frequency report, review your E/M services and other frequent procedures and services, and enlist a coding and documentation expert auditor to review a sample of your documentation to ensure that it is sufficient to pass a payer audit.

Table 2: Excerpt CMS CERT Results 2020 by Inpatient E/M Code

<table>
<thead>
<tr>
<th>E/M Codes</th>
<th>Projected Improper Payments</th>
<th>Improper Payment Rate</th>
<th>Percentage of Service Improper Payments by Error Type</th>
<th>Percent of Overall Improper Payments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>No Doc</td>
<td>Insufficient Doc</td>
</tr>
<tr>
<td>Initial hospital care (99223)</td>
<td>$351,154,832</td>
<td>20.0%</td>
<td>6.1%</td>
<td>17.1%</td>
</tr>
<tr>
<td>Initial hospital care (99222)</td>
<td>$78,686,816</td>
<td>11.6%</td>
<td>0.0%</td>
<td>31.4%</td>
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<tr>
<td>Subsequent hospital care (99233)</td>
<td>$305,673,947</td>
<td>14.9%</td>
<td>5.2%</td>
<td>27.8%</td>
</tr>
<tr>
<td>Subsequent hospital care (99232)</td>
<td>$152,085,881</td>
<td>6.1%</td>
<td>22.7%</td>
<td>64.5%</td>
</tr>
<tr>
<td>Subsequent hospital care (99231)</td>
<td>$27,989,124</td>
<td>13.7%</td>
<td>0.0%</td>
<td>26.2%</td>
</tr>
<tr>
<td>Hospital discharge day (99239)</td>
<td>$50,657,501</td>
<td>11.2%</td>
<td>9.3%</td>
<td>46.2%</td>
</tr>
<tr>
<td>Hospital discharge day (99238)</td>
<td>$17,758,664</td>
<td>12.3%</td>
<td>4.5%</td>
<td>90.8%</td>
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<tr>
<td>Critical care first hour (99291)</td>
<td>$196,057,902</td>
<td>19.7%</td>
<td>3.7%</td>
<td>22.9%</td>
</tr>
</tbody>
</table>


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Section and Chapter News

THE SOCIETY OF CRITICAL CARE MEDICINE (SCCM) has 15 specialty sections to accommodate members of different professions and disciplines. Members may join up to three sections for unique opportunities to network with colleagues and become more involved in projects and initiatives while advancing SCCM’s mission. For more information on joining a specialty section, visit sccm.org/membership.

Anesthesiology Section
The Anesthesiology Section continues to build on a strong foundation and develop new initiatives. On the research front, Research Section Chair-Elect Ashish K. Khanna, MD, FCCP, FASA, FCCM, was the co-lead for the Clinical Investigators Meeting of SCCM’s Discovery, the Critical Care Research Network, held in July.

The section has been using the new SCCM member forum on SCCM Connect to open communication. An internal newsletter produced by Samuel M. Galvagno Jr, DO, MS, PhD, FCCM, and his education team is now in circulation. Collaborative efforts across SCCM and the European Society of Intensive Care Medicine (ESICM) are being fostered. One such example is the ongoing work of Shahla Siddiqui, MD, MS, DABA, FCCM, on compassionate care in the ICU, which is being delivered via an online survey tool.

The Anesthesiology Section places a strong emphasis on diversity, equity, and inclusion, and is asking a diverse and inclusive representation of speakers across membership for future panel proposals for SCCM’s annual Congress events. A mentorship team comprising Dr. Khanna; Jose L. Díaz-Gómez, MD, FASE, FCCM; Craig S. Jabaley, MD; Robert D. Stevens, MD, PhD, FCCM; and Tamas Szakmany, MD, PhD, FCCM will help with this process. Members interested in building panel proposals, including Critical Crossstalk panels, should contact Section Chair Miguel A. Cobas, MD, FCCM, or Chair-Elect Mark E. Nunally, MD, FCCM.

As some parts of the world deal with catastrophic surges of COVID-19 variants, the COVID Activated Emergency Scaling of Anesthesiology Responsibilities (CAESAR) ICU initiative has been reopened for use and credit claiming via the American Society of Anesthesiologists. Several section members were represented on this team last year.

