MESSAGE FROM THE CHAIR
Russel Roberts, PharmD, FCCM, BCCCP

I hope everyone had a pleasant summer and is ready for an amazing fall. I am more than halfway through my term serving as your chair and it is quite amazing to see how much our Section has accomplished in such a short time. It is a testament to the hard work and dedication of our various committee and task force members and I thank you all for your continued engagement! Our Section continues to work hard on committee charges and a number of key initiatives (eg, critical care pharmacy position paper, practice model, global health initiative, board recertification and credentialing) to help shape the direction of critical care pharmacy practice. Many of the Section initiatives are highlighted in the Committee updates in the rest of this newsletter. I encourage all members to get involved not only with the CPP Section but also with other SCCM committees. Please contact the committee chairs or me to get involved.

I hope everyone will be able to attend the upcoming 46th Critical Care Congress (Jan 21–25, 2017) in Hawaii. Please remember to register. This Congress promises to have many sessions that will pique your interest. The CPP Section is happy to provide a Pre-Congress Meeting before the start of the meeting that I am sure will resonate with any member who participates in or desires to conduct research. This session, titled “Pharmacist-Driven Research in the ICU,” will consist of the following focused topics: 1) Learning From Experience: Tips and Tricks to Start Research Off Right (Dr. Samuel Poloyac) 2) Making Big Data Seem Small (Dr. Omar Badawi), and 3) Making Novel Feel Normal: Breaking Down Advance and Novel Study Design (Dr. Todd Miano). Additionally, the CPP Section is pleased to provide another great Year-In-Review session. The three topics for the upcoming Congress are: 1) An Update on Pain and Sedation in the ICU (Dr. David Gagnon) 2) Anecdotes on Antidotes: A Toxicology Update (Dr. Megan Rech) and 3) An Update on Pharmacotherapy in the Pediatric ICU (Dr. Elizabeth Goswami). I hope to see everyone at these sessions to obtain a rich learning experience and support our colleagues.
I want to congratulate those members who passed the Critical Care Pharmacy Board Examination this past spring and fall. For those members considering taking the exam in the spring or fall of 2017, SCCM (in partnership with the American College of Clinical Pharmacy) will be offering a Critical Care Pharmacy Preparatory Review Course to be held on the Friday and Saturday before the 2017 Congress.

It is not too early to start thinking about applying to become a fellow of the American College of Critical Care Medicine (FCCM) or a master of critical care medicine (MCCM). The application process is quite comprehensive, and application due dates are typically in March or April. Please navigate to the SCCM website for complete information. Additionally, SCCM usually provides a session on how to become a fellow or master of critical care medicine at Congress. Consider attending the session for more information about the application process.

I am looking forward to an exciting and productive second half of my term. Please feel free to share any ideas or suggestions with me at rjroberts@mgh.harvard.edu

CPP COMMITTEE CORNER

Communications Committee
Joanna Stollings, PharmD, FCCM, BCPS, BCCCP (chair), and Jason Makii, PharmD, MBA, BCPS, BCCCP (chair-elect)

The Communications Committee is presenting its second themed newsletter of the year. The member spotlight and pharmacotherapy article in this issue focus on a practitioner and a topic concerning trauma critical care.

The December newsletter will include a summary of the CPP Section meeting schedule and CPP members involved in educational sessions at the 2017 Congress in Honolulu, Hawaii, USA. Also, the Communications Committee will be compiling a list of CPP Section members whose abstracts were accepted for presentation at the 2017 Congress to publish in the December newsletter. Please ensure that PGY2 critical care residents or other new pharmacists attending their first Congress are aware of this helpful information as they begin to plan their navigation of Congress.

If you have any questions regarding membership in the Communications Committee or contributions you would like to make to the CPP Section newsletter, please contact Joanna Stollings (Joanna.stollings@vanderbilt.edu) or Jason Makii (Jason.Makii@UHhospitals.org).

Education Committee
Diana Mulherin, PharmD, BCPS, BCCCP (chair), and Karen Berger, PharmD, BCPS, BCCCP (chair-elect)
The Education Committee continues to partner with the Society on educational modules, which includes collaboration with the Graduate and Resident Education (GRE) Committee. Our volunteers are working with the GRE Committee to create new modules on Toxicology and Therapeutic Drug Monitoring and update the existing module on Nutrition for Virtual Critical Care Rounds.

The CPP Journal Club continues to be held on the third Friday of every month at 2:00 p.m. Eastern Time. The Education Committee will be collaborating with the Patient Safety Committee to present one patient safety-themed journal club in December 2016. Remember that any SCCM member can register for upcoming Journal Club webcasts for free through the SCCM store. Subscription to Journal Club On Demand is automatic once you are registered. This can be accessed any time by logging in to MySCCM and navigating to MyLearning. Contact Drayton Hammond (drayton.hammond@gmail.com) with any questions relating to CPP Journal Club.

