Welcome Address

Colleagues,

We are thrilled to host our first Pharmacy Research Showcase to highlight the fantastic projects our pharmacy residents have completed. This exciting afternoon will consist of oral presentations and poster presentations that highlight 38 of the Medication Use Evaluations and Research Projects our residents conduct each year to support our Health System.

In past years, we have sent our residents to a regional conference to present their data. This year, we planned to host our own conference so our Pharmacy Services ICCE Care Team Members and MUSC Health Leadership Team will learn about the residents’ great work. Their projects focus on quality, safety and finance and we will ask attendees to vote on the best posters in these categories.

At the end of the conference, we will also announce the Pharmacy Research Showcase Award winners. There will be two oral presentation winners: one from the PGY1 class and the other from the PGY2 class. The winners were selected based on the following criteria:

- Completeness and quality of abstract
- Study design
  - Number of patients
  - Methodological rigor
  - Inferential statistics
- Novel research area
- Clinical significance / ability to impact practice at MUSC and elsewhere

Our residents are the backbone of the Pharmacy Services Quality Program. Without their effort, we could not complete the high-level projects that teach us so much about our patients and how to best care for them.

I would also like to thank the preceptors for these residents’ projects. They spend many hours mentoring and guiding the residents to ensure not only that we obtain valuable information, but also that the residents are receiving a high-quality education. They are excellent role models for the future pharmacists our residents will become.

Thank you,

Heather Easterling, PharmD, MBA
Administrator, Pharmacy Services, MUSC Health
Director of Graduate Pharmacy Education
Acknowledgements

## Project Mentors

- Andrew Bodiford, PharmD, BCOP
- Nicole Bohm, PharmD, BCPS
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- Wendy Bullington PharmD, BCPS
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- David Cruse, PharmD, MS
- Tracie Delay, PharmD, BCPS
- Heather Easterling, PharmD, MBA
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- Neha Patel, PharmD, BCPS
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- Sophie Robert, PharmD, BCPP
- Clint Ross, PharmD, BCPP
- Amy Sion, PharmD, BCOP
- Tiffeny Smith, PharmD
- David Taber, PharmD, BCPS
- Jill Thompson, PharmD, BCPS, BCPPS
- Walter Uber, PharmD
- Barbara Wiggins, PharmD, BCPS, CLS, BCCCP
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- Christopher Wisniewski, PharmD, BCPS

## Showcase Planning Committee

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- Kristy Brittain, PharmD, BCPS, CDE
- Heather Easterling, PharmD, MBA
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- Samantha Landolfia, PharmD, BCPS
- Melanie Manis, PharmD
- Holly Meadows, PharmD, BCPS
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- Clint Ross, PharmD, BCPP
- Peggy Smith

## Session Moderators

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- Stephanie Kirk, PharmD, CDE, BCACP
- Holly Meadows, PharmD, BCPS
- Jean Nappi, PharmD, BCPS-AQ Cardiology
- Nicole Pilch, PharmD, MSCR, BCPS
- Walter Uber, PharmD

## Session Evaluators

- Jason Cooper, PharmD
- James Fleming, PharmD, BCPS
- Joe Mazur, PharmD, BCPS
- Jimmy New, PharmD, BCPS
- Tiffeny Smith, PharmD
- Kyle Weant, PharmD, BCPS

## Poster Discussants

- Andrew Bodiford, PharmD, BCOP
- Carolyn Bondarenka, PharmD, MBA, BCPS
- Kristy Brittain, PharmD, BCPS, CDE
- Wendy Bullington PharmD, BCPS
- Tracie Delay, PharmD, BCPS
- Lauren Haney, PharmD, BCPS, BCPPS
- Matthew Hebbard, PharmD
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- Don Willis, MHA
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<td>Clinical evaluation of vancomycin susceptibility testing for methicillin-resistant Staphylococcus aureus blood culture isolates: A comparison between Etest and automated testing methods</td>
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<td>Jessica Hochstetler</td>
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<td>Ten-year single-center analysis of combined liver/kidney transplants</td>
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<td>Lauren Linder</td>
<td>Evaluation of thiamine prescribing patterns in patients with alcohol use disorder</td>
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BE-011: Assessment of Venous Thromboembolism (VTE) Risk and Initiation of Appropriate Prophylaxis in Psychiatric Patients
Ann Marie Ruhe, PharmD; Amy Hebbard, PharmD, BCPS, BCPP; Genevieve Hayes, PharmD, MSPharm, BCPS

Learning Objective: Identify additional risk factors for development of venous thromboembolism (VTE) in the psychiatric patient population

Purpose/Background: In the quality assessment for psychiatric inpatient facilities, venous thromboembolism (VTE) prophylaxis is not included among the core measures as it is for other acute care inpatient settings. Literature supports that antipsychotic agents may be an independent risk factor for the development of VTE; therefore, the development of a universal VTE risk stratification tool would improve the quality and safety of care for the psychiatric inpatient population. Our primary aim is to develop clinically relevant criteria to assess the risk of VTE upon admission to the MUSC Institute of Psychiatry.

Methods: This retrospective, single-center cohort study enrolled patients in two cohorts from the MUSC Institute of Psychiatry. Patients in cohort I with new-onset VTE diagnosis during IOP admission were identified through ICD 9 and 10 coding. Cohort II consisted of a random sample of 100 patients admitted in a three-month time period. The percentage meeting criteria for prophylaxis in each cohort was assessed utilizing both the Padua Prediction Score as well as a modified score. Descriptive statistics and appropriate measures of central tendency were utilized to characterize all specific aims.

Results: In cohorts I and II, 66.7% and 14% of patients, respectively, met criteria for VTE prophylaxis utilizing the modified Padua Prediction Score. Only one patient received VTE prophylaxis in each cohort, and the median time to VTE diagnosis in cohort I was 42 days. In cohort I, the rate of VTE was 0.6%, which is less than the reported annual rate of 1% to 2.4% for nursing homes or post-acute rehabilitation facilities.

Conclusion: Given the median time to onset of VTE in cohort I and low rate of VTE at IOP, we recommend the implementation of clinical decision support to prompt individualized reassessment of VTE risk and/or prophylaxis continuation when length of stay exceeds 30 days.

BE-012: Evaluation of Thiamine Prescribing Patterns in Patients with Alcohol Use Disorder
Lauren Linder, PharmD, BCPS; Sophie Robert, PharmD, BCPP; Genevieve Hayes, PharmD, MSPharm, BCPS

Learning Objective: Describe how to appropriately recognize and treat patients who are at risk for the development of Wernicke’s Encephalopathy

Purpose/Background: Alcohol use disorder (AUD) is the leading cause of thiamine deficiency and can lead to Wernicke’s Encephalopathy (WE). Oral thiamine is ineffective at reversing thiamine deficiency in patients at risk for developing WE or as a treatment in suspect WE. WE has a higher prevalence of development in patients with AUD and current recommendations emphasize parenteral administration of thiamine. Our objective was to characterize thiamine utilization in patients with AUD and further evaluate retrospectively if these patients who received oral thiamine had established risk factors for the development of WE.

Methods: This retrospective chart review enrolled all patients greater than the age of 18 admitted to the IOP from October 2014 - September 2015 diagnosed with AUD per the international classification of diseases, 9th revision (ICD-9). The cohort was subdivided by route of thiamine (non-parenteral, parenteral) and screened for risk factors for the development of WE. Descriptive data and measures of central tendency were utilized to assess the objectives.

Results: The majority of patients included were Caucasian males with a mean age of 48. Of the 226 patients included, 89% were prescribed oral thiamine. In evaluating the first 100 patients who received oral thiamine, 36% had risk factors for the development of WE. The most common risk factor was malnutrition. A chi-square analysis revealed risk factors for the development of WE did not influence route of thiamine prescribing ($\chi^2 = 2.148$, df = 1, $P=.143$). No patients were diagnosed with WE during their admission; however, eight patients received parenteral thiamine at treatment dose for WE.

Conclusion: Based on our findings, education is needed in order to enhance thiamine prescribing. Education will allow treatment teams to learn how to appropriately identify and treat patients at highest risk for thiamine deficiency. A thiamine prescribing protocol will be developed for further thiamine optimization.
BE-013: An Alternate Dosing Strategy of Enoxaparin in Reduced Renal Function
Aulbrey Drisaldi, PharmD; Barbara Wiggins, PharmD, BCPS, BCCCP, CLS, FNLA, FAHA, FCCP, AACC

Learning Objective: Evaluate the efficacy and safety of enoxaparin 0.75 mg/kg/dose every 12 hours in a patient with moderate renal impairment requiring anticoagulation

Purpose/Background: While clinical trials have shown that the clearance of enoxaparin is reduced in patients with renal impairment, there is little evidence regarding the appropriate dose to obtain therapeutic anticoagulation. Consequently, dose reduction and/or anti-factor Xa activity (anti-Xa) monitoring is typically utilized in these patients. The purpose of this study is to evaluate the efficacy and safety of enoxaparin 0.75 mg/kg/dose every 12 hours for therapeutic anticoagulation in patients with moderate renal impairment.

Methods: Data were collected retrospectively for inpatients aged 18 years and older with a creatinine clearance of 30 to 50 mL/min receiving enoxaparin 0.6 to 0.8 mg/kg/dose every 12 hours from July 2014 through April 2017. The primary efficacy outcome was therapeutic anti-Xa levels and secondary safety outcomes were bleeding or thromboembolic complications. Data were analyzed via retrospective chart review of Epic.

Results: Twenty four patients receiving an average dose of enoxaparin 0.71 mg/kg/dose every 12 hours were evaluated. The majority of patients were receiving anticoagulation for a diagnosis of pulmonary embolism (38%) or as a bridge to warfarin for atrial fibrillation (29%). Of the 24 patients, 21 had anti-Xa levels measured. The majority of the patients receiving the 0.75 mg/kg/dose had therapeutic anti-Xa levels (75%), while two patients had supratherapeutic levels and one patient had a subtherapeutic level. Additionally, 43% of patients receiving 0.75 mg/kg/dose previously required a dose reduction from 1 mg/kg/dose due to supratherapeutic anti-Xa levels. Only 1 patient had documented bleeding requiring a transfusion that was not related to enoxaparin. No patients developed documented new thrombi during their admission or 30 days post discharge.