Clinical Pharmacy and Pharmacology Section
Check out the April 2021 Clinical Pharmacy and Pharmacology (CPP) newsletter and supplement containing summaries from over 80 sessions from SCCM’s Critical Care Congress and a new section on diversity, equity, and inclusion. Upcoming issue themes include pulmonology and neurocritical care and will be available on SCCM Connect.

Patient safety updates provide quarterly summaries of patient safety-related literature and alerts and are also available on SCCM Connect. A new interactive pharmacy safety networking series began in August 2021. We have new opportunities for Visiting Clinical Professors to visit your site virtually. Application details and information can be found on SCCM Connect.

New mini-interviews are posted on SCCM Connect. Journal Club: Spotlight on Pharmacy webcasts continue to be held monthly on the third Friday of the month at 1:00 p.m. Central Time.

Join the CPP Section Mentor-Mentee Program as a mentee or mentor to gain or provide professional guidance in a variety of areas. We also encourage each member to take a few moments on MySCCM to update your profile with demographic information and self-identified expertise.

Visit the Research Forum (https://bit.ly/3zDzmIW) to access quarterly Ask Me Anything events, a grant-funding database, and research discussions. Research consult and manuscript/grant review services are also available. View the monthly CPP Pharmacotherapy Literature Update on SCCM Connect and Twitter.

The CPP Section Practice Advancement Committee is working on a pharmacist-to-patient ratio time-motion study. Listen to CPP Section leaders discuss their leadership paths during interviews available this summer.

Visit the CPP Community on the new SCCM Connect for more information on how to get involved and contact information for committee chairs and chairs-elect.

Emergency Medicine Section
The Emergency Medicine (EM) Section is working hard for its members and SCCM with Enyo Ablordepepey, MD, MPH, as the new section chair. Dr. Ablordepepey has a vision for the section of “Engaging by Giving Back!” and we are asking for help recruiting new members from your home institutions. If you know new graduates or colleagues who are not members of the EM Section, please send them our way! Our goal is to have EM Section members on every single SCCM committee, and we can’t do it without your support and recruiting help.

We also ask that members update their profile on SCCM Connect; this will help section leadership identify members with special interests and expertise. The section would also like to welcome Ms. Janean Morales, the new organizational affairs specialist at SCCM.

The section leadership is planning a town hall-style Zoom meeting in the fall, where members will be updated on the section’s activities and have some time for virtual networking, so please be on the lookout for an invitation this summer.

Finally, we have started to plan some activities for the 2022 Critical Care Congress, which will take place in February 2022 in Puerto Rico. Please contact section leadership with any ideas that you may have for our group. Have a safe and happy summer and follow SCCM Connect for section updates.

Internal Medicine Section
Building on the engagement from a great section meeting at the 2021 Critical Care Congress, the Internal Medicine (IM) Section and its executive committee have a number of exciting initiatives planned for the upcoming
year. Under the leadership of Hayley B. Gershengorn, MD, FCCM, we are focusing our efforts in several key areas.

Leo C. Rotello, MD, FCCM, and John P. Reilly, MD, MS, are facilitating the creation of IM Section subcommittees, specifically targeting IM interest groups to better meet membership needs. Robert C. Hyzy, MD, MCCM, is working on IM-specific programming for SCCM’s 2022 Critical Care Congress, including organizing section meetings and social events. Rachel Kohn, MD, is creating content and activities specifically aimed at engaging early-career IM Section members. Christina C. Chen, BCPS, PharmD, is identifying areas of disparity and promoting diversity (e.g., speaker lists). Bram Rochweg, MD, MSc, is investigating new communication channels to optimize member connections (including social media) and optimizing use of the new SCCM Connect platform. Kenneth E. Remy, MD, FCCM, is creating educational content specific to the needs of IM Section members, and Dr. Gershengorn is working on a robust process to solicit IM nominees for SCCM awards.

If any section member is interested in working on any of these initiatives, please reach out to the steering committee member who is responsible for that initiative. We would appreciate your ideas and engagement. More from us soon!