If you have questions or would like to be involved in the Education Committee, please contact Diana Mulherin (dianalynnwells@gmail.com) or Karen Berger (karenberger7@gmail.com).

**Membership Committee**

*Serena Harris, PharmD, BCPS, BCCCP (chair), and Tara Holt, PharmD, BCPS, BCCCP (chair-elect)*

**Mentor-Mentee Program**

The Mentor-Mentee Program continues to provide guidance for mentees in the areas of research, precepting, academia, clinical practice, professional development, and SCCM/CPP Section involvement. All members are encouraged to participate in this program. Thank you to everyone who has signed up to be a mentor. We continue to emphasize the need for additional mentors in all areas and levels of practice and especially those with experience in research and CPP involvement. You may indicate your interest in the program either when completing the membership database profile or by e-mailing Serena Harris (serena.harris@eskenazihealth.edu) or Tara Holt (tholt4@iuhealth.org). Please note that the most expeditious way of indicating interest is by direct e-mail contact.

**PGY2 Critical Care Resident and Fellowship Membership**

SCCM continues to offer sponsored membership dues for trainees. If you are a program director in critical care, nutrition, or emergency medicine and have not received information about sponsored membership, please contact Serena Harris (serena.harris@eskenazihealth.edu) or Tara Holt (tholt4@iuhealth.org).

**CPP Congress Buddy Program**

The Membership Committee would like to introduce the CPP Congress Buddy Program, which aims to connect CPP members (mentor attendees) with first-time Congress attendees or attendees who are interested in becoming more involved in the CPP Section or SCCM (junior attendees). Mentor attendees will be matched with one or more junior attendees based on practice area, years of experience or membership, and/or goals for Congress. Participants will be matched before Congress and will be expected to communicate the plan for the initial meeting, goals for participating in the program, and activities at Congress such as attendance at education sessions and committee meetings or networking through the CPP Section. A guidance document and other information will be provided to all participants. This program is separate from the year-long Mentor-Mentee Program. If you are interested in participating as either a mentor attendee or junior attendee, please contact Serena Harris (serena.harris@eskenazihealth.edu) or Tara Holt (tholt4@iuhealth.org).
Patient Safety Committee
Rachel Kruer, PharmD, BCPS (chair), and Andrew Fritschle-Hilliard, PharmD, BCPS, BCCCP (chair-elect)

The CPP Patient Safety Committee is excited to announce the inaugural patient safety-centric journal club in December. In collaboration with the Programming Committee, the Patient Safety Committee is pleased to represent one of the three journal club topics being presented. Consistent with our committee’s charge to “promote and support patient medication safety-related educational initiatives consistent with the goals and mission of SCCM,” we are thrilled to expand patient safety to this venue! We invite you to join us for this unique opportunity and welcome feedback for future expansion of this initiative. The December CPP Journal Club is scheduled for 2:00 p.m. Eastern Time (1:00 p.m. Central Time) on December 16, 2016. Please look for upcoming communication via the CPP Listserv regarding registration for this event.

The Patient Safety Committee is also charged with conducting and supporting patient safety research and publications. Two research projects are ongoing. A study evaluating ICU admissions as a result of adverse drug events is nearing completion. Additionally, data collection has commenced for a multicenter, retrospective, observational, seven-day point prevalence study seeking to determine the rate of medication errors that occur during patient transfer from an adult ICU to a lower level of care, to characterize the types of medication errors that occur, and to evaluate risk factors contributing to the errors.

Through work with SCCM staff, CPP Section members were able to submit applications for Patient Safety and Section Travel Awards via the online abstract submission portal. Three important abstracts will be highlighted at Congress in Hawaii!

Please contact Rachel Kruer (rkruer1@jhmi.edu) if you are interested in joining the Committee or if you have a desire to learn more about this initiative or others that our Committee is undertaking.

Program Committee
Scott Nei, PharmD, BCPS, BCCCP (chair), and Todd Miano, PharmD, MSCE (chair-elect)

Recruitment Exchange
Are you looking to advertise a current position or do you have current residents looking or applying for a critical care position? Look no further! The CPP Programming Committee offers a Recruitment Exchange at Congress that is free to both employers and applicants. This is an opportunity for candidates to speak with employers about open positions in a low-stakes setting. Below is a flyer with more information. For questions or more information, please e-mail SCCMCPPEXCHANGE@gmail.com. You may also contact Carrie Griffiths (clgriffiths@wingate.edu) with any questions.
2017 CPP Recruitment Exchange

Location: 2017 SCCM Annual Congress Honolulu, Hawaii
Date and Time: Sunday, January 22 from 9:30-10:30 AM

The Clinical Pharmacy and Pharmacology Section is proud to announce the second annual CPP Recruitment Exchange to be held at the 2017 Society of Critical Care Congress in Honolulu, HI.