Conclusion: Based on anti-Xa monitoring, it is reasonable to utilize a reduced dose of enoxaparin 0.75 mg/kg/dose every 12 hours as empiric dosing for patients with moderate renal impairment (CrCl 30 to 50 mL/min) when systemic anticoagulation is required.

BE-014: Evaluation of a Preoperative Pharmacist Medication Review Process in an Academic Medical Center
Melanie Manis, PharmD; Joel Melroy, PharmD, MS, BCPS; Stephen Matics, PharmD; Genevieve Hayes, PharmD, MSPharm, BCPS

Learning Objective: Analyze a preoperative pharmacist medication review process and evaluate its impact on patient safety

Purpose/Background: Medication errors often occur during key transitions including planned surgical admissions. This study aimed to improve the perioperative medication reconciliation process by utilizing operating room (OR) pharmacists to complete the medication review prior to admission.

Methods: The prospective portion of the study was conducted in the University Hospital OR satellite pharmacy. All high-risk, pre-scheduled, surgical patients with a planned admission postoperatively were eligible for inclusion. Patients were excluded if they were less than 18 years of age, a transplant recipient or donor, or those discharged on the same day as the procedure. The OR-pharmacist performed a comprehensive medication review via telephone 2 to 3 business days prior to the patient’s scheduled procedure or on the day of the procedure in the preoperative area. In order to compare the efficacy of the intervention with standard of care, a retrospective, matched patient analysis was performed. Patients in the control group had to meet the pre-defined inclusion criteria and have had a medication reconciliation completed by an inpatient pharmacist. The primary endpoint was number of exposure days to potential errors related to home medications.

Results: From December 2016 through March 2017, 581 pre-scheduled surgical patients met the inclusion criteria for intervention, of which 100 were contacted by the OR-pharmacist. The median time to medication reconciliation postoperatively in the usual care group was 22.9 hours. There were 4 interventions per patient in the control group compared with 3 interventions per patient in the intervention group (P = .041). The average time to complete the medication reconciliation via telephone or in person prior to surgery was 10 minutes versus 25 minutes after surgery on the inpatient unit (P < .001).

Conclusion: Performing medication reconciliation preoperatively was more efficient and reduced the potential exposure to medication errors by an average of 23 hours.
BE-211: Reclassification of Moderate Drug-Drug Interactions at an Academic Teaching Institution
Matthew Van Cuyk, PharmD, BCPS; Holly Griffin, PharmD

Learning Objective: Describe appropriate strategies to help reduce alert fatigue in the workplace

Purpose/Background: Previous studies have found that clinicians routinely override alerts, regardless of their clinical significance. This phenomenon may be due to what is commonly referred to as alert fatigue, and it may result in patient harm from a clinically significant drug-drug interaction. Therefore, it is desirable to review alerts on a regular basis and eliminate warnings that may not be clinically significant. With fewer alerts, it is thought that clinicians will be more likely to review and take action on the remaining alerts. Therefore, the primary objective of this project was to reclassify moderate drug-drug interactions for pharmacy order entry.

Methods: In August 2016, a list containing 785 moderate drug-drug interactions was exported from First DataBank (FDB) AlertSpace. However, these 785 moderate drug-drug interactions consisted of drug-class and class-class interactions, which accounted for approximately 34,000 unique drug-drug interactions. A scoring system was created utilizing the interaction checker of 3 tertiary databases (Lexicomp, Facts and Comparisons, and Micromedex) to quickly identify drug-drug interactions that can be turned off and ones that will need further review based on the severity of the drug-drug interactions.

Results: To date, 44.8% (352/785) of the moderate drug-drug interactions have been reviewed and scored. Of these, 20.4% (72/352) that have been reviewed were brought before our decision support committees to recommend that all or part of the medication interactions be turned off. Recently, the recommended drug-drug interactions have been suppressed, and results are pending to determine the impact this will have on the percent of drug-drug interaction alerts that are overridden.

BE-212: Characterization of Economic Predictions Utilized to Make Formulary Decisions Within an Academic Medical Center
Mary Frances Picone, PharmD; Genevieve Hayes, PharmD, MSPharm, BCPS; Christopher S. Wisniewski, PharmD, BCPS

Learning Objective: Describe a method of generating economic predictions for formulary review purposes within MUSC Health

Purpose/Background: Pharmacy and Therapeutics (P&T) Committees are tasked with evaluating medications for formulary consideration. Traditional processes include a standardized monograph that reviews cost information, but reimbursement or potential cost savings should also be considered. This project aimed to assess the accuracy of cost savings and reimbursement predictions for medications added to formulary at an academic medical center when financial considerations factored into the decision.

Methods: Formulary changes over a 5-year period were reviewed. Medications were included if the medication was added to formulary and the monograph included cost savings or reimbursement data that indicated a positive net margin. The primary endpoint was average percent predicted cost savings or net margin per medication. Secondary endpoints included the percent of medications with greater than or equal to 100% predicted cost savings or net margin and evaluation of average percent predicted savings or net margin individually.

Results: The P&T Committee reviewed 558 formulary agenda items, 184 of which were selected for further analysis. In total, 19 medications were identified with predicted monetary advantages that factored into the decision. The primary endpoint of average percent predicted cost savings or net margin yielded a median of 146.3% (IQR 76.2%-263.2%). For 13 of 19 medications (68.4%), the percent predicted cost savings or net margin was greater than or equal to 100%.

Conclusion: Economic predictions utilized for formulary management at an academic medical center generated net positive monetary value for medications where predicted cost savings or reimbursement factored into the decision to add a medication to formulary.
Learning Objective: Determine benefits and limitations of a medication utilization predictive model

Purpose/Background: External benchmarking is helpful as a starting point for identifying significantly variant utilization from comparator institutions, but does not provide any information regarding variation within a single institution. Currently, most pharmacy internal benchmarking metrics focus on labor and productivity, inventory turns, expenses, or revenues. As the price of medications continues to soar, it will become increasingly more important for leaders to understand medication utilization and prescribing patterns at their institution, which are not fully captured through standard internal benchmarking methods. Prescribing variability for a given indication can occur in dosing, duration of therapy, or choice of drug. While there are many patient-specific factors in deciding upon a particular dose or duration of therapy, pharmacy leaders often have more global influence over the choice of drug.

Methods: A predictive model for medication utilization was developed to identify prescribing patterns and variability at various levels of the organization. A least absolute shrinkage and selection operator (LASSO) regression was performed to identify patient-specific factors to incorporate into the model, which was built in Tableau Server using historical internal patient data beginning with October 1, 2015. The model was presented to several engaged physician stakeholders who provided feedback and input for optimization of the model.

Results: Several limitations of the model were identified and suggestions for modification were provided. Physician leaders expressed a desire to compare duration of therapy, drugs grouped by class, and patient location at time of administration, as well as evaluate order set adherence.

Conclusion: Shifting responsibility for drug expenditures to physician leaders helps increase ownership and awareness of drug costs and utilization. As an academic medical center, there will always be a certain degree of prescribing variability. Based on stakeholder feedback, focus has shifted toward identifying variability due to processes. A project evaluating medication utilization in patients with pneumonia is under development.
K.C. Mangan, PharmD; Lindsay Deloney, PharmD Candidate; Brian McKinzie, PharmD, BCPS, BCCCP; Evert Eriksson, MD

Learning Objective: Recognize the risk of QTc prolongation with using high doses of quetiapine to treat delirium

Purpose/Background: The use of atypical antipsychotic medications is common when treating intensive care unit (ICU) delirium. A prospective, randomized, controlled trial has previously shown that quetiapine, when utilized at doses up to 400 mg daily, reduces the duration of ICU delirium. Current dosing regimens of quetiapine in the surgical trauma intensive care unit (STICU) to treat delirium are titrated to effect, periodically utilizing doses higher than previously reported in the literature. This study aimed to assess safety of quetiapine in our trauma and surgery patient population.

Methods: A retrospective medical chart review was conducted, and data regarding patients were pulled starting from July 1st, 2014. Inclusion criteria included patients who received at least 1 dose of quetiapine for the treatment of delirium. Exclusion criteria were patients who were on antipsychotics at home, receiving antipsychotics for other indications, and those being managed by another service team.

Results: 154 patients were started on Seroquel and had 856 EKGs done. The median average daily dose was 150 mg (79 – 234) and the median max dose was 225 mg (100 – 350). The overall range was 25-800 mg daily. The time to peak dose was 3 (1 – 8) days. Patients with QTc prolongation were significantly older (age 54 ± 11 vs 45 ± 17 years (p = 0.002)) and with higher baseline QTc (454 ± 33 vs 442 ± 30 (p =0.045)). Regression analysis revealed only dose as a significant factor OR = 1.006 (1.003 – 1.009) (p < 0.001).

Conclusion: The dose of quetiapine has very little correlation with corresponding QTc and overall change from baseline. A small number of side effects due to quetiapine resolved after discontinuation. No episodes of torsade de pointes were observed. Overall, titrating quickly to high doses of quetiapine is safe for treating delirium in the critically ill population.

DD-012: Impact of Angiotensin II Inhibitors on the Incidence of Gastrointestinal Bleeds after Left Ventricular Assist Device Placement
Maureen P. Converse, PharmD; Minoosh Sobhanian, PharmD, BCPS; David J. Taber, PharmD, BCPS; Brian A Houston, MD; Holly B. Meadows, PharmD, BCPS; Walt Uber, PharmD

Learning Objective: Describe how ACE/ARBS may be protective against AVM-related GIBs in patients with continuous flow LVADs

Purpose/Background: Activation of the angiotensin II receptor results in angiogenesis, and ultimately arteriovenous malformations (AVMs), though activation of transforming growth factor beta (TGF-β) and angiopoietin-2 pathways. We hypothesized that angiotensin converting enzyme inhibitors (ACE-inhibitors) or angiotensin receptor blockers (ARBs) would cause a dose-dependent reduction of major gastrointestinal bleeds (GIBs) and AVM-related GIBs in patients with continuous flow left ventricular assist devices (CF-LVADs).

