2017 ACCP Annual Meeting

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LATE BREAKING ORIGINAL RESEARCH

Adult Medicine

1. Pharmacy-led medication education intervention improves medication adherence and self-efficacy in patients at high risk for readmission, a patient safety and quality initiative *Matthew Li, Pharm.D.*[1], Amy Yu, Pharm.D.[2], Kelly Hau, Pharm.D.[2], Grace Shyh, Pharm.D., BCPS[3]; [1]Department of Pharmacy, James J. Peters VA Medical Center, Bronx, NY [2]St. John's University, Jamaica, NY [3]Department of Pharmacy, New York-Presbyterian Hospital, New York, NY

INTRODUCTION: Recent studies have demonstrated that non-adherence to medications can lead to increased health care costs, adverse clinical outcomes and recurrent hospital readmissions.

RESEARCH QUESTION OR HYPOTHESIS: Pharmacy-led medication education intervention will lead to an increase in regimen adherence, patients' self-efficacy, and a decrease in 30-day readmission rates.

STUDY DESIGN: This was a prospective, single center, case-control cohort study in the New York-Presbyterian Hospital, NY.

METHODS: Medicaid-insured patients at high risk of 30-day readmission were enrolled to receive additional pharmacy intervention. Pharmacy intervention consisted of medication reconciliation upon admission and discharge in addition to medication teaching sessions accompanied by a personalized medication education card in the patient's native tongue. We used Medication Understanding and Use Self-Efficacy (MUSE) surveys before and after the medication teaching session to measure our primary endpoint: the impact of pharmacy teaching on the patient's self-efficacy. We incorporated a statistically validated Morisky adherence scale at day 14 to measure another primary endpoint: patient regimen adherence. Secondary endpoints included the 30-day hospital readmission rate and overall cost-savings.

RESULTS: From November 2016 to May 2017, a total of 24 patients were enrolled. Of these enrollees, 78% had an education level of high school or less and greater than 50% lacked proficiency in the English language. There was a 10% improvement in adherence and a sustained improvement in chronic disease state self-efficacy. The overall all-cause 30-day readmission rate was 4% compared to 7.2% in a matched-control group during the same time period. Pharmacy-led medication education yielded an estimated cost-savings of $11,354.52 per year.

CONCLUSION: An individualized pharmacy-led medication education intervention is a cost-effective approach to improve patient adherence and understanding, and to decrease 30-day readmission rates. Future studies will focus on the role of pharmacy interns and technicians to provide routine personalized medication cards and counseling in high-risk patients.

Cardiovascular

2. A retrospective analysis of effectiveness of standard dose versus accelerated dose sotalol initiation in patients with atrial fibrillation or atrial flutter John Toler, Pharm.D.[1], *Oksana Barakat, Pharm.D.*[1], Caroline Girardeau, Pharm.D.[1], Stephanie Baumhover, Pharm.D.[1], Nastaran Gharkholonarehe, Pharm.D.[2]; [1]UNC REX Healthcare, Raleigh, NC [2]Department of Pharmacy, Rex UNC Healthcare, Raleigh, NC

INTRODUCTION: Sotalol initiation may be performed utilizing an accelerated dose loading of 120 mg or 160 mg twice daily or standard loading of 80 mg twice daily. Theoretical benefits for an accelerated load include shorter length of hospitalization and higher efficacy. These two regimens have not been previously studied for antiarrhythmic effectiveness.

RESEARCH QUESTION OR HYPOTHESIS: Is an accelerated dose sotalol initiation more effective than a standard initiation?

STUDY DESIGN: Single-center, retrospective, cohort study.

METHODS: Patients receiving sotalol initiation for atrial arrhythmias at UNC REX Hospital between 8/1/14 and 8/1/16 were included and reviewed up to 90-days post-hospital discharge from the sotalol load. Patients without follow-up within 90 days were excluded. The primary endpoint was the proportion of patients with a documented recurrence of atrial arrhythmia within 90 days post-load. Secondary endpoints included discontinuation rates, length of hospital stay, and rates of cardioversion during initiation. Chi-squared tests and t-tests were utilized for analysis of categorical and continuous numerical variables. A convenience sample of 200 total patients was powered at 82.5% to detect a 20% difference in the recurrence of atrial arrhythmias.