Institutions
- Advertise your position to the largest gathering of critical care pharmacy specialists in the country
- Meet one-on-one or in small groups with potential candidates
- Follow-up with potential candidates from the ASHP Midyear Meeting or other conferences

Potential Candidates
- Network
- Learn about potential employment opportunities
- Follow up with institutions from the ASHP Midyear Meeting or other conferences

There is NO CHARGE for this event. We do request that all institutions please pre-register by December 15, 2016. On site registrations will be welcome.

Institutions unable to attend SCCM Annual Congress can still participate by sending position information. This information will be posted for prospective candidates to view during the Exchange.

Research Committee
Heather Personett, PharmD, BCPS, BCCCP (chair), and Joe Swanson, PharmD, BCPS (chair-elect)

We’d like to congratulate the authors of this year’s full-length article, “Major Publications in the Critical Care Pharmacotherapy Literature: January 2015 – December 2015,” which will be appearing in the American Journal of Health-System Pharmacy later this year. Thanks to all members of the team: Adrian Wong, Michael Erdman, Drayton Hammond, Tara Holt, Jenna Holzhausen, Michelle Horng, Lori Lynn Huang, Jennifer Jarvis, Bridgette Kram, Shawn Kram, Christine Lesch, Jessica Mercer, Megan Rech, Ryan Rivosecchi, Brian Stump, Colleen Teevan, and Sarah Day.

Online Research Discussion Forum
The Pharmacy Research Committee has created an online forum for the generation of novel research within the Section. This is a private forum intended for Section members to discuss research subjects, troubleshoot potential issues during idea generation, and eventually foster multicenter, pharmacist-led studies. Any subspecialty topic is welcome. Committee members are available to help schedule phone or Google videoconference calls when you are ready to take the idea offline. The forum can be found at http://www.cppresearchforum.icyboards.net. Instructions for logging in and posting can be found in the “Read First” forum prior to registration. If there are any questions or concerns, the committee can be reached at sccmcppforum@gmail.com or by private messaging the administrator account on the forum. We look forward to seeing you there!

Funding Opportunities
The Research and Scholarship Committee maintains a database of critical care research and grant funding opportunities available outside of SCCM. This includes pharmacist support from pharmacy foundations, the pharmaceutical industry, private foundations, and federal funding. There are opportunities available for all research backgrounds, from new to seasoned researchers. The funding opportunity database can be found in the “Research and Scholarship
Committee” folder on the “Committee Documents” web page within the CPP iRoom. Below is an example of an opportunity highlighted in the database:

The Orthopaedic Trauma Association (OTA) is offering grants for OTA members for any research issue related to musculoskeletal trauma, including Clinical Research Grants, Basic Research Grants, and Directed Topic Research Grants. Pre-proposal applications will open November 1, 2016. Visit the Research Funding Database in the CPP iRoom for more information and a link to the OTA website.

Research Consult Service
If you are in need of research consultation for any aspect of your study design, methodology, statistical evaluation, or preparation for manuscript submission, please consider using the E-mail Research Consult Service. No question is too big or too small for this group to address. E-mail your inquiry directly to cppresearchconsult@gmail.com, and the Research Committee will connect you with an experienced investigator who can help with your question. All submitted questions will be addressed within seven business days. Please keep an eye open for the research pearls contained in the monthly CPP newsletter as well!

Manuscript Review
The CPP peer review service is the ideal resource for residents seeking a review of their manuscript by an experienced, published researcher/writer. The purpose is to provide objective feedback of the project to increase the likelihood of journal acceptance. This service is easily accessible to charge members and elicits a response from the reviewer within weeks of a request. A formal policy is available outlining the expectations and responsibilities of the requestor as well as the reviewer. This policy can be found in the “Research and Scholarship Committee” folder under the Committee Documents Section in the CPP iRoom. If you are interested in using this service or have any questions, please contact Heather Personett (personett.heather@mayo.edu) or Joe Swanson (jswanson@uthsc.edu).