Methods: This was a retrospective cohort of patients that received HeartMate II LVADs between January 2009 and July 2016. GIBs and AVMs were documented in the medical record and endoscopically confirmed. Major GIB was defined as a confirmed GIB requiring at least 2 units of packed red blood cells (PRBCs) in 24 hours.

Results: Ninety-nine patients were included with a mean 2.3 ± 1.4 years of follow-up. Patients, who received 30 consecutive days of an ACE/ARB postoperatively, had a 79% reduction in risk of major GIB (p=<0.0001) and 83% reduction in risk of major GIB (p=<0.0001). Patients off an ACE/ARB for 30 consecutive days postoperatively had 2.44 times the risk of major GIB (p=0.027). The risk of major GIB (p = 0.022, p=0.001, and p=0.0009) and AVM-related GIB (p=0.024, p=<0.0001, and p=0.008) decreased as the lisinopril equivalent dose increased from 0.1-5 mg, to 5.01-10 mg, and >10 mg, respectively.

Conclusion: This data suggests ACE/ARB therapy is associated with protection from GIBs in LVAD patients, possibly due to prevention of AVM formation, in a dose-dependent manner.
Learning Objective: List 2 favorable characteristics of ketamine when used for pain and sedation

Purpose/Background: Patients mechanically ventilated (MV) in the intensive care unit (ICU) often require continuous sedative and analgesic agents to manage agitation and pain. There is increased interest in the utility of ketamine for analgosedation due to its favorable cardiopulmonary effects. Despite promising case reports, there is currently a lack of high-quality trials to assess its use for this purpose. The objective of this study was to determine whether the addition of ketamine as analgosedation improves outcomes in MV patients.

Methods: A retrospective chart review was conducted on 56 patients who received either ketamine (Ketamine Group), or alternative agents (Standard Care Group) for pain and sedation, for at least 24 hours while MV in the ICU. Primary outcomes were time on MV and time within target Richmond Agitation and Sedation Score (RASS). Secondary outcomes included daily requirements of analgesic agents, daily requirements of sedative agents, incidence of ICU-delirium, ICU length of stay, and mortality.

Results: The ketamine group demonstrated greater time within target RASS after the addition of ketamine compared with scores prior to the addition of ketamine (p=0.049). The ketamine group also achieved greater time within target RASS compared to the standard care group (p=0.019). When compared with the standard care group however, the ketamine group demonstrated an increased ICU length of stay (p=0.048), as well as an increased incidence of ICU-delirium (p<0.0001).

Conclusion: Ketamine, when used as an adjunct for analgosedation, significantly improved time within target RASS. When ketamine was added to analgosedation regimens however, this agent was associated with an increased incidence of ICU-delirium. When compared to the standard care group, the ketamine group also experienced a significantly longer ICU length of stay. The use of ketamine for analgosedation in the ICU is not well studied and more research is needed to explore the relationship between this agent and ICU-delirium.

Learning Objective: Describe the long term management of diabetes in liver transplant recipients and factors predictive of glycemic control

Purpose/Background: Post-transplant diabetes mellitus (PTDM) is a frequent complication of solid organ transplantation. Multiple PTDM risk factors have been identified, similar to type 2 diabetes, along with calcineurin inhibitor (CNI) exposure. With early post-transplant hyperglycemia occurring in the setting of increased steroid exposure, insulin has been the mainstay of therapy. There is limited data describing the contemporary long-term management of diabetes in liver transplant recipients.

Methods: Retrospective cohort study of liver transplant recipients between 2010 and 2015 who received anti-hyperglycemic therapy at or beyond 90-days post-transplant. Patients < 18 years of age, multi-organ recipients, and graft loss within 30-days were excluded. Glycemic control was defined as a mean blood glucose ≤ 153 mg/dL over the first year post-transplantation. Chi-squared and t-test analyses were performed for patient characteristics, then a multivariate logistic model was built for prediction of glycemic control post-transplant.

Results: Of the 368 liver transplants that occurred during this time frame, 154 were identified as having PTDM, and 104 achieved glycemic control in the first year. Significant pre-transplant differences included the presence of diabetes mellitus, number of anti-hyperglycemic medications, and metformin exposure. Post-transplantation, patients with controlled blood glucose had less insulin NPH and glargine exposure. Multivariate logistic regression identified mTOR inhibitor exposure as predictive of glycemic control, while number of anti-hyperglycemic therapies at transplant and tacrolimus trough at post-op day 14 were predictive of uncontrolled PTDM.

Conclusion: Patients who required more anti-hyperglycemic agents prior to transplantation or had increased tacrolimus exposure at post-op day 14 were less likely to achieve glycemic control following transplant, while exposure to mTOR inhibitors was predictive of glycemic control in the first year following transplant.
During the poster session, attendees are encouraged to vote for poster awards in the categories of Clinical Impact, Patient Safety, and Cost Savings. Assigned Poster Discussants will also participate in award selection. Projects should be chosen for having the largest or most beneficial impact in each of these areas. The author(s) of the winning project in each category will be recognized during the Awards Presentation.

**P-01: Determination of Carbapenem Resistant Enterobacteriaceae (CRE) Resistance Mechanisms**
Barbara Santevecchi, PharmD, BCPS; Lisa L Steed, PhD; John Bosso, PharmD, BCPS-AQ ID

**Purpose/Background:** In an age of increasing antimicrobial resistance, CRE represent a clinically important group of organisms with limited treatment options and high mortality rates. The Medical University of South Carolina (MUSC) Diagnostic Microbiology laboratory utilizes rapid diagnostics to identify *Klebsiella pneumoniae* carbapenemase (KPC)-producing organisms in blood cultures; however, further testing to determine mechanisms of resistance in CRE is not routinely performed. This study utilized several different methods to determine resistance phenotype with the objectives of elucidating mode of resistance and to compare results among these methods.

**Methods:** Ertapenem resistant isolates from July 1, 2013, through March 31, 2017, were tested utilizing four phenotypic testing methods: the Modified Hodge test (MHT), Modified Carbapenem Inactivation Method (mCIM), KPC/Metallo-β-Lactamase (MBL) Confirm Kit, and Neo-Rapid CARB Kit.

**Results:** Forty-one patient isolates identified as ertapenem resistant were tested. Presence of a carbapenemase was detected by all phenotypic testing methods in 20/41 (49%) isolates, whereas 7/41 (17%) isolates were identified as not producing a carbapenemase by all 4 tests. All phenotypic testing methods agreed 66% of the time (n=27/41). The MHT identified carbapenemase production in 28/41 (68%) isolates and the mCIM identified 27/41 (66%) isolates as expressing carbapenemase. Results of the KPC/MBL Confirm Kit indicated that 76% (n=31/41) of isolates produced a KPC. Of isolates identified as producing carbapenemase by the Neo-Rapid CARB Kit, the majority (n=19/21, 90%) became positive within 15 minutes, indicating high level carbapenemase production.

**Conclusion:** The majority of CRE isolates tested at our institution during the study period were classified as producing carbapenemases, specifically KPC. The KPC/MBL Confirm Kit was the most useful test to determine the presence of KPC as compared to other phenotypic testing methods. This information may be useful in informing optimal empiric antimicrobial therapy within the institution when such resistance is suspected or proven.

**P-02: Incidence of Hypoglycemia in Patients with Renal Dysfunction Treated for Hyperkalemia with Regular Insulin: A Single-Center, Retrospective Cohort Study**
Dannielle Brown, PharmD, BCPS; Chase Brown, PharmD Candidate; Genevieve Hayes, PharmD, MSPharm, BCPS; Ruth Campbell MD, MS, PH; Tracie Delay, PharmD, BCPS

**Purpose/Background:** Guideline-recommended therapy for patients with hyperkalemia includes intravenous (IV) regular insulin, which causes an intracellular shift in potassium. Patients with renal dysfunction are at an increased risk of hyperkalemia and thus are frequently treated with insulin. Several studies have shown that patients with chronic kidney disease (CKD) or end stage renal disease (ESRD) are at an increased risk of hypoglycemia after hyperkalemia treatment. The purpose of this study was to identify the incidence of and risk factors for hypoglycemia in patients with CKD stage III-V or ESRD treated with insulin for hyperkalemia at MUSC Health.

**Methods:** Patients included were ≥ 18 years of age with a diagnosis of CKD stage III-V or ESRD who had a serum potassium ≥ 5 mmol/L and were treated with regular insulin for hyperkalemia. The primary outcome was the incidence of hypoglycemia during hospitalization. Key secondary outcomes included incidence of hypoglycemia within 24 hours of insulin administration and identification of risk factors associated with hypoglycemia.

**Results:** A total of 235 encounters were included in the final analysis. Sixty-six patients (28.1%) experienced a hypoglycemic event during the encounter. Fifty-three patients (22.6%) had hypoglycemia within 24 hours of insulin administration. The average time to onset of hypoglycemia was 21.2 hours in all patients who experienced hypoglycemia and 6.4 hours in the subset who experienced hypoglycemia within 24 hours of insulin administration. Inciting potassium was significantly higher and baseline blood glucose was significantly lower in the group that experienced hypoglycemia ($P=.01$, $P=.02$, respectively).

**Conclusion:** Hypoglycemia in CKD Stages III-V or ESRD patients treated with regular insulin for hyperkalemia was a common occurrence. Current practice at MUSC Health lacks standardization in both insulin/dextrose dosing and follow-up glucose monitoring. A protocol with individualized dextrose dosing determined by baseline glucose values and structured glucose monitoring is warranted.
Dannielle R. Brown, PharmD, BCPS; Megan Z. Roberts, PharmD, BCPS; Lisa L. Steed, PhD; Tiffeny T. Smith, PharmD; Shawn H. MacVane, PharmD, BCPS

Purpose/Background: Vancomycin susceptibility for methicillin-resistant Staphylococcus aureus (MRSA) blood culture isolates warrants further elucidation due to discrepancies among various susceptibility testing methods, as well as conflicting findings on clinical implications of elevated minimum inhibitory concentrations (MICs). Documented treatment failure among isolates within the susceptible range (MIC ≤ 2 mcg/mL) emphasizes the need to characterize optimal susceptibility testing methods.