**Neuroscience Section**

SCCM launched the inaugural Neurocritical Care Review course this year as a virtual event due to the COVID-19 pandemic. It was well attended by over 300 multidisciplinary professionals including physicians, nurses, and physician assistants from community and academic settings. The course comprised 30 lectures by 16 specialists on content from general and neurocritical care that were case-based and included supplemental board review-style questions. The course was favorably reviewed on knowledge gain, applicability to practice, and effectiveness of the learning methods and platform. While attendees missed the interaction of a live event, they generally favored the remote accessibility and content covered on the virtual platform. The course was directed by Rhonda S. Cadena, MD, FNCS, and Aarti Sarwal, MD, FAAN, FNCS, FCCM, who will offer a virtual follow-up case review session in the fall to complement the material available on demand. The Neuroscience Section is looking forward to the continued success of the review course, which will be offered annually starting in 2022.

SCCM’s Adult Advanced Critical Care Ultrasound course also endorsed and included neuro-ultrasound in the advanced ultrasound module. This was offered virtually in 2020 and was one of the live courses held in Chicago in August 2021. *Comprehensive Critical Care Ultrasound, Second Edition*, the companion guide for new and experienced clinicians seeking to improve ICU-based ultrasound understanding and skills, also included an inaugural chapter on neuro-ultrasound.

**Nursing Section**

The Nursing Section would like to highlight its two mentorship programs, which promote engagement within the section and help mentees improve their skills in selected areas to help advance their careers.

The Advance Practice Committee developed a mentorship program for those members of the Nursing Section striving to obtain induction as a Fellow of Critical Care Medicine (FCCM). In 2021, the section was proud to have 10 members inducted into the American College of Critical Care Medicine as fellows. With the Advanced Practice Committee’s mentorship program, we hope to continue this trend and increase our numbers yearly. If interested in this mentorship program, please contact Amita Avadhani, ACNP, CCRN, DNP, PhD, at avadhaam@rutgers.edu.

The Membership Committee has also developed a mentorship program for all section members. Career advancement, research, navigation of SCCM Congress, publishing, and leadership are just some of the areas for mentoring offered. The mentorship program launched mid-year 2020 amid the pandemic and was still able to pair 10 mentors and mentees. If interested in this mentorship program, please contact the Membership Committee at nursingsectionmentorship@gmail.com.

The Nursing Section recognizes the hard work of the individuals who put forth the effort to launch these programs and the mentors who are devoting their time to promote the success of a fellow section member. Collaboration and engagement pave the road to success!

**Physician Assistant Section**

Greetings from the Physician Assistant (PA) Section! First, we would like to congratulate James E. Lunn, PA-C, RRT, MHS, FCCM, for being elected to the American College of Critical Care Medicine (ACCM) Nominating Committee! What an honor and great representation for all PAs!

Our subcommittees have been hard at work, and we are excited to share their progress.

Our **Membership Committee** has been working to increase our engagement. Did you know that our section is not exclusive to PAs? If you are not receiving SCCM Connect correspondence, please check to make sure you are a member of the PA Section and that the emails are not going directly to your spam folder. We look forward to connecting with anyone who is passionate about critical care!

Our **Mentorship Committee** held its first Meet and Greet in April via Zoom. We had a great turnout and engaging conversations. We look forward to having another virtual event later this year to further the conversation. In addition, the PA Section is collaborating with the Nursing Section to have a virtual discussion on "Becoming an FCCM Fellow: Pearls and Pitfalls" later this summer. If you’re interested in becoming a mentor or mentee or would like more information on these events, please reach out to Danielle Miltz, PA-C, at danielle.miltz@gmail.com.

The **Fellowship Subcommittee** created a survey for current critical care APP fellowship directors to determine how to best serve the directors and the current fellows. We would love to collaborate with current APP fellows to serve on the subcommittee and to represent the PA Section at Congress 2022! This subcommittee also submitted a crosstalk proposal for Congress 2022 to discuss PA, NP, and pharmacist transitions into practice after critical care fellowship. If you have any questions, please email Melissa A. Ricker, PA-C, at Melissa.Ricker@atriumhealth.org.

Be sure to follow our section on Twitter @PhysAssistICU. Shout out to our **Social Media Committee** for helping to keep us all informed on these events and the latest critical care news. If you would like to have something posted on our social media page, please contact Ash Seth, PA-C, MBA, FCCM, at getback67@gmail.com.
If you have any questions or comments, please reach out to the PA Section Chair, Peter S. Sandor, MBA, PA-C, RRT, MHS, FCCM, at petericupa@yahoo.com.