Pharmacotherapy Article

Scratching the Surface: Infection Prophylaxis Practices for Intracranial Devices
Kimberly Berger, PharmD, BCPS, BCCCP, and Jessica Jones, PharmD, BCPS

Traumatic brain injury (TBI) is a leading cause of death and disability worldwide. In 2010, approximately 2.2 million U.S. emergency department (ED) visits and 50,000 deaths were due to TBI. Between 2001 and 2010, rates of TBI-related ED visits increased by 70%.1,2 Leading causes of TBI include assault, falls in the growing elderly population, and motor vehicle accidents.3–5 The World Health Organization projected that, by 2020, traffic accidents will be the third leading cause of the global burden of disease and injury.6 Due to the large incidence in young adults, TBI also presents a significant socioeconomic impact through life-years lost from disability or death.7 In 2005, Zaloshnja and colleagues estimated that 3.17 million people in the United States had TBI-related long-term disability, with approximately 2 million of working age (20 to 69 years).8 According to the Centers for Disease Control and Prevention, the economic cost of TBI in 2010, including direct and indirect medical costs, was estimated to be approximately $76.5 billion.4,9

The initial traumatic blow causes direct damage through skull fracture, coup-contrecoup injury, contusions, hematoma or intracranial bleeding, and diffuse axonal injury. However, brain damage extends beyond the initial impact, with secondary insults occurring hours to days later as a result of both intracranial and extracranial processes. Secondary injuries include cerebral edema,
Intracranial hypertension occurs in up to 63% of severe TBI cases (highest risk with Glasgow Coma Scale [GCS] score < 9) and is associated with a poorer outcome due to decreased cerebral perfusion pressure (CPP). Both elevated ICP and hypotension are the leading causes of death in severe TBI. As a result, ICP monitoring is the current standard of practice to promote early identification and treatment of elevated ICP. The Brain Trauma Foundation (BTF) recommends that ICP “should be monitored in all salvageable patients with a severe TBI (GCS score 3–8) and an abnormal computed tomography (CT) scan.” Additionally, the BTF notes that “ICP monitoring is indicated with a normal CT scan if two or more of the following features are noted at admission: age over 40 years, unilateral or bilateral motor posturing, and systolic blood pressure < 90 mm Hg.” Intracranial devices can be placed in the ventricle; parenchyma; or subarachnoid, subdural, or epidural spaces. However, a ventricular catheter connected to an external strain gauge or an external ventricular drain (EVD) is considered the reference standard for ICP monitoring because it is the most accurate, cost-effective, and reliable method. In addition to utilization for ICP/CPP management, these devices are also crucial for identifying evolving intracranial pathologies and for therapeutic cerebrospinal fluid (CSF) drainage.

ICP monitoring devices have demonstrated benefit through early identification and treatment of intracranial hypertension; however, they are not without potential complications. While the reported incidence of these complications is low (hemorrhage requiring surgical intervention 0.5%, malfunction/obstruction 6–16%, malposition 3%, infection 1–27%), their consequences can be devastating. The incidence of ICP device infections varies depending on the type of device: ventricular 8%, parenchymal 14%. Risk factors that may affect EVD infection include duration of monitoring, presence of other systemic infections, location of hemorrhage, open skull fracture (especially when associated with CSF leak), leakage around the ventriculostomy catheter, and flushing the EVD tubing. To decrease the risk of infection, the BTF recommends against routine ventricular catheter exchange or prophylactic antibiotic use for ventricular catheter placement.

Several studies have evaluated risk factors associated with development of central nervous system (CNS) infections after placement of ICP or EVD devices, as well as the causative organisms. Flibotte and colleagues evaluated 311 patients to determine overall risk associated with the placement of these devices. The overall infection rate was 5.5% (17/311). However, no patient with ICP monitors developed infections (0/100); rather, the infection rate among EVD patients was 8.1% (17/211). Of these, the majority of infections were due to gram-positive organisms (82%, 14/17), with 94% (16/17) exhibiting a fever at the time of CSF culture. Although the majority of the infections were due to the common skin contaminant coagulase-negative Staphylococcus, the authors suspected that its presence in CNS cultures did not reflect contamination. Despite infection, clinical outcome measured by mortality and discharge GCS score did not differ among infected and noninfected patients.

In the literature, risk factors for ventriculitis associated with ICP or EVD placement have been identified. They include advanced age, duration of EVD placement > 11 days, number of catheter manipulations (such as for taking CSF samples), and presence of intraventricular hemorrhage. In the retrospective review, Flibotte and colleagues found the strongest predictor of CNS infection to be the increasing duration of device insertion (OR = 1.2 for each day, 95% CI, 1.1–1.3, p < 0.001). Similarly, Kourbeti and colleagues found that the risk of

hematoma, hyper- or hypotension, hypoxemia, hyper- or hypocapnea, hydrocephalus, vasospasm, seizures, and increased intracranial pressure (ICP). Significant reductions in morbidity and mortality have been demonstrated with protocolized care of TBI targeting prevention and limitation of ongoing brain damage due to secondary insult, including monitoring and management of ICP.
meningitis was increased per number of days of EVD (OR 1.21; \( p = 0.049 \)) and ICP (OR 1.24; \( p = 0.002 \)) placement.\(^{15}\)