Methods: This observational, retrospective cohort study included adult patients with a MRSA positive blood culture isolate during inpatient admission at an academic medical center between January 1, 2014 and October 31, 2016. The primary objective evaluated the variability in vancomycin MIC values with automated testing methods (MicroScan® or BD Phoenix™) and Etest methods. Secondary objectives included the impact of vancomycin MICs on clinical outcomes and decision making regarding therapy.

Results: Among the 167 MRSA blood culture isolates tested, MICs were ≥ 1.5 for 80% by Etest (133/167), 83% by MicroScan®(38/46), and 7% by BD Phoenix™(8/121). MRSA targeted antimicrobial therapy was modified in 50% of patients, with the most common initial therapy being vancomycin (137/167; 82%) and therapy modification being a switch to daptomycin (50/83; 60%). Of patients whose isolate had an MIC ≥ 1.5 by Etest, 56% (74/133) underwent a therapy modification compared with 26% (9/34) of those with an isolate MIC of ≤ 1 by Etest (P<0.002). Thirty-day all-cause mortality was 16%, and was not different between those with Etest MIC values of ≥ 1.5 (21/133; 16%) and ≤ 1 (6/34; 18%; P =0.793).

Conclusion: Vancomycin MICs among MRSA bacteremia isolates are frequently discordant between Etest and automated testing methods. MICs ≥ 1.5 by Etest were not associated with increased mortality but were more likely to have modifications in MRSA antimicrobial therapy. The findings suggest that two-fold dilution susceptibility testing is not sufficiently sensitive to guide therapy selection in MRSA bacteremia.

P-04: Implementation of a Chemotherapy-induced Nausea/Vomiting (CINV) Collaborative Disease Therapy Management (CDTM) in the Outpatient Oncology Clinics
Kasey Jackson, PharmD; Cathy Letton, PharmD, BCOP; Andy Maldonado, PharmD, BCOP; Andrew Bodiford, PharmD, BCOP; Amy Sion, PharmD, BCOP

Purpose/Background: Collaborative drug therapy management (CDTM) is a formal partnership between a pharmacist and physician to allow the pharmacist(s) to manage a patient’s drug therapy. Literature supports CDTM can improve patient outcomes, improve medication adherence, enhance medication safety, and positively influence healthcare expenditures. Chemotherapy induced nausea/vomiting (CINV) is considered one of the most distressing and feared adverse events in patients receiving chemotherapy. CINV can impact a patient’s quality of life and may affect compliance with the treatment plan. The objective of this pilot study was to determine the feasibility of implementing a CINV CDTM protocol in the outpatient oncology clinics.

Methods: The pharmacists were consulted by an oncologist to manage CINV. The pharmacists interviewed the patient and provided recommendations. The pharmacists followed up with the patient via a telephone call or during the next scheduled clinic visit to assess their symptoms. The primary endpoint was to determine the feasibility of a pharmacist-centered CINV CDTM. Secondary endpoints included comparing patient’s MASCC scores and revenue of pharmacists’ services.

Results: The CINV CDTM was implemented October 2016-January 2017. From October 2016 through January 2017, there were 45 consults for the management of CINV. The pharmacists were able to make 188 total interventions, which included addition of new medications (37%), patient education (34%), deletion of medications (10%), changing a dose/duration/frequency (8%), and other interventions (11%). Available symptom scores were available for 5 patients, in which all showed improvements from baseline with the pharmacists’ interventions.

Conclusion: The implementation of our CINV CDTM has shown favorable results after a 4-month period. The pharmacists have made a lot of interventions and provided patient education to patients undergoing chemotherapy.
P-05: Effectiveness and Safety of Direct Oral Anticoagulant Agents and Warfarin Among Patients with Sickle Cell Disease: A Retrospective Cohort Study
Megan Roberts, PharmD, BCPS; Eric Gaskill, PharmD Candidate; Nicole Bohm, PharmD; Brittany Jones, PharmD; Julie Kanter, MD; T. Rogers Kyle, MD

Purpose/Background: Venous thromboembolism (VTE) is a common complication of sickle cell disease (SCD), occurring at a higher rate and younger age than non-SCD populations. Treatment of VTE is essential to prevent recurrence, complications, and mortality. However, no studies have evaluated appropriate treatment of VTE in this population. This study aims to characterize the effectiveness and safety of direct oral anticoagulant agents (DOAC) and warfarin for VTE treatment in patients with SCD.

Methods: This observational, retrospective cohort study included adult patients with SCD at a single academic medical center receiving a DOAC or warfarin for VTE treatment between July 1, 2012 and June 30, 2016. Patients were identified for the study by ICD codes for SCD, VTE, and medication orders. Patients were excluded from data collection if they were pregnant or receiving anticoagulation for an indication other than VTE treatment. Effectiveness and safety outcomes were assessed for 6 months following the VTE occurrence.

Results: Thirty-seven patients were identified for inclusion in this study, of which 22 (60%) were initiated on a DOAC. Patients in the study primarily received treatment for an upper extremity deep vein thrombosis (17, 46%). The incidence of recurrent VTE was 27% overall and 27% in both groups of warfarin treated patients and DOAC treated patients. Bleeding events were low in both groups with one warfarin treated patient developing a vitreal hemorrhage. Twelve patients received more than one oral anticoagulant during the study period, most commonly due to practitioner concern of non-adherence or subtherapeutic INR (10, 83%).

Conclusion: In this small cohort of patients with SCD, the overall incidence of VTE recurrence and bleeding events were similar between groups; however, occurred at a higher rate than those found in major clinical trials of anticoagulant agents, indicating unique considerations for this population.

P-06: Assessment of Liposomal Amphotericin B for Empiric Coverage and Documented Fungal Infections: A Medication Use Evaluation
Alyssa D. Rabon, PharmD; Elizabeth H. Robinette, PharmD; Shawn MacVane, PharmD, BCPS; Genevieve Hayes, PharmD, MSPharm, BCPS

Purpose/Background: Amphotericin B is a broad spectrum intravenous antifungal agent used for various invasive fungal infections and is often utilized empirically in critically ill patients. When examined with a group of comparator Vizient hospitals, MUSC Health has a higher utilization of liposomal amphotericin B (LAMB). The objective of this project was to assess trends in the utilization of LAMB and identify potential opportunities to reduce costs associated with the medication.

Methods: A retrospective chart review was performed to ascertain trends in prescribing practices at MUSC Health. Inpatient adults treated with intravenous LAMB from June 2015 to July 2016 were examined, and data collected included patient demographics, order information, and medication therapy information. The use of diagnostic laboratory tests, previous antifungals, and involvement of the Infectious Disease consult service was also assessed.

Results: A total of 101 orders for LAMB were processed, and 873 doses were administered. The Hematology/Oncology service utilized LAMB most frequently, comprising of 45% of doses administered. Biomarker testing was commonly utilized, as a (1,3) beta-d glucan was obtained in 51% of encounters, aspergillus antigen in 62%, and cryptococcal antigen in 47%. Positive fungal cultures were present in 49% of encounters. Other antifungal agents were used prior to LAMB in 62% of encounters, and 90% were at treatment doses. Infectious Disease was consulted during 88% of hospitalizations, and LAMB was recommended by the consult service in 65% of these instances.

Conclusion: When assessing trends in prescribing of LAMB, the results of this medication use evaluation indicate that LAMB is being utilized appropriately at MUSC Health with opportunities to further help guide prescribing through requiring an Infectious Disease consult for all LAMB orders and through a protocol allowing dose rounding by pharmacists.
P-07: Assessment of Timing of Aspirin Initiation Following Intracranial Hemorrhage
Melanie Smith, PharmD, BCPS; Morgan Lange, PharmD Candidate; Julio Chelala, MD; Ron Neyens, PharmD

Purpose/Background: A large number of both spontaneous and traumatic intracranial hemorrhages (ICH) occur in patients receiving either anticoagulant or antiplatelet medications for the secondary prevention of thrombotic events. Although more evidence is emerging regarding the acute management of these medical emergencies in patients taking antithrombotic medications, less is known about the long-term management of bleeding risks versus thrombotic complications or the appropriate timing for reinitiation of these medications. There is limited evidence regarding outcomes related to the timing of initiation of aspirin in patients with ICH. The primary objective of this study is to compare the impact of timing of initiation of aspirin on safety and efficacy outcomes in patients with ICH.

Methods: This was a retrospective, single-center study including adult patients admitted for ICH with aspirin initiated during the hospitalization. Patients with subarachnoid hemorrhage and suspected amyloid angiopathy were excluded. Endpoints included rates of hematoma expansion and ischemic events including ischemic stroke and major adverse cardiac events.

Results: The 34 included patients were mostly male (74%), African American (62%), with a median age of 68.5 years. Intracranial bleeds included 53% subdural hematoma, 44% intracerebral hemorrhage, and 3% epidural hematoma. Seventy-one percent were on an anti-platelet medication prior to admission. There were two patients with hematoma expansion after aspirin initiation and one with a myocardial infarction prior to aspirin initiation. All three were in patients with subdural hematoma.

Conclusion: This hypothesis generating study found similar event rates for hematoma expansion and ischemic events in patients initiated on aspirin after ICH. Larger studies are needed to confirm the safety and efficacy of aspirin use in this patient population.

P-08: Evaluation of Renal Function with the Use Everolimus or Mycophenolate Mofetil in Liver Transplant Recipients
Caroline P. Perez, PharmD, BCPS; James N. Fleming, PharmD, BCPS; Megan Sell, PharmD; Bailey O’Brien, PharmD; Alex Rogers, PharmD; Irene Lee, PharmD; Caitlin R. Mardis, PharmD, BCPS; Benjamin A. Mardis, PharmD, BCPS; Neha Patel, PharmD, BCPS; Holly B. Meadows, PharmD, BCPS; Nicole W. Pilch, PharmD, MSCR, BCPS; Kenneth D. Chavin, MD, PhD; Derek Dubay, MD; Vinayak Rohan, MD; David J. Taber, PharmD, BCPS

Purpose/Background: There are no head-to-head studies comparing mTOR inhibitors to mycophenolate mofetil in regards to improvement in renal function in liver transplant recipients over time. The aim of this study is to assess whether there is a difference in renal function over time when transitioning to everolimus versus mycophenolate mofetil.