RESULTS: A random sample of 100 patients was included in each arm. The groups were well-matched with respect to age, sex, duration of atrial arrhythmia, and comorbidities but there was a difference in renal function. Accelerated initiation led to higher doses compared with the standard initiation (mean 168.08 mg vs. 222.22 mg) but no difference in the primary endpoint (36% accelerated vs. 37% standard; $p = 0.9272$) or any secondary endpoints. More adverse events were observed in the accelerated arm (42% vs. 24%; $p = 0.0068$)

CONCLUSION: Accelerated sotalol loading was associated with more adverse events and no greater antiarrhythmic effectiveness within 90 days. This data suggests that standard initiations should be the preferred method for sotalol loading however limitations exist for the study.

Critical Care

3. Analysis of pharmacy response to in-hospital cardiopulmonary arrests at a Community Academic Hospital; A pilot study *Christopher Adams, Pharm.D.*; Ernest Mario School of Pharmacy, Rutgers, The State University of New Jersey, Piscataway, NJ

INTRODUCTION: In-hospital cardiopulmonary arrests (Code Blues) are emergent and high intensity events that warrant immediate attendance, organization and treatment. Pharmacist attendance during Code Blue events has been endorsed by leading medical societies including the American College of Clinical Pharmacy and the Society of Critical Care Medicine. Direct pharmacy involvement at code blue cases has been shown to reduce mortality, medication errors and confusion of pharmacological management. After surveying our nursing staff we found a demand existed for pharmacy presence at code blues at our institution.

RESEARCH QUESTION OR HYPOTHESIS: Does the integration of structured pharmacy involvement in cardiopulmonary arrests improve patient outcome?

STUDY DESIGN: Single Center, Quality improvement, Prospective anaysis.

METHODS: We instituted a new program which included a pharmacist response to all codes between the hours of 8am and 5 pm. All pharmacists received basic training by a clinical pharmacy specialist, including follow up competency testing. Prospectively tracking each case, we compared codes attended by a pharmacist to those with no pharmacy presence. We also conducted a pre and post survey to identify the demand and perceived areas of improvement at our institution.

RESULTS: Between July 2016 and July 2017 there were 229 all-inclusive code blue patients (receiving CPR); of these 69 had a pharmacist respond. During codes when a pharmacist was present: time to epinephrine < 5 minutes measure was met 85.7%, versus 77% when there was no pharmacist present ($p = 0.178$; OR = 1.434: 0.681–3.16). Time to intubation < 5 minutes was improved by 23.5%; ($p = 0.033$; OR=3.01: 0.929–10.22). Outcomes data showed that ROSC was successful in 48/69 codes with

pharmacy present (69.5%) versus 68/160 (42.5%) ($p < 0.05$; OR=3.07:1.696–5.697). Mortality findings were non-significant.
CONCLUSION: Although a small cohort of codes was measured in our pilot study we found that pharmacy presence during in-hospital cardiopulmonary arrest improves clinical markers and outcomes but does not affect survival at discharge.

Emergency Medicine

4. Hemodynamic effects of propofol for induction of rapid sequence intubation in traumatically injured patients Scott Dietrich, Pharm.D.[1], Mark Mixon, Pharm.D.[1], *Ryan Rogoszewsk, Pharm.D.*[1], Vanessa Knapp, Pharm.D.[1], Stephanie Dunlap, Pharm.D.[1], Michael Floren, Ph.D.[1], Julie Dunn, M.D., M.S.[2]; [1]UCHealth, Fort Collins, CO [2]UCHealth, Loveland, CO
INTRODUCTION: Current guidelines for emergency intubation in traumatically injured patients recommend rapid sequence intubation (RSI) as the preferred method of airway management but do not recommend specific pharmacologic agents.
RESEARCH QUESTION OR HYPOTHESIS: Does a difference exist between propofol and other induction agents when used for for RSI regarding hemodynamic effect, hospital length of stay (LOS), or mortality.
STUDY DESIGN: Single center, retrospective review.
METHODS: Retrospective review of trauma patients presenting to the Emergency Department (ED) between 8/1/2013 and 12/31/2016. Patients were included for analysis if intubated in the ED. Data collected included demographics, vital signs, injury severity score (ISS), initial Glasgow coma score (GCS), injury mechanism, hospital LOS, and mortality. Patients were divided in two groups based on induction agent, propofol or non-propofol.
RESULTS: Of the 745 patients identified, 83 were analyzed, 43 in the propofol group, 40 in the non-propofol group. Groups were similar at baseline in terms of pre-RSI hemodynamics, injury mechanism, initial GCS, and ISS. On univariate analysis post-intubation hypotension was more common in patients who received propofol compared to those who did not, 39.5% versus 22.5%, although not statistically significant ($p = 0.1$). When adjusted for age, ISS, and pre-RSI hemodynamics, the risk of hypotension among propofol-treated patients was significantly higher ($p = 0.04$), with the odds of hypotension over three and a half times that of patients who did not receive propofol (OR= 3.64; 95% CI 1.16–13.24). There were no significant differences between groups in hospital LOS or mortality.
CONCLUSION: Propofol increases the odds of post-intubation hypotension in traumatically injured patients. Considerable caution should be used when contemplating the use of propofol for induction of injured patients requiring RSI as other agents possess more favorable hemodynamic profiles.