Literature has shown that the complications associated with EVD and ICP device placement are minimal and are dependent on a number of risk factors. However, there are inconsistent practices with regard to antimicrobial prophylaxis. In a multinational survey-based study of members of the Neurocritical Care Society, there was no consistent practice pattern based on specialty, location, or years of perspective.\(^{16}\) The lack of standard practice can be attributed to the inconsistencies found in the literature. In general, the prevention of postoperative ventriculitis and meningitis presents significant challenges. Clinical decision-making is further complicated by the risk of developing multidrug-resistant (MDR) infections from prolonged antimicrobial use.\(^{17}\)

Stoikes and colleagues tested the hypothesis that prophylactic antibiotics do not reduce the incidence of CNS infections but are associated with acquisition of MDR infections in a single-center trial at a level I trauma center. Patients were identified and divided into two groups: those who received no antibiotics before or during ICP monitoring (NONE; \( n = 71 \)), and those who received antibiotics at the time of ICP monitor insertion (PRO; \( n = 84 \)). The study groups did not differ based on age, injury severity score, GCS score, ICP days, ICU days, or length of stay. Two patients developed CNS infections in the study but they were in the PRO group. Infectious complications (0.7 vs. 1.4 per patient; \( p < 0.05 \)) and infections secondary to MDR organisms (0.03 vs. 0.33 per patient; \( p < 0.01 \)) were significantly more common in the PRO group. Twenty-nine percent of the ventilator-associated pneumonias and 33% of the bloodstream infections in the PRO group were MDR compared to only two total MDR organism bloodstream infections that occurred in the NONE group.\(^{18}\)

Alleyne and colleagues evaluated the efficacy and the cost of prophylactic periprocedural antibiotics in patients with EVDs. A systematic review was performed of 308 patients with EVDs in place for more than three days. Group A (\( n = 209 \)) received prophylactic cefuroxime for the duration of EVD placement. Group B (\( n = 99 \)) received only periprocedural antibiotics (less than three doses). Infection rates were similar between groups (Group A 3.8% vs. Group B 4%; NS). The authors estimated that the average cost per day for routine prophylaxis was $359 per patient in Group A versus $40 per patient in Group B, resulting in savings of more than $80,000 per year.\(^{19}\)

The use of prophylactic systemic antibiotics to prevent infections from placement of an EVD or ICP remains controversial; as a result, other techniques have been investigated. In recent years, the use of antibiotic-coated EVDs has emerged as an alternative strategy for preventing infections.\(^{20}\) The use of EVDs impregnated with antimicrobial agents is increasing, but it is not clear whether additional benefit is gained when adherence to other infection prevention strategies is maintained.\(^{17}\)

Pople and colleagues compared the incidence of infection in antibiotic-impregnated vs. standard EVD catheters in an international, randomized, open-label trial (\( N = 434 \)). Proven infection was documented in 9 (2.5%, 9/348) total cases (antibiotic-impregnated group: 4/167 [2.3%] vs. standard: 5/181 [2.8%]; \( p = 1.0 \)). Suspected infection was documented in 31 (17.6%) of patients receiving antibiotic-impregnated EVDs and 37 (20.4%) patients receiving standard EVD catheters (\( p = 0.504 \)). Duration of time to suspected infection was prolonged in the antibiotic-impregnated group (8.8 ± 6.1 days) compared to the standard EVD group (4.6 ± 4.2 days) (\( p = 0.002 \)). Thus, despite overall low rates of catheter-associated infections, the antibiotic-impregnated catheters were not associated with risk reduction compared to standard catheters. However, a major limitation of this study is that the adverse effect, while presumed minimal, was not evaluated.\(^{21}\)
Despite the lack of randomized controlled data supporting efficacy, ICP monitoring continues to be a standard of care in the neurotrauma patient population. Even less data exists regarding the appropriate use of antimicrobial prophylaxis for these devices. Currently, there is no consensus statement or guideline regarding the use of antimicrobial prophylaxis in patients with EVDs or ICP monitors. However, for clean neurosurgical procedures and CSF-shunting procedures, the Infectious Diseases Society of America recommends cefazolin (clindamycin or vancomycin with β-lactam allergy) given as a single dose within 60 minutes before surgical incision. No subsequent guidance is provided regarding whether prophylaxis should remain throughout duration of placement. Thus, it remains a controversial practice area.