Methods: This was a retrospective cohort study of adult liver transplant recipients who were initiated on either everolimus or mycophenolate by post-operative day 90 as either calcineurin inhibitor minimization or withdrawal. The primary outcome was renal function at 2-year post-transplant using MDRD equation. Other outcomes included discontinuation of therapy, biopsy-proven rejection, complications, infections, malignancy, disease recurrence, laboratory findings, graft loss, and death.

Results: A total of ninety-six patients were included in the study. Based on the change in eGFR slope overtime, there was a trend towards worsening renal function in the everolimus group at 1-year post-transplant, but were similar between both groups by year-2 (p=0.537). Discontinuation of therapy occurred in 15 (54%) patients in the everolimus group versus 26 (38%) in the mycophenolate group (p=0.167). There was no difference between groups in for other clinical outcomes.

Conclusion: This data demonstrates that adjunctive use of everolimus, as compared to mycophenolate mofetil, produced similar renal function with a trend towards a higher discontinuation rate. Larger prospective studies must be done to determine differences in clinical outcomes.
P-09: This is Why We Can't Have Nice Things: Real World Experience with Everolimus in Livers
Caroline P. Perez, PharmD, BCPS; James N. Fleming, PharmD, BCPS; Megan Sell, PharmD; Bailey O’Brien, PharmD; Alex Rogers, PharmD; Irene Lee, PharmD; Caitlin R. Mardis, PharmD, BCPS; Benjamin A. Mardis, PharmD, BCPS; Neha Patel, PharmD, BCPS; Holly B. Meadows, PharmD, BCPS; Nicole W. Pilch, PharmD, MSCR, BCPS; Kenneth D. Chavin, MD, PhD; Derek Dubay, MD; David J. Taber, PharmD, BCPS

**Purpose/Background**: The aim of this study was to determine whether discontinuation rates of everolimus in clinical practice are higher than the 30% discontinuation rate demonstrated in clinical trials.

**Methods**: This was a retrospective cohort study of adult liver transplant recipients between Jan 2010 through Dec 2015 who were initiated on everolimus following CNI minimization or withdrawal protocol. The primary outcome was the rate of discontinuation of everolimus. Other outcomes included days to conversion to everolimus, reason for discontinuation, total number of days on everolimus, and lipid, proteinuria, and CBC monitoring.

**Results**: A total of 42 patients were included. The median time to everolimus conversion was 56 days with the most common indication for initiation being malignancy. A large proportion of patients discontinued therapy with everolimus (59.5%). The most common reasons for discontinuation were bone marrow suppression, rejection, and planned surgical procedure. Patients who were discontinued off everolimus were on therapy for a median of 112 days. Only 64% of patients got a lipid panel and 41% got a urine protein/Cr ratio checked at initiation. Follow-up lipid panels and urine protein/Cr ratios were only performed in 38% and 12% of patients, respectively.

**Conclusion**: Everolimus was discontinued within 180 days of initiation in a large proportion of patients. Patients are not being properly monitored for adverse effects and many are most likely being continued on therapy inappropriately secondary to poor monitoring.

P-10: Botulinum Product Optimization in Ambulatory Clinics
Vanessa Jamison, PharmD; Megan Sell, PharmD; Genevieve Hayes, PharmD, MSPharm, BCPS; Vera German, PharmD

**Purpose/Background**: Currently, MUSC Health has 4 botulinum products on formulary, including abobotulinumtoxinA (Dysport®), incobotulinumtoxinA (Xeomin®), onabotulinumtoxinA (Botox®), and rimabotulinumtoxinB (Myobloc®). The purpose of this medication use evaluation was to determine which botulinum products would be most optimal to have on the MUSC Health formulary.

**Methods**: A report of all botulinum products administered in the outpatient clinics at MUSC Health from July 1, 2015 through June 30, 2016 was generated from the electronic medical record, Epic. Data collection included the following factors for each product: labeled and off-label indications, average percent waste per patient, storage requirements and shelf life, frequency of use, and overall cost benefit based on cost of vials and reimbursement. For average percent waste per patient, billing data was used to determine the amount of each vial that was administered to the patient and the amount that was wasted. Overall cost benefit was calculated based on the third-party payer reimbursement minus the outpatient 340B acquisition cost of the medication for a random sample of orders.

**Results**: There were 3554 orders for botulinum products identified between July 1, 2015 and June 30, 2016. The breakdown of botulinum products used at MUSC Health was as follows: onabotulinumtoxinA 95.9%, rimabotulinumtoxinB 3.03%, abobotulinumtoxinA 0.63%, and incobotulinumtoxinA 0.42%. Notably, 712 orders were excluded from analysis of amount wasted; while certain clinics divide waste between all of the patients who received botulinum in a single day, this practice is not reflective of the majority of clinics at MUSC Health. Overall, reimbursement met or exceeded 340B acquisition costs on average for Botox® and Myobloc®.

**Conclusion**: Based on the data collected, it will be recommended to clinic physicians that abobotulinumtoxinA (Dysport®) and incobotulinumtoxinA (Xeomin®) be removed from formulary for use in MUSC Health outpatient clinics.
P-11: Impact of a Dedicated Pharmacist in the Malignant Hematology Clinics
Ryan Miller, PharmD; Andrew Bodiford, PharmD, BCOP

Purpose/Background: Malignant hematology is a heterogeneous collection of numerous blood-related malignancies. Many patients with a hematological malignancy receive either intravenous chemotherapy or oral chemotherapy and many require supportive care medications. It has been shown that a pharmacist’s interventions can help prevent medication-related harm in patients and improve clinical outcomes. It has also been demonstrated that pharmacists can play an integral role in outpatient services involving oral chemotherapy; however, no study has solely evaluated the impact of a pharmacist in an ambulatory malignant hematology clinic. The primary objective of this study is to evaluate the number of medication-related interventions completed by a pharmacy clinical specialist in the ambulatory malignant hematology clinic.

Methods: This study is a single-center, retrospective chart review of the electronic medical record following the implementation of a dedicated pharmacist on August 1st 2016 through November 30th 2016. All patients with a visit during this study period whom had a documented intervention by the pharmacist were included in our analysis.

Results: In a four-month period of time, current preliminary data show that at least one intervention occurred with 232 patients. The most common intervention was initiation of therapy (n=78), with anti-emetics being the most commonly recommended therapy. The second most common intervention was discontinuation of therapy or avoidance of therapy (n=51). Additionally, medication dosing adjustments (n=33) occurred due to drug interactions, organ impairment, or adverse effects. Finally, direct involvement in procurement or reimbursement for an oral chemotherapy agent occurred on 44 separate occasions.

Conclusion: This study showed that a pharmacist can play a significant role in oral chemotherapy agent medication procurement and reimbursement, assessing patient adherence to oral chemotherapy agents, serving as a resource for drug information-related questions, and assessing the need for supportive care medications.

P-12: Assessment of Naloxone Prescribing Practices Upon Hospital Discharge in Psychiatric Patients at Risk for Opioid Overdose
Lauren Linder, PharmD, BCPS; Ann Marie Ruhe, PharmD; Clint Ross, PharmD, BCPP; Alison Ivey, PharmD Candidate; Genevieve Hayes, PharmD, MSPPharm, BCPS

Purpose/Background: Opioid overdose persists as a nationwide epidemic and public health crisis. Though all patients using opioids may be at risk for overdose, literature supports a correlation between certain risk factors and overall risk. At the Medical University of South Carolina (MUSC) Institute of Psychiatry (IOP), there is no standardized prescribing or dispensing of naloxone for patients at risk for overdose following discharge. Our primary objective was to characterize current prescribing practices for naloxone upon discharge in patients at highest risk for opioid overdose.

Methods: This retrospective chart review enrolled all adult patients admitted to the IOP from August to October 2016 diagnosed with opioid–related disorders per the international classification of diseases, 10th revision (ICD-10), or a documented opioid use disorder. To further classify patients as high risk, a number of characteristics were collected based on existing supporting literature. Descriptive data and measures of central tendency were utilized to assess all specific aims.

Results: The patients included in this retrospective study consisted primarily of Caucasian males with a mean age of 48 years. Of the 60 patients included in our high risk cohort, only 5% were prescribed naloxone at discharge. Additionally, 90% of the cohort had at least one additional active risk factor in addition to current opioid use, and more than 25% had at least two or three additional risk factors. Greater than 50% of the cohort had documented opioid use in combination with active use of a benzodiazepine, alcohol or cocaine.

Conclusion: Through both targeted treatment team education and the development of a screening tool within the electronic medical record, we aim to optimize the prescribing of naloxone to high risk patients upon discharge from the IOP.
P-13: Evaluation of the Prescribing Practices and Use of Proton Pump Inhibitors in the Outpatient Setting
Melanie Manis, PharmD; Alex Rogers, PharmD; Kelly Crowley, PharmD; James P. New, PharmD, BCPS

Purpose/Background: Proton pump inhibitors (PPIs) are one of the most commonly prescribed medications and have been identified by the South Carolina Public Employee Benefit Authority (PEBA) as a high cost pharmaceutical class used by its members. These agents work to reduce gastric acid secretion and are most commonly used to treat gastroesophageal reflux disease (GERD). The objective of this medication-use evaluation was to analyze the trends in ambulatory prescribing of PPIs and their use by patients.

Methods: A report was generated from the MUSC Health retail pharmacy claims data for PPI prescriptions filled between October 2015 and September 2016. A second report was generated utilizing the MUSC Health electronic medical record to identify PPIs prescribed in the ambulatory setting between April and June of the same year. A small subset of patients (n = 70) who had 6 or more fills of a PPI for the indication of GERD in this time frame were selected and reviewed for appropriateness. Based on current practice guidelines, therapy was deemed inappropriate if continued beyond 60 days without switching agents, adjusting the dose or frequency, or consulting gastroenterology.

Results: In review of PPI prescriptions written by MUSC Health providers, it was found that 10% of prescribers wrote for 58% of all PPI prescriptions, with omeprazole being the most commonly prescribed agent. The majority (63%) of patients were provided with multiple refills. In reviewing appropriateness, 46% of patients continued their initial PPI beyond 60 days without change.