5. Effect of Potassium Acetate-Containing Fluids on Time to Resolution of Pediatric Diabetic Ketoacidosis *Kevin Poel, Pharm.D.*[1], Claire Palmer, M.S.[2], Jane Gralla, Ph.D.[3], Nicole Glaser, M.D.[4], Nathan Kuppermann, M.D., M.P.H.[5], Arleta Rewers, M.D., Ph.D.[2]; [1]Department of Pharmacy, Children's Hospital Colorado, Aurora, CO [2]Department of Pediatrics, Children's Hospital Colorado, Aurora, CO [3]Department of Pediatrics, Department of Biostatistics and Informatics, Children's Hospital Colorado, Aurora, CO [4]Department of Pediatrics, University of California, Davis, Sacramento, CA [5]Department of Pediatrics, Department of Emergency Medicine, University of California, Davis, Sacramento, CA
INTRODUCTION: Hypokalemia is a known sequelae of pediatric DKA. The American Diabetes Association consensus statement recommends potassium replacement with potassium chloride (KCl), potassium acetate (KAc), potassium phosphate or a combination of these potassium salts during treatment of DKA. Advantages of using one anion over another are unknown, however KAc may have a salutary effect on blood gas abnormalities compared to KCl.
RESEARCH QUESTION OR HYPOTHESIS: Is there a difference in the time to resolution of diabetic ketoacidosis (DKA) in children treated with either potassium-chloride (KCl) or potassium-acetate (KAc) containing fluids?
STUDY DESIGN: Retrospective case-control pilot study of children with DKA who received either KAc or KCl during therapy.
METHODS: 214 patients (matched based on initial serum bicarbonate, age and duration of type 1 diabetes) were evaluated. Initial and subsequent blood gases and electrolyte concentrations were recorded. Treatment initiation was defined by the time of fluid or insulin initiation and DKA resolution was defined as the time when the patient's serum bicarbonate concentration was above 18 mmol/L or venous pH was above 7.3 or when the insulin drip was discontinued. We analyzed data using conditional logistic and Cox proportional hazards regression.
RESULTS: Although the median time to DKA resolution did not differ between groups, there was a significant difference in the hazard ratio for DKA resolution in favor of the KAc group compared to the KCl group after 10 hours.
CONCLUSION: Children with DKA have more rapid resolution of acidosis after 10 hours when treated with KAc versus KCl containing fluids. These findings should be confirmed prospectively with a larger sample size.

HIV/AIDS

6. Cardiovascular disease in patients with and without HIV in the US Veteran's Affairs Administration System S. Scott Sutton, Pharm.D., BCPS (AQ ID)[1], Joseph Magagnoli, M.S.[2], James W. Hardin, Ph.D.[3], Anne Beaubrun, Ph.D.[4], Babatunde Edun, M.D.[2]; [1]Department of Clinical Pharmacy and Outcomes Sciences, University of South Carolina, College of Pharmacy, Columbia, SC [2]Dorn Research Institute, WJB Dorn Veterans Affairs Medical Center, Columbia, SC [3]Arnold School of Public Health, Department of Epidemiology and Biostatistics, and Institute for Families in Society, University of South Carolina, Columbia, SC [4]Gilead Sciences, Foster City, CA
INTRODUCTION: Cardiovascular events have been identified as important complications of HIV infection.
RESEARCH QUESTION OR HYPOTHESIS: Using a national cohort of veterans infected with HIV and their non-HIV matched controls, we evaluated the association between HIV and cardiovascular events within the Veteran's Affairs (VA) Administration system.
STUDY DESIGN: Retrospective observational cohort.
METHODS: Claims were extracted from the VA Informatics and Computing Infrastructure (VINCI) from 2000–2016. Cases had an ICD-9/10 for HIV and at least one prescription for a complete antiretroviral regimen. Two non-HIV controls were matched directly on race, sex, month and year of birth for each HIV case. Both cases and controls were followed until the earliest of the following: first cardiovascular event, last date with a VA claim, death, or December 31, 2016. The outcome was the first cardiovascular event after cohort entry and was defined using diagnosis codes for coronary artery disease, acute myocardial infarction, congestive heart failure, cerebrovascular disease, atrial fibrillation, and peripheral artery disease. A Poisson regression model was used to estimate the relative risk (RR) for the association between HIV and cardiovascular event/all cause death. Models were adjusted for demographics and comorbidities (e.g., age, race, sex, diabetes, body mass index, cardiovascular-related medication use).
RESULTS: Among 26,526 HIV patients matched to non-HIV controls (n = 53,052), the average age was 49.3 years, 38% were black, 32% were white, and 97% were male for both cohorts. Unadjusted analyses showed that HIV was associated with a 43% increased incidence of cardiovascular events/death (RR 1.43, 95% CI 1.41–1.46). The adjusted model showed that HIV was