Additional questions that remain controversial include: 1) Are prophylactic antibiotics indicated at all? 2) Should local vs. systemic antibiotics vs. antibiotic-impregnated catheters be used? 3) Is a single dose before insertion adequate or should prophylaxis be continued for the duration of catheter placement? 4) Is there a specific high-risk population for whom antimicrobial prophylaxis may be warranted? Prescribing practices continue to vary and are primarily driven by physician preference developed during specialty training. Patients who have the following risk factors are more likely to develop CNS infections: longer duration of ICP or EVD placement, advanced age, frequent manipulations of catheter, or presence of intraventricular hemorrhage. This subset of patients, especially those with multiple risk factors and/or long duration of catheter placement, may potentially benefit from continued systemic antimicrobial prophylaxis. Based on the data available and current practice guidelines, if antibiotics are used, specific agent selection should predominantly target gram-positive organisms. If prophylaxis is warranted, using appropriate antibiotic stewardship reduces the risk of developing MDR organism selection and aids in cost containment.

References


Member Spotlight
By Kelli Rumbaugh, PharmD, BCPS

William J. Peppard, PharmD, BCPS
Trauma/Surgical Critical Care Pharmacist

Bill has been the trauma/surgical critical care pharmacist at Froedtert & the Medical College of Wisconsin in Milwaukee, Wisconsin, USA, for more than 12 years. He obtained his doctor of pharmacy from St. Louis College of Pharmacy, and completed a PGY1 residency at Froedtert & the Medical College of Wisconsin. He established the PGY2 Critical Care Residency at Froedtert Hospital in 2009 and is the director of the program. He is also an assistant professor in the Department of Surgery, Division of Trauma & Critical Care at the Medical College of Wisconsin.

Bill has been a member of SCCM for about 10 years, and serves on the CPP Research Committee. This year he is the charge lead for the coordination of multi-institutional research projects. He is also a member of the SCCM Liver Failure Guideline Writing Task Force, for which he chairs the Pharmacology Subcommittee. Bill participates in the CPP Mentor-Mentee program as a mentor. At a local level, he is involved in the Greater Milwaukee College of Clinical Pharmacy Chapter of the American College of Clinical Pharmacy (ACCP), and serves as the treasurer.

Bill became interested in pharmacy through its focus on science, education, and helping others. He enjoys the trauma/surgical ICU environment for its fast pace, high intensity, and challenges. Every day he is presented with challenges that test his ability to make rapid, high-quality, evidence-based decisions. The trauma/surgical ICU team is multidisciplinary, and he appreciates being a key part of the team.

Bill was one of seven pharmacists recognized this year as a Master Preceptor by ACCP. Bill’s proudest moment thus far in his career is being accepted as a fellow of the American College of Critical Care Medicine. He looks forward to his induction this coming January in Hawaii.
Visiting Clinical Professor (VCP) Spotlight

By Scott Nei, PharmD, BCPS, BCCCP

Joanna Stollings, PharmD, FCCM, BCPS, BCCCP

The Visiting Clinical Professor (VCP) is a program within SCCM and the CPP section that strives to advance critical care pharmacy practice at institutions across the country. The program seeks to connect an established critical care practitioner with an institution that has identified an opportunity for growth within their pharmacy practice. A practitioner is matched with an institution based on the desires and goals of the institution submitting the application and may include a variety of opportunities. This service has been utilized in the past to expand pharmacy services, justify current and future pharmacist positions, and optimize patient care.

In August 2016, Cape Fear Valley Health in North Carolina hosted VCP Joanna Stollings, PharmD, FCCM, BCPS, BCCCP. Dr. Stollings is the Clinical Pharmacy Specialist at the Vanderbilt University Medical Center in Nashville, Tennessee. She has written research manuscripts, review articles, and book chapters related to analgesia, sedation, delirium, and post-intensive care syndrome. Dr. Stollings also serves on the executive committee of the SCCM ICU Liberation Collaborative which has been a part of establishing the ABCDEF bundle in over 70 hospitals across the United States.

Dr. Lynn Bass, PharmD is the Critical Care Pharmacist at Cape Fear Valley Health who applied for the VCP program this past year. Dr. Bass identified the value and opportunity in expanding pharmacy involvement during rounds and implementing the SCCM ABCDEF bundle in the ICU. The hope of the VCP visit would be to optimize the new pharmacist rounding service in the ICU and provide leverage to expand pharmacist rounding services throughout the institution to improve patient care. Based on Dr. Bass’s application, Dr. Stollings was identified as an ideal fit given her expertise and experience.

During the one day visit Dr. Stollings joined the surgical ICU team on rounds and met with hospital leadership and pharmacists at Cape Fear Valley Health. She provided feedback to the team on how to enhance their implementation of the ABCDEF Bundle into practice. She also gave grand rounds which focused
on interdisciplinary rounding for patient care and implementation of the ABCDEF bundle into practice. Dr. Stollings was welcomed with open arms on her visit. Her input was extremely valuable to Cape Fear Valley Health. SCCM and CPP were excited to hear that the VCP trip was a success. The CPP Section looks forward to hearing more in the future about the full impact of this experience. If any CPP member is interested in having a VCP visit your institution, please visit the iRoom for the VCP application or e-mail either Laura Zane (lzane12@gmail.com) or Scott Nei (nei.scott@mayo.edu) for more information.