**Pediatrics Section**
The Pediatrics Section Steering Committee will hold elections before SCCM’s 51st Critical Care Congress to fill two member-at-large seats. The first seat is currently held by Rajit Basu, MD, FCCM, who is completing his second term on the committee and will take on the position of chair-elect at the conclusion of the 51st Critical Care Congress. The second seat belongs to Vijay Srinivasan, MD, FCCM, who is currently in his first term and is eligible to run again for a second term. We are now accepting applications from those interested in joining the Pediatrics Section Steering Committee through the upcoming election.

The ideal candidate is a member of the Pediatrics Section with an established track record of involvement in SCCM activities through previous engagement in other SCCM committees and continued participation in SCCM-sanctioned events. The Pediatrics Steering Committee strives for diversity, so candidates from across the entire professional spectrum are encouraged to apply. Individuals with no prior SCCM committee experience are highly encouraged to first volunteer on other SCCM committees or Pediatrics Section subcommittees to gain experience and then apply for consideration in a subsequent election cycle. In other words, this should not be your first SCCM committee engagement.

Please indicate your interest by submitting a short bio highlighting your background, history of SCCM involvement, and why you would like to be part of the Pediatrics Section Steering Committee to Alexandre T. Rotta, MD, FCCM (alex.rota@duke.edu), Chair of the Pediatrics Section Steering Committee. Additional details regarding the election will be circulated to the Pediatrics Section membership via SCCM Connect.

**Research Section**
The Research Section Steering Committee is interested in increasing members’ involvement. A bimonthly newsletter has been developed and launched via SCCM Connect. It is not required that you be a basic science researcher to join the section as we all use science to inform clinical practice.

Below are descriptions of the Research Section subcommittees along with email addresses of the subcommittee chair should you wish to request additional information. The committees are interdisciplinary and open to new members.

*The Awards Subcommittee* showcases members’ achievements. Contact Varsha P. Gharpure, MD, FCCM (Varsha.Gharpure@ahh.org).

*The Basic and Translational Science Subcommittee* hosts monthly webinars. Contact Kenneth E. Remy, MD, FCCM (kremy@wustl.edu) or Jamie L. Sturgill, PhD (jlstur0@uky.edu).

*The Clinical Research and Epidemiology Subcommittee*.

*The Communications Subcommittee* is seeking volunteers to increase the section’s social media and online presence. Contact Mary E. Lough, PhD, RN, CCNS (mlough@stanfordhealthcare.org) or JoAnn C. Green, RN, CCNS, CNS, DNP (joanngreen017@gmail.com).

*The Education and Simulation Subcommittee* is very active. Contact Pooja A. Nawathe, MD, CHSE-A, FCCM (Pooja.Nawathe@csmc.edu) or Upal S. Bhalala, MD, FAAP, FCCM (Upal.Bhalala@bcm.edu).

*The Mentorship Subcommittee* supports upcoming members. Contact Upal S. Bhalala, MD, FAAP, FCCM (Upal.Bhalala@bcm.edu) or Amy Kiskaddon, PharmD, BCPPS (akiskad1@jhmi.edu).

*The Programming Subcommittee* generates topic proposals and speakers for the annual Congress. Contact David N. Hager, MD, PhD (dhager1@jhmi.edu).

*The Quality and Patient Safety Subcommittee*.

*The Research Section Chair*.

*The Surgery Section*.

July 12, 2021, and shared Surgery Section activities in education, patient safety, award nominations, and an upcoming genealogy project.

Welcome, new surgical critical care fellows! Summer is an exciting time for surgical critical care as we welcome new surgical critical care fellows on August 1. It is a good time to remind all of us that membership in SCCM is FREE for fellows of ACGME-approved surgical critical care fellowship programs when the fellowship program director is an SCCM member. For a full listing of other benefits, visit sccm.org/sponsoredfellows. We will announce details of our annual quiz show soon. Surgical critical care fellows are invited to join a fun team-based quiz show. Members of the winning team receive a valuable prize!

Mark your calendar and join us for the 51st Critical Care Congress February 6-9, 2022, in San Juan, Puerto Rico. The Surgery Section hosts a Year in Review session, highlighting publications in emergency general surgery, trauma surgery, and surgical critical care. We are also looking into hosting a reception and have submitted several program proposals. The Critical Care Congress Program will be available in the fall.