Conclusion: As a result of these findings, it would be beneficial to re-educate high-volume PPI prescribers on the appropriate duration of therapy with PPI use. Additionally, developing a collaborative drug therapy management (CDTM) agreement to allow pharmacist intervention on inappropriately continued PPI prescriptions may limit the over-use of these agents.

P-14: Impact of a Centralized, Dedicated Resource in a Health-System Based Hepatitis C Service
Jennifer Carter, PharmD, BCPS; David Cruse, PharmD, MS

Purpose/Background: The evaluation of clinical outcomes with utilization of a dedicated, centralized resource versus a decentralized resource for hepatitis C patient management services in the outpatient setting is described.

Methods: This quality improvement, retrospective study was conducted at a large academic medical center during Oct 2015-March 2017. Adult patients greater than or equal to 18 years of age with the diagnosis of hepatitis C were considered for inclusion if they were being treated by a provider at our institution. Patients were also required to have their laboratory information accessible through the electronic health record. Pregnant and lactating patients and those participating in a research study were excluded. The primary outcome measurement was sustained virologic response (SVR) at 12 weeks post completion of therapy, an indicator of cure. Secondary outcomes included: collection of SVR at 4 weeks of therapy, SVR labs post SVR12, SVR that was not collected and unknown, and treatment failure. Other outcome measures evaluated in the study were HIV or hepatitis B coinfection, history of intravenous drug use, hemodialysis, and transplantation history. Funding status was collected to determine potential access issues of the population studied.

Results: A total of 152 patients were included with 78 in the intervention group and 74 in the comparator group. There was a statistically significant difference in achievement of sustained virologic response at 12 weeks post therapy in the intervention versus comparator group (p=0.004).

Conclusion: This study demonstrates the importance of a dedicated, centralized resource in the management of complex specialty pharmacy patients like hepatitis C patients in order to ensure proper follow up and medication access. Our phase one study did not compare type of resource, just the importance of a dedicated resource.
P-15: Rituximab Use in the Acute Setting: Results from an Academic Medical Center
Mary Frances Picone, PharmD; Bailey O’Brien, PharmD; Genevieve Hayes, PharmD, MSPharm, BCPS; Wendy Bullington, PharmD, BCPS

Purpose/Background: Rituximab is a high-cost medication, making the list of top 15 drugs by expenditures in nonfederal hospitals in 2014. The aim of this project was to assess our use of rituximab in the acute setting.

Methods: A report was generated of all rituximab orders administered between July 1, 2015, and June 30, 2016. Data collection points included the indications for which rituximab was prescribed, doses administered, acuity of conditions for which rituximab was used, average length of stay, appropriateness of premedications and hepatitis B screening, and adverse events. Medical record review was performed on all identified orders, with results reported as descriptive statistics.

Results: Within the study period, 179 orders for rituximab were administered to 87 patients (38 female, 49 male; average age 56.2±16.7 years). In 64 of 87 patients (73.6%), use of rituximab was associated with an oncology indication and administered as part of a chemotherapy regimen; this corresponds to 147 of 179 orders (82.1%). In 163 out of 179 orders (91.1%), rituximab was given for an indication found on the Palmetto GBA Local Coverage Determination (LCD) list. By a definition of appropriate that takes into account current inpatient chemotherapy practices at MUSC Health, 87.7% of indications were classified as appropriate for administration in the inpatient setting. Adverse effects related to rituximab infusion were minimal, consisting primarily of infusion reactions (13/87 or 14.9%).

Conclusion: Rituximab use within our institution is generally for appropriate indications, but our use is primarily in the setting of scheduled chemotherapy admissions. Other institutions are able to provide rituximab in the clinic setting prior to scheduled admission for chemotherapy, and thus, receive reimbursement for this medication. Significant cost savings could be realized with implementation of any 1 of 3 scenarios analyzed.

P-16: Characterization of Linezolid Use at MUSC Health
Brian R. Raux, PharmD; Irene Y. Lee, PharmD; Kyle C. Mangan, PharmD; Genevieve Hayes, PharmD, MSPharm, BCPS; Tiffeny Smith, PharmD

Purpose/Background: Recent comparison between the utilization of medication at MUSC Health and other Vizient University HealthSystem Consortium (UHC) academic medical centers showed that MUSC Health had a three-fold higher utilization of linezolid. Thus, it is imperative to evaluate the overall linezolid use and to identify potential opportunities for optimization of use.

Methods: This was a retrospective electronic medical record chart review on patients identified through reports generated from Epic between January 1, 2016 and March 31, 2016.

Results: During this three-month study period, 235 patients were included. The median age was 57 years. The prescribing criteria for linezolid use at MUSC Health are patients in the intensive care unit (ICU), patients with cystic fibrosis, patients needing empiric and definitive treatment of MRSA pneumonia, patients with febrile neutropenia, and patients with other indications as approved by the Infectious Diseases consult or Antimicrobial Stewardship Program. The majority of linezolid orders (85%) met the institutional restriction criteria. Approximately two-thirds (68%) of linezolid use was deemed clinically appropriate. Pneumonia accounted for the preponderance of use (67%). Among patients in whom linezolid was used to treat pneumonia (n=158), only 80 (51%) had respiratory cultures sent within 48 hours of linezolid initiation. The use of linezolid was deemed inappropriate in 25 patients. Amongst these patients, the median duration of use was 2.5 days, and the total days of inappropriate linezolid use was 83 days. MUSC Health’s restriction criteria permit 72 hours of empiric use. Collectively, patients received an additional eight days of linezolid than what is allowed per restriction criteria.

Conclusion: The high usage of linezolid may be attributed to prescribers preferring linezolid over vancomycin rather than prescribers inappropriately using it. Potential interventions include adding a discontinuation date on the empiric order and mandatory consult to Infectious Diseases or Antimicrobial Stewardship for duration of therapy longer than 8 days.
BE-021: Admissions After Liver Transplantation: They May Be Predictable, But Are They Inevitable?

Bailey O’Brien, PharmD; Caitlin Mardis, PharmD, BCPS; Andrew Mardis, PharmD, BCPS; James Fleming, PharmD, BCPS; Holly Meadows, PharmD, BCPS; Neha Patel, PharmD, BCPS; Nicole Pilch, PharmD, MSCR, BCPS; Caroline Perez, PharmD, BCPS; Megan Sell, PharmD; Alex Rogers, PharmD; Irene Lee, PharmD; John McGillicuddy, MD; Kenneth Chavin, MD, PhD; Derek DuBay, MD; David Taber, PharmD, BCPS

**Learning Objective:** Summarize the variables identified as predictive factors for 30-day readmissions following liver transplantation

**Purpose/Background:** Published studies suggest that approximately 40% of recipients are readmitted to the hospital within 30 days. The aim of this study is to analyze the risk factors for 30-day readmissions following liver transplantation at a hospital that has developed protocols and allocated resources to preventing early post-transplant readmissions.

**Methods:** This was a retrospective cohort study of adult liver transplant recipients from January 2010 through December 2015. Pediatric patients and patients who were never discharged from the hospital were excluded. Patients were assessed for risk factors and variables that may have contributed to 30-day readmissions, and readmissions were analyzed for trends over time. Using this data, a predictive model was created using binary logistic regression with backward elimination.

**Results:** This study included 351 patients; a total of 108 (30%) were readmitted to the hospital within 30 days. The majority of readmissions were surgical in nature, with biliary complications being the most common cause. There were no statistically significant trends in the rate of readmissions or the cause of readmissions over time. The logistic regression model had good predictability with a ROC of 0.71 (CI 0.649-0.766) and included 9 variables, 3 of which were statistically significant.

**Conclusion:** The results of this study demonstrate that rates of 30-day readmission in the liver transplant population are stable over time and similar to the published literature. While there are variables that are predictive of 30-day hospital readmissions in liver transplant recipients, it appears that these predictive factors may be center-specific, challenging to prevent, and thus difficult to influence over time.

BE-022: Cardiovascular Events are a Substantial and Increasing Cause of Graft Loss in Liver Transplant Recipients

Megan Sell, PharmD; Holly Meadows, PharmD, BCPS; Andrew Mardis, PharmD, BCPS; Irene Lee, PharmD; Caroline Perez, PharmD, BCPS; Bailey O’Brien, PharmD; Alex Rogers, PharmD; Caitlin Mardis, PharmD, BCPS; Neha Patel, PharmD, BCPS; James Fleming, PharmD, BCPS; Nicole Pilch, PharmD, MSCR, BCPS; Kenneth Chavin, MD; David Taber, PharmD, MS, BCPS

**Learning Objective:** Evaluate changes in the etiologies of graft loss over time and risk factors that may have contributed to this change

**Purpose/Background:** The overall 1- and 3-year graft survival rates following liver transplant are 89.53% and 80.48%, respectively. Overall, 75.0% of liver transplant recipients are alive at 5 years. While these numbers have vastly improved, it is unclear if the etiologies of graft loss have changed over time.

**Methods:** A retrospective, longitudinal, case-control study was conducted at a single academic medical center which included patients who received a solitary liver transplant between Jan 1, 2010 and Dec 31, 2015. Pediatric recipients and multi-organ recipients were excluded. The primary outcome was to identify changes in cause of graft loss over time. The secondary outcome was to identify risk factors for patients who experienced graft loss compared to those who did not.

**Results:** A total of 311 patients were identified and included in the analysis. The incidence of liver graft loss from a cardiovascular cause significantly increased from 0.34 to 3.36 events per 100 patient-years (P=.0411) between 2010 and 2015. The risk of liver graft loss from infection/malignancy decreased from 3.05 to 0 events per 100 patient-years (P=.029). Graft loss due to primary non-function has also significantly increased in recent years (P=.0439). Patients who received a split liver, received Interleukin-2 Receptor Alpha (IL2RA) induction, required a percutaneous intervention (PCI) prior to transplant, received renal replacement therapy during their hospitalization following transplant, had 1 or more acute rejection episodes, or had 1 or more readmissions within 30 days of initial discharge were at higher risk for graft loss.