Research Pearl

Clinical Research Design: Sample Size Calculation
Written by Megan L. Webb, PharmD, BCPS
Edited by Chris Droege, PharmD

Power analysis and sample size calculations are key components to successful and robust research study design. Time and resource limitations lend to a relatively small sample of patients in a particular population the potential to be analyzed in a study. Sample size calculations assist investigators in determining the appropriate number of patients to enroll in a study to be able to draw scientifically valid conclusions. Sample size should be considered before interventional or comparison study initiation, when possible, to limit interpretation bias. An a priori sample size calculation is an important first step in determining the appropriate study design and should be performed while research design changes can still be made. For example, if an investigator wishes to study factors impacting development of a rare disease, and a sample size calculation reveals that a large number of patients will be needed, the investigator may select a case control study design instead of an experimental design to best utilize available time and resources.

The essential elements of a sample size calculation include: level of significance (\(\alpha\)), power of the study (1 – \(\beta\)), expected incidence of primary outcome in control population, expected difference between groups, and population variability. A complete understanding of each of these elements is essential to understanding sample size and power analysis calculations.

\(\alpha\) represents the probability that any difference found in the study is due to chance. Convention in clinical studies suggests that 5% is the maximum allowable level of significance. \(\alpha\) is the probability of committing a type I error, or a false-positive finding. This occurs when the study rejects a null hypothesis that is true in the population of interest.

Power is defined as the probability that a study will detect a true difference when it exists in the study population. Power is equal to 1 – \(\beta\), where \(\beta\) represents the probability of committing a type II error, or a false-negative finding. This occurs when the study fails to reject the null hypothesis that is actually not true in the population of interest. In order to determine sample size, we must define the minimal acceptable power level. Convention suggests a minimal power of 80%, but certain study infrastructures (eg, non-inferiority) may increase power to 90% to reduce the chance of a type II error. This is because, in a non-inferiority study, in which the investigators hypothesize that a new treatment is non-inferior to a current treatment, it is important to be as sure as possible that a finding of non-inferiority is not observed due to chance.

Once \(\alpha\) and power have been selected for the study, the investigators’ next step is to determine the expected incidence of the primary outcome in the control group and the expected difference in the outcome between the study groups. The expected incidence of the primary outcome in the control population should be discerned from previously reported study data. If the incidence is found to be unexpectedly low in the studied population, the sample size may have to be carefully adjusted while the study is ongoing.
The expected difference, or “effect size” between groups may be obtained from previously reported study data or preclinical trials or may be based on the investigators’ best estimate, if no previous or preliminary data exists.\textsuperscript{2,3} The process of selecting an appropriate effect size may be the most difficult aspect of sample size calculation. The magnitude of the effect size expected in the study will impact the sample size because it takes a larger sample to detect a smaller difference. While investigators want to ensure a large enough sample size to detect the hypothesized difference between groups, it is also important not to make the sample size too large. A very large sample that includes more patients than necessary may result in a small change being determined to be statistically significant, even if it is not clinically significant or important to real practice. This approach would also require more resources.\textsuperscript{3}

Population variability as it relates to the effect size also plays a role in determining sample size. A common measure of variability, standard deviation, measures the dispersion of the data around the mean. As the variability in the measured outcome increases, the difficulty in demonstrating a difference also increases, and therefore the study requires a larger sample size.\textsuperscript{2,3}

The equation used to calculate sample size based on the required components is:

\[
 n = \frac{2(Z_\alpha + Z_1 - \beta)\sigma^2}{\Delta^2}
\]

where \( n \) is the required sample size per arm in a two-group clinical trial, \( Z_\alpha \) is a constant determined by the accepted \( \alpha \) error level, \( Z_1 - \beta \) is a constant based on the study power, \( \sigma \) is the standard deviation, and \( \Delta \) is the effect size.\textsuperscript{3} Most statistical analysis software has a function to determine the sample size if the necessary components are entered into the program.

One final factor to consider is the potential for patients lost to follow-up, withdrawals from the study, and missing data. The sample size calculation reflects the number of patients who are needed in the final study. However, it is prudent to include more patients (about 5\% to 10\%), since a certain percentage of patients are anticipated to be either lost to withdrawal in prospective studies or unable to participate in needed follow-up. Including a higher number of patients upfront will help ensure that the number of final patients included in the primary outcome satisfies the necessary sample size.\textsuperscript{4}

In summary, sample size calculations should be performed in the initial design stage of any clinical research study. The necessary components of sample size detailed in this article are level of significance (\( \alpha \)), power of the study (\( 1 - \beta \)), expected incidence of primary outcome in the control population, expected difference between groups, and population variability. Sample size calculations assist investigators in embarking on an adequately powered study poised to answer the research question.