**Carolinass/ Virginias Chapter**
The Carolinas/Virginias Chapter of SCCM (CVCSCCM) serves over 350 members across North and South Carolina, Virginia, and West Virginia to foster collaboration regionally to enhance patient care. Benefits include the Annual Scientific Symposium, leadership and professional development opportunities, collaborative research projects, outreach, mentorship, and networking.

Our 39th Annual Scientific Symposium and Pre-Conference Pharmacology Course, held virtually in June, was a success! Presentations included a keynote by SCCM President Greg S. Martin, MD, MSc, FCCM; an overview of post-intensive care syndrome by Joanna L. Stollings, PharmD, FCCM; acute respiratory distress syndrome in 2021 by Craig R. Ruckle, MD, FCCP; a COVID-19 anticoagulation pro/con debate; and several abstracts from around the region.

The Mentorship Committee has launched a mentor-mentee program, which offers mentorship for FCCM applications, clinical practice, teaching and precepting, research, manage-
Several CVCSCCM committees provide excellent opportunities for networking, collaboration, and professional growth:

- **Communications**: offers chapter newsletters and Twitter journal clubs
- **Education**: coordinates the annual symposium and chapter educational activities
- **Membership**: focuses on recruitment and retention
- **Nominations**: solicits nominations for the board of directors
- **Outreach**: provides local and global outreach opportunities
- **Research**: promotes collaborative research opportunities across the region

If you are interested in joining any of these committees or would like more information about how to get involved, please fill out our new “Join a Committee” form on the website’s home page or email cvcsccm@gmail.com.

Please follow us on social media to stay up to date with chapter news! Find us on Facebook at SCCM Carolinas/Virginias Chapter (CVCSCCM) and on Twitter: @CVCSCCM.

**Texas Chapter**

Since SCCM’s 51st Critical Care Congress, the Texas Chapter met for our annual leadership retreat for goal-setting, group discussion, and team building.

We have also held several in-person and virtual events since Congress including our annual business meeting, where we reflected on our accomplishments of the past year and awarded Anne Rain Tanner Brown, PharmD, BCCCP, FCCM, with the 2020 Alan I. Fields Award for advances in clinical research. We have also been fortunate enough to hold local and multi-city meetings across Texas, including one on hospital management of hyperkalemia and another on the role of CroFab.

As we move toward autumn, we begin our application period for the SCCM Texas Chapter Joseph L. Nates research grant that awards $4000 to fund clinical research designed to enhance the care and outcomes of critically ill patients.

Finally, we are actively preparing for our Annual Symposium October 8-9, 2021, in San Antonio. We are planning to have multi-disciplinary committee members, speakers, and participants with the symposium theme “ICU: It’s All About Resilience.” We will focus on critical care hot topics including resilience during and after a pandemic, women in critical care, and popular sessions such as critical crosstalks and jeopardy. For any questions or information, please contact Utpal S. Bhalala, MD, FAAP, FCCM (utpal.bhalala@bcm.edu).

If you are interested in attending the symposium or learning more about the work of the Texas Chapter, please visit www.sccmtexaschapter.org. Follow us on Facebook, Twitter @sccmtxchapter, and Instagram for the most up-to-date notifications of our activities.

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**Coding and Billing for Critical Care**

**A Practice Tool**

**EIGHTH EDITION**

A must-have text for professional coders, hospital administrators, physicians, nurse practitioners, and physician assistants, *Coding and Billing for Critical Care: A Practice Tool*, Eighth Edition, explains the complexities of critical care coding and billing and offers a better understanding of coding and billing procedures in a critical care setting.

**This new edition includes:**

- An overview of contemporary coding and payment systems
- Expanded information on remote care services, including telehealth, virtual visits, and other online consulting services
- Indispensable guidance on coding related to COVID-19
- The most current information on coding for common procedures performed in critical care

*Coding and Billing for Critical Care: A Practice Tool, Eighth Edition, is available in both print and electronic formats. To purchase, visit sccm.org/coding.*
See how Fresenius Kabi Nutrition, the U.S. market leader in lipid injectable emulsions,¹ may help your critically and chronically ill patients flourish with its portfolio of clinical nutrition products.
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Other Resources