**Conclusion:** The etiology of graft loss changed from 2010 to 2015, with a significant increase due to cardiovascular causes and a significant decrease due to infection/malignancy. Several factors significantly increased the risk of overall graft loss.
BE-023: Ten-Year Single-Center Analysis of Combined Liver/Kidney Transplants
Irene Lee, PharmD; Neha Patel, PharmD, BCPS; Bailey O'Brien, PharmD; Caroline Perez, PharmD, BCPS; Alex Rogers, PharmD; Andrew Mardis, PharmD, BCPS; Caitlin Mardis, PharmD, BCPS; Holly Meadows, PharmD, BCPS; James Fleming, PharmD, BCPS; Nicole Pilch, PharmD, MSCR, BCPS; Ken Chavin, MD; David Taber, PharmD, BCPS

Learning Objective: Describe the ten-year trend in outcomes of combined liver/kidney transplants at our institution

Purpose/Background: There is a general trend towards combined liver kidney transplants (CLKT) in patients with end-stage liver disease and irreversible renal failure; however, the outcomes of this population are not well studied.

Methods: This was a single-center, retrospective cohort study of patients who received a CLKT between January 2006 and December 2015. During this period, 49 CLKT were completed at our institution. Data collection included a detailed assessment of baseline characteristics, perioperative outcomes and graft/patient survival.

Results: Forty-nine patients received a CLKT during this 10-year period; the median age was 59 years with 43% being female and 18.4% were black. The most common indication for transplant was hepatitis C (24.5%). Twenty patients (41%) were on renal replacement therapy (RRT) prior to transplant, and 13 patients (26.5%) required RRT post-transplant. The median length of stay was 8 days and 25% were discharged to rehab. Surgical complications were uncommon, with the most frequent being wound complications (25%). The rate of infection within the first month of transplant was 61.3% but patients were treated without significant sequelae. Overall, the rates of rejection were relatively low within the first year of transplant with 16.3% in the liver and 10.2% in the kidney. The vast majority of patients received induction therapy with an IL-2 antagonist, and was maintained on tacrolimus, MMF, and prednisone. Renal function remained stable within the first year of transplant, with a median serum creatinine of 1.1 to 1.7 mg/dL. Graft and patient survival rates remained high throughout follow up, with a ten-year survival rate of 84%.

Conclusion: Overall, patients that received CLKTs appear to have no higher rates of perioperative complications and excellent long-term graft outcomes, comparing favorably to those receiving solitary liver transplants. Acute rejection is uncommon and long-term kidney allograft function appears to be excellent in this cohort of patients.

BE-024: The Impact of Pre-LVAD Psychosocial Evaluations on Post-LVAD Outcomes
Minoosh Sobhanian, PharmD BCPS; Maureen Converse, PharmD; Neha Patel, PharmD, BCPS; Andrew Mardis, PharmD, BCPS; David Taber, PharmD, MS, BCPS; Brian Houston, MD; Bhavadharini Ramu, MD; Eva Serber, PhD; Amma Agyemang, PhD; Dawn Heyward, MSN, ANP-C; Walter Uber, PharmD; Holly Meadows, PharmD, BCPS

Learning Objective: Evaluate the incidence of post-LVAD related complications in patients who received a pre-LVAD psychosocial evaluation

Purpose/Background: The ISHLT guidelines recommend that all LVAD eligibility evaluations include both medical and social considerations. At our center, the Behavioral Medicine team completes a comprehensive psychosocial evaluation examining functional domains of neurocognition, psychiatric, health behavior, coping, knowledge, social support, and LVAD preparedness; and assigns an overall score for each patient. There is limited data assessing the association between the pre-LVAD psychosocial component and outcomes.

Methods: This was a retrospective longitudinal cohort study which included patients implanted with a Heartmate II® LVAD from Jan 2009 through Jul 2016. Adults that completed a pre-LVAD psychosocial evaluation were included. The scores on the psychosocial evaluation were recorded with values ranging from 1-9 (poor to excellent) for each component and a composite score.

Results: Of the 67 patients (52% male, median age 56 [23-79]) that were evaluated, the mean overall psychosocial evaluation score was 5.9 ± 1.1, indicating moderate candidacy. 61% were implanted as destination therapy. Major complications included: major bleeding (51%), pump thrombosis (18%), and infection (45%). None of the psychosocial evaluation components predicted major complications. However, a higher social support score was associated with a significant decrease in risk of infection and delayed time to readmission. A higher overall score on the knowledge component also delayed time to readmission.

Conclusion: Psychosocial evaluations may be an important part of the selection process for LVAD recipients. Reduced social support appears to be predictive of increased risk of infection and readmission. Improved knowledge as well as a positive overall psychosocial assessment appears to decrease the risk of readmission. If confirmed with a prospective study, these results may help streamline the psychosocial evaluation process for LVAD recipients and better allocate time and resources to address these specific components.
BE-221: Practice Change from Intermittent Medication Boluses to Bolusing from a Drip in Pediatric Critical Care: A Quality Improvement Project
Jessica Hochstetler, PharmD; A. Jill Thompson, PharmD, BCPS, BCPPS; Elizabeth Mack, MD; A. Lauren Haney, PharmD, BCPS, BCPPS; Diana Nguyen, PharmD Candidate

Learning Objective: Determine the impact of the implementation of bolusing from a drip in pediatric intensive care units

Purpose/Background: Intermittent IV medications may be administered either as an individual dose, obtained from a pharmacy or automated dispensing machine (ADM), or as a bolus from a drip if that medication is being continuously infused. Bolus from drip method is standard of practice in many children's hospitals. MUSC Children's Hospital started to bolus from drip in November 2015. The objective of this study is to determine the impact of this method on the quality of patient care and safety in pediatric intensive care units (ICUs).

Methods: This study evaluated patients <18 years old in MUSC’s pediatric cardiac and medical ICUs receiving continuous infusions of midazolam, fentanyl, morphine, vecuronium, cisatracurium, or dexmedetomidine between 5/1/2015 and 5/31/2016, with November being a washout period. The following were evaluated for patients receiving these drips: time to administer bolus, nursing satisfaction, cost savings, barcode scanning rates, infusion pump overrides, and medication utilization. The time between when a bolus dose was necessary until administration was collected in real time by volunteers and nurses. A nursing satisfaction survey was administered before and after the practice change. Cost savings were calculated using average wholesale price of the vial size(s) of medication that would be used for each dose given as a bolus from the drip for six months, then extrapolated to one year. Medication utilization data were collected retrospectively from the electronic medical record for a random sample of patients in each time period. Data collected included: cumulative dose, average hourly drip dose, average total hourly dose (drip plus boluses), drip duration, average bolus dose, boluses per day, boluses from drip, and boluses from ADM. The data for barcode scanning rates and infusion pump overrides were collected from the electronic medical record and from pump downloads, respectively, and represented data for all patients in each location and included all medications.

BE-222: Correlation of Heparin Monitoring Parameters in Critically Ill Pediatric Patients
Bridget Blowey, PharmD; Stephanie Gaydos, MD; Lauren Haney, PharmD, BCPS, BCPPS

Learning Objectives: Evaluate the correlation between aPTT and antiXa monitoring

Purpose/Background: Unfractionated heparin (UFH) is a common drug utilized in the pediatric cardiac intensive care unit (PCICU) for various indications. Monitoring for therapeutic efficacy can be done using multiple different assays including activated thromboplastin time (aPTT) and anti-factor Xa (antiXa). The objective of this study was to determine the optimal heparin monitoring method in critically ill pediatric cardiac patients requiring heparin anticoagulation through establishing a definitive correlation between aPTT and antiXa in a pediatric cardiac intensive care unit.

Methods: Retrospective review of patients admitted to the Medical University of South Carolina Children’s Hospital PCICU. Patients were included if they were admitted between July 1, 2014 and July 31, 2016 and received continuous heparin infusion with therapeutic monitoring. Acceptable therapeutic ranges for aPTT and antiXa were 60-80 seconds and 0.3-0.5 IU/mL, respectively. All appropriate laboratory data was collected by means of chart review to establish correlations and patient outcomes.

Results: Forty-five patients met inclusion criteria. The most common therapeutic indication was use for post-operative bridge to aspirin therapy. Of the 781 paired levels evaluated, only 288 (37%) correlated to the equivalent outcome of either subtherapeutic, therapeutic, or supratherapeutic. Previously reported factors that increased the probability of discordance were consistent within this review, including higher heparin rates and hypertriglyceridemia

Conclusion: The results of this retrospective review demonstrate no consistent correlation between aPTT and antiXa monitoring parameters within any population in the PCICU and these monitoring parameters are therefore not interchangeable within clinical practice. This study did not assess for potential confounding factors including the incidence of heparin boluses, ATIII replacement, or appropriateness of the labs drawn. Continued research accounting for these parameters should be done to determine if there is a true correlation between aPTT and antiXa in any pediatric population that can be used to improve anticoagulation monitoring in these patients.
Learning Objective: Compare chest tube output in Fontan patients receiving differing albumin and vasopressin regimens

Purpose/Background: The Fontan operation is the final palliative procedure in patients with single ventricle physiology. It has undergone advancements to improve morbidity and mortality. Despite these advancements and low mortality of the procedure itself, post-operative care is associated with high morbidity. Much of the morbidity can be attributed to chest tube placement for prolonged drainage leading to pleural effusions, infection, and increased length of stay. A number of management options have been proposed to decrease chest tube output thereby decreasing the associated morbidity. Albumin has been used post Fontan to increase intravascular oncotic pressure to mobilize interstitial fluid to the intravascular space. Different regimens have been proposed with this goal in mind, including both 5% and 25% albumin. Vasopressin increases peripheral vascular resistance and decreases capillary leakage by tightening endothelial intercellular junctions and reducing capillary hydrostatic pressure. The Medical University of South Carolina has utilized both albumin and vasopressin with the purpose of decreasing morbidity in Fontan patients. The primary objective of this study is to compare chest tube output in Fontan patients receiving differing albumin and vasopressin regimens. Secondary objectives are to compare length of stay, and readmission rate.