References
The Society of Critical Care Medicine (SCCM) is proactively expanding its use of Twitter through the focused efforts of the SCCM Social Media Task Force. SCCM Twitter presence has increased to include journal clubs (follow at #SCCMJC) and opportunities for interactions during Critical Care Congress. With this year’s Congress fast approaching, from January 21–25, 2017 in Honolulu, Hawaii, USA, it is worth noting several opportunities to be involved on Twitter during this upcoming meeting. Twitter-moderated talks for select speakers will again be available and can be followed at the hashtag specific for that module. First introduced during Congress in Orlando, Florida, USA, in February 2016, select talks are automatically tweeted, after which a moderator pulls comments and questions submitted on Twitter. Twitter has become a useful modality for dynamic communication among SCCM members during the past two years. Members are encouraged to use the interactive resources that continue to become available. If you have questions regarding involvement in Twitter, you may contact Tony Gerlach, PharmD, BCPS, FCCP, FCCM (gerlach.6@osu.edu or @SICUPharmD).

Frequently Asked Questions
By Kaitlin A. Pruskowski, PharmD, BCPS

- As a new practitioner starting a clinical pharmacy service, what resources are available through SCCM or CCP that can help strengthen my practice?
  - The Visiting Clinical Professor Program aims to advance critical care pharmacy practice and teaching through a one- to two-day program. The visiting clinical professor (VCP), an established critical care practitioner, will interact with pharmacy practitioners, attend grand rounds, and provide a guest lecture. The VCP can provide feedback on how to strengthen and advance the inviting site’s critical care pharmacy and teaching programs. More information on the VCP program can be found at in the CPP iRoom under committee documents within the Program Committee Folder.
  - The Mentorship Program matches mentors with mentees based on clinical interests, as well as selected areas of guidance. Mentees can receive guidance in clinical practice, research, teaching, and/or professional involvement. More information about the Mentorship Program can be found More information on the mentorship program can be found at in the CPP iRoom under committee documents within the Membership Committee Folder.

- How can I become more involved in the CPP Section?
  - The New Member Packet, found in the CPP iRoom, contains information on the programs and committees that make up the CPP Section. The charges assigned to each committee are listed in the packet, as well as information for each committee chair and chair-elect. For more information or to become involved with a committee, you may contact the committee’s chair or chair-elect.

Communications Committee members are charged with publishing the newsletter.
Thanks to the following members:

Joanna Stollings (chair)  Payal Gurnani  Heath Oetken
Jason Makii (chair-elect)  Susan Hamblin  Kristine Parbuoni
Erin Frazee (member-at-large)  Lauren Igneri  Daryl Paris
Aida “Rebecca” Bickley  Jessica Jones  Mona Patel
Marilyn Bulloch  Julie Kalabalik  Cari Philpott
Tram Cat  Justin Kaplan  Kaitlin Pruskowski
Darlene Chaykosky  Michael Kenes  Kelli Rumbaugh
Jennifer Cortes  Desiree Kosmisky  Laura Siemianowski
Gretchen D’Arcangelo  Kirstin Kooda  Abbi Smith
Caroline Der Nigoghossian  Elizabeth Lakatos  Calvin Tucker
Deepali Dixit  Simon Lam  Sarah Welch
Chris Droege  Kelly Maguigan  Patrick Welch
Stacey Folse  Lukas Martin
Gabrielle Gibson  Thomas Moran
Kasey Greathouse  Justin Muir
Christine Groth  Scott Nei
Featured CPP Resources

- Are you stuck on a research-related question? Consider reaching out to the experts in the CPP Research Committee by e-mailing cppresearchconsult@gmail.com.
- Do you have a manuscript or grant that you would like to have reviewed by a content expert? If so, consider e-mailing the Research Committee Chair at personett.heather@mayo.edu.

Upcoming SCCM Congresses—Save the Dates!

<table>
<thead>
<tr>
<th>Year</th>
<th>Date</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>January 21-25</td>
<td>Honolulu, Hawaii, USA</td>
</tr>
<tr>
<td>2018</td>
<td>February 24-28</td>
<td>San Antonio, Texas, USA</td>
</tr>
<tr>
<td>2019</td>
<td>February 16-20</td>
<td>San Diego, California, USA</td>
</tr>
<tr>
<td>2020</td>
<td>February 15-19</td>
<td>Orlando, Florida, USA</td>
</tr>
</tbody>
</table>