associated with a 32% increased incidence of cardiovascular events/death (RR 1.32, 95% CI 1.28–1.37).
CONCLUSION: The adjusted rate of cardiovascular disease or death is 32% higher in HIV patients compared to matched controls, suggesting that cardiac risk modification strategies are important for the management of HIV patients.

Infectious Diseases

7. Pharmacoeconomic analysis of extended-infusion piperacillin-tazobactam *Karan Raja, Pharm.D., BCPS*, Ruben Patel, Pharm. D., BCPS, Mitesh Patel, Pharm.D., BCCCP, Mark Attalla, Pharm.D., Mona Philips, R.Ph., MAS; Clara Maass Medical Center, Belleville, NJ
INTRODUCTION: Piperacillin-tazobactam (PTZ) doses range from 2.25 grams every 12 hours – 4.5 grams every 6 hours based on indication and renal function. PTZ is available in 2.25 g, 3.375 g, and 4.5 g doses for 30-minute intermittent bolus (IB) infusion. Studies show, however, IB does not produce adequate time of drug concentration above certain pathogens' minimum inhibitory concentration. Extended infusion (EI) over 4 hours may optimize PK/PD parameters and clinical outcomes with lower total daily doses by utilizing a standardized 3.375 g dose. At our institution, the 4.5 g dose is costliest; followed by 3.375 g and 2.25 g. Therefore, this dosing strategy also creates a cost-savings opportunity.
RESEARCH QUESTION OR HYPOTHESIS: Conversion to extended infusion piperacillin-tazobactam reduces drug costs compared to intermittent bolus administration
STUDY DESIGN: Retrospective pharmacoeconomic analysis.
METHODS: Billing data was used to determine utilization in adult patients from January 1 – December 31, 2016. PTZ was administered as IB during this period. Purchasing data provided drug acquisition cost. IB orders were converted to corresponding EI regimens. Patients ordered 2.25 g q6–12 h were modeled to receive 3.375 g q12 h and others, 3.375 g q8 h. Single dose orders were excluded. Doses administered were multiplied by drug cost to obtain cost of treatment with each dosing strategy. A reduction in total daily doses and, hence, quantity of IV diluent bags was assessed. Descriptive statistics were used.
RESULTS: Based on billing data and acquisition cost, approximately $160,000 was spent on nearly 25,000 PTZ doses in 2016. After conversion to corresponding EI models, the reduction in total daily dose and standardized utilization of 3.375 g created a potential cost-savings of approximately $46,000. An estimated reduction of almost 5,000 doses to provide treatment represents additional diluent savings.
CONCLUSION: EI dosing requires lower total daily PTZ doses to maintain appropriate PK/PD parameters. Use of standardized dosing and reduction in total daily doses creates a total potential of over $50,000 in cost-savings opportunity.