Methods: A retrospective, single center review of 43 patients post Fontan operation was performed. Patients were evaluated for demographic data, laboratory data including serum sodium and albumin pre and post albumin administration, chest tube output, and medication data for albumin 5% and 25%, and vasopressin.
DD-021: Incidence of Device-Related Infections in Patients Receiving Prophylactic Antibiotics in Addition to Perioperative Compared to Patients Only Receiving Perioperative Antibiotics
Barbara S. Wiggins, PharmD, BCPS, CLS, FNLA, FAHA, FCCP, AACC, BCCCP; Amanda Northup, MD; Galen M. Kabuls, PharmD, BCPS

Learning Objective: Compare and contrast the incidence of cardiovascular implantable electronic device (CIED) infections in patients receiving post-procedural antibiotic prophylaxis in addition to perioperative antibiotics and compare to those not receiving post-procedure prophylactic antibiotics

Purpose/Background: CIEDs are crucial in improving patient outcomes with an array of cardiovascular diseases, but remain subject to infectious complications. In addition to standard-of-care aseptic technique, the 2010 American Heart Association statement on CIED infections recommends prophylactic antibiotics to be given 1 hour prior to device implantation. These guidelines state there are no data to support continuation of antimicrobial prophylaxis post-operatively. British guidelines are in agreement with the AHA guidelines, which also recommend pre-procedure prophylactic antibiotics but do not advocate for repeat administration following skin closure. Despite this evidence, antibiotics are often given following CIED implantation and are subject to physician-dependent prescribing practices at the Medical University of South Carolina (MUSC). The primary objective of the study was to answer if the administration of post-operative antibiotics following device placement reduces the risk of device infection.

Methods: Retrospective chart review was carried out on 1000 consecutive patients 18 years of age or older undergoing CIED implantation, lead revision, or generator change at MUSC between October 2010 and August 2014. Patients were excluded from the trial if they underwent lead extraction or device removal without reimplantation of the device or had an active device infection prompting removal.

DD-022: Incidence and Risk Factors for Development of Thrombocytopenia in Patients Treated with Linezolid for 7 Days or Greater
Alyssa D. Rabon, PharmD; Jon P. Fisher, PharmD Candidate; Shawn H. MacVane, PharmD, BCPS

Learning Objective: Describe the incidence and risk profile for the development of thrombocytopenia in patients treated with linezolid for seven days or greater

Purpose/Background: Recent retrospective studies suggest substantially higher rates of thrombocytopenia related to linezolid therapy compared to clinical trial data. Risk factors for the development of thrombocytopenia include: renal dysfunction, duration of linezolid therapy, hemodialysis, low body weight, and advanced age. We determined the incidence of thrombocytopenia and examined risk factors for the development of thrombocytopenia in patients treated with linezolid for ≥ 7 days.

Methods: We retrospectively studied all adults treated with linezolid ≥ 7 days at a single center from 8/1/14 to 7/31/16. Patients were excluded if they had recently suffered from serious bleeding complications or disseminated intravascular coagulation, or did not have platelet counts reported at least every 48 hours while receiving linezolid therapy. Thrombocytopenia was defined as platelet count <150x10^9/L, <112.5x10^9/L, or a reduction of >50% in the baseline platelet count.

Results: A total of 159 patients received linezolid for a median (interquartile range, IQR) duration of 9 (8-12) days. Thrombocytopenia developed in 35.8% (n=57) of patients, with a median platelet nadir of 89 (33-129) x10^9/L. Of the patients who developed thrombocytopenia, 31.6% (n=18) required platelet transfusion. Median time to resolution of thrombocytopenia from onset was 5 days (2-10). Patients with thrombocytopenia were more likely to have severe renal dysfunction (CrCl < 30 ml/min), elevated ALT, elevated total bilirubin, received hemodialysis, and baseline platelet count of <200 x10^9/L. In multivariate analysis, hemodialysis (adjusted odds ratio = 4.6 [1.3-15.9], P= 0.016) and elevated total bilirubin (3.2 [1.4-7.2], P= 0.004) remained significant risk factors for thrombocytopenia.

Conclusion: Patients receiving linezolid for ≥ 7 days frequently develop thrombocytopenia. Patients with hepatic dysfunction or renal dysfunction requiring hemodialysis may be at increased risk, and should be monitored closely for the development of thrombocytopenia.
DD-023: Lumacaftor/Ivacaftor Outcomes in Cystic Fibrosis
Vanessa Jamison, PharmD; Wendy Bullington, PharmD, BCPS

**Learning Objective:** Decide on an appropriate therapy modification in patients reporting significant adverse effects to lumacaftor/ivacaftor

**Purpose/Background:** This study was done to determine long term outcomes associated with lumacaftor/ivacaftor as well as examine compliance rates and adverse effects at our institution. Learning more about patient adherence and therapy outcomes will help improve patient care through developing strategies to mitigate non-compliance as well as modify dosing regimens to assist in medication tolerance.

**Methods:** Patients were included if they had received 9 months of lumacaftor/ivacaftor therapy. Data collection for each patient included pre and post lumacaftor/ivacaftor pulmonary exacerbations, BMI, antibiotic use, hospitalizations, and pulmonary function tests. Pharmacy fill information was utilized to determine when patients initiated therapy as well as investigate when doses were refilled.

**Results:** Pulmonary function improvements post therapy included an FEV1 average percent increase of 4.2% and an FVC average percent increase of 2.6%. Additionally, exacerbations increased 1.83% after the initiation of lumacaftor/ivacaftor compared to the 9 months prior to therapy. Hospital admissions were reduced by 0.24% after 9 months of therapy, and the average use of intravenous treatment for exacerbations was reduced by 7.2%. Out of the patients who experienced side effects, 33% percent had resolution when the lumacaftor/ivacaftor dose was reduced and slowly titrated up.

**Conclusion:** Regarding the unexpected finding of an increase in exacerbations, many patients were intermittently withholding lumacaftor/ivacaftor due to side effects, which likely contributed to this result. This study confirms the efficacy of lumacaftor/ivacaftor in improving pulmonary function, and provides clinical guidance to utilize a titration method in patients on lumacaftor/ivacaftor therapy experiencing significant side effects. Educating patients on the option of titration and importance of compliance with regards to side effects will assist in improving outcomes for patients utilizing this drug for cystic fibrosis.

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DD-024: Utilization of FilmArray Gastrointestinal Panel (GIP) Results on Altering Empiric Antibiotic (ABX) Use in Patients with Acute Diarrhea
Brian R. Raux, PharmD; Mohammed Aldhaeefi, PharmD Candidate; Lisa L. Steed PhD; John Bosso, PharmD, BCPS-AQ ID

**Learning Objective:** Review opportunities to improve antibiotic utilization in patients with suspected infectious diarrhea based on results of the FilmArray Gastrointestinal Panel at MUSC

**Purpose/Background:** Acute infectious diarrhea is a leading cause of hospitalizations, outpatient visits, and lost quality of life in the United States. The GIP is a multiplex PCR test that detects 13 bacteria, 5 viruses, and 4 parasites in approximately 1 hour of run time. Our objective was to determine the frequency of alterations in empiric ABX therapy for acute diarrhea within 48 hours of reporting of GIP results.

**Methods:** Patients that had the GIP performed on diarrheagenic stool while in our emergency department or an inpatient location from January 1 to June 30, 2016 were identified. Patient data, including gender, race, age, ABX use and duration, and the results of non-stool bacterial cultures (if obtained) were collated with GIP results.

**Results:** Complete patient information and GIP results were available on 517 patients. At least 1 positive result occurred in 220 patients; 45 patients (8.7%) had ≥ 2 positives. There were 161, 73, and 2 positives for bacteria, viruses, and parasites, respectively. Within 48 hours of result availability in the medical record, ABX were added in 47.3% of patients with any positive result and 24.2% of patients with negative results. Empiric ABX were stopped in 42.9 and 48.6% of patients with positive or negative results, respectively. ABX were altered (ie, start, stop, dose-change) in 55.9 and 38.4% of patients with positive or negative results, respectively.

**Conclusion:** GIP results appear to impact changes in ABX therapy, though these may not have been the sole driver of change in all cases. That there may be room for improvement suggests an opportunity for antimicrobial stewardship (AST) initiatives, such as prospective auditing of GIP results by AST staff who make recommendations to the treatment team, or an expansion of our current gastroenteritis guidelines to include a clinical pathway for all organisms on the GIP to decrease inappropriate ABX use.
During the poster session, attendees voted for poster awards in each of the categories below. Poster session attendees and assigned Poster Discussants participated in award selection. Projects are chosen for having the largest or most beneficial impact in each of these areas. The author(s) of the winning project in each category will be recognized.

- Clinical Impact
- Patient Safety
- Cost Savings

The Showcase Planning Committee has selected a PGY1 and a PGY2 oral presentation, based on the submitted abstracts, to receive the Pharmacy Research Showcase Award. These awards were selected using the following criteria:

- Completeness and quality of abstract
- Study design
  - Number of patients
  - Methodological rigor
  - Inferential statistics
- Novel research area
- Clinical significance and/or ability to impact practice at MUSC Health and elsewhere
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MUSC Health Pharmacy Research Showcase

To be compliant with ACPE guidelines and ensure reporting of credits to the CPE Monitor, please complete your evaluations within 30 days and update your profile with your NAPB e-ID and day/month of birth. Credit reported after 60 days from completion of program will be rejected by the CPE Monitor.


2 - To complete your evaluation and claim credit, log in. If you have already attended a program accredited by SCCP and created an account, please do not create a new account.

Hint:  Your username is your email address.  If you cannot remember your password, click “Forgot Password?” or call our office at 803-777-9979.

To create an account, click “Create an Account.” Once you have created your account, you will be logged in.

3 – Please click on “Complete Test/Evaluation” tab.

4 – The “Programs and Pending CE” page will display. At the bottom of the page is a statement – “To access a private program, enter the registration code here:”. Enter your access code and click register (hitting enter won’t work). Your program details will display. Select only the session(s) attended. Click on the green “Register Now” button.

5 - Confirm your personal information – especially your NABP E-ID and date of birth. Click on the blue “Register” button at the bottom.

6 - Scroll to the bottom of the page. Click on the green “Complete Evaluation” button and answer all of the questions and click submit. This credit will automatically be reported to the CPE Monitor. Individual credit statements or transcripts may be printed from your NABP e-profile.

Problems: Contact Cori Fairchild (USC) 803-777-9979