8. Comparison of three antimicrobial strategies in diabetic foot infections (DFIs) post-amputation *Samarth Shah, Pharm.D., BCPS*[1], Jennifer Twilla, Pharm.D., BCPS[2], Ana Negrete, Pharm.D., BCPS[2], Timothy Self, Pharm.D.[3]; [1]School of Pharmacy, Roosevelt University, Schaumburg, IL [2]Department of Pharmacy, Methodist University Hospital, Memphis, TN [3]College of Pharmacy, The University of Tennessee Heath Science Center, Memphis, TN
INTRODUCTION: The 2012 Infectious Diseases Society of America (IDSA) guidelines recommend antimicrobial treatment of diabetic foot infections (DFIs) post-amputation, but the optimal route and duration are poorly defined. This study aimed to evaluate differences in hospital outcomes for hospitalized patients post-amputation receiving antimicrobial therapy.
RESEARCH QUESTION OR HYPOTHESIS: Does a specific antimicrobial strategy lead to a difference in patient outcomes post-amputation for DFIs?
STUDY DESIGN: Retrospective review.
METHODS: A retrospective review of adult admissions to Methodist LeBonheur Healthcare system with a primary diagnosis of DFIs post-amputation was conducted using diagnoses codes for amputation of a lower limb. Pregnancy and above-the-knee amputation were study exclusions. The difference in average length of stay (LOS), thirty–day readmission rates (TDR), and treatment failure (TF) was compared in patients treated with intravenous antibiotics (IV), oral antibiotics (PO), and no antibiotics (NA).
RESULTS: Of 200 patients screened, 120 were included (IV n = 72; PO n = 20; NA n = 28). Baseline characteristics were similar for all 3 groups except for a significantly higher baseline white blood cell count in the IV group ($p = 0.02$). No statistically significant differences were identified in average LOS (IV-9.97 $\pm$ 5.85, PO-8.83 $\pm$ 7.37, NA-9.33 $\pm$ 5.91 days; $p = 0.74$). However, post-operative LOS was significantly shorter in the PO group (PO-3.43 $\pm$ 2.56, IV-7.34 $\pm$ 5.95, NA-5.81 $\pm$ 4.18 days; $p = 0.01$). While there were no statistically significant differences for TDR ($p = 0.84$) or TF ($p = 0.12$) between the groups, TF did occur at a higher rate in the IV group (IV-22%, PO-5%, NA-11%).
CONCLUSION: Our results indicate that a PO antibiotic treatment strategy post-amputation for DFIs has the potential to decrease post-op LOS without increasing the risk of readmission. Based on the results of our study, we feel consideration should be given to transitioning to oral therapy soon after amputation.

9. Ceftriaxone versus antipseudomonal beta-lactam antibiotics for the treatment of common ampC producing organisms *David Peters, Jr, Pharm.D.*[1], Siyun Liao, Pharm.D., Ph.D., BCPS[2], Jessica Winter, Pharm.D., BCPS[2], Christopher Droege, Pharm.D.[2], Neil Ernst, Pharm.D.[2]; [1]Department of Pharmacy Practice, Cedarville University, Cedarville, OH [2]University of Cincinnati Medical Center, Cincinnati, OH
INTRODUCTION: Induction of antibiotic resistance is associated with increased morbidity and mortality in AmpC beta-lactamase producing Enterobacteriaceae. Subsequently, ceftriaxone is controversial for the treatment of these organisms due to possible emergent resistance. Infections by Enterobacteriaceae are commonly treated with antipseudomonal beta-lactams. Understanding the proper place of ceftriaxone can improve patient outcomes and allow for the most appropriate and narrow antibiotic choice. This study compared treatment failure between ceftriaxone and antipseudomonal beta-lactams for infections caused by common AmpC producing organisms.
RESEARCH QUESTION OR HYPOTHESIS: Can ceftriaxone be used to effectively treat infections by *Enterobacter, Citrobacter,* and *Serratia spp*?
STUDY DESIGN: Retrospective review of electronic medical record, single-center, cohort study.
METHODS: We evaluated 140 patients who received ceftriaxone (n = 70) or antipseudomonal beta-lactam (n = 70) monotherapy for Enterobacteriaceae infections. We categorized and compared information about demographics, antibiotic treatment, and outcomes. Treatment failure was defined as either clinical failure (leukocytosis; fever on day 7 post-antibiotics) or microbiologic failure (regrowth of the same organism at the same site of infection within 14 days). Patients were excluded if a secondary infection occurred within the evaluation window. The primary objectives compared treatment failure rate and 30-day regrowth rate between ceftriaxone and antipseudomonal beta-lactams.
RESULTS: Treatment failure rates were similar in both groups (34% vs. 35%, $p = 1.00$). There were no differences in rates of clinical or microbiologic failure between groups. The ceftriaxone group had less organism regrowth (11% vs. 27%, $p = 0.032$), but had significantly more patients being treated for urinary tract infections. Intensive care unit (ICU) status was associated with an increase in treatment failure risk (OR, 4.1, 95% CI, 1.1–12.2). Cefepime use was associated with a decrease in treatment failure risk (OR, 0.2, 95% CI, 0.07–0.77).

CONCLUSION: Ceftriaxone exhibited similar efficacy when compared to antipseudomonal beta-lactams for susceptible Enterobacteriaceae infections, particularly for urinary tract infections. For critically-ill patients, cefepime may be the most effective antibiotic choice.

10. Retrospective review of candidemia patients in a large academic medical center to evaluate implementation of a rapid diagnostic screen (T2Candida®) Rebecca Hilton, Pharm.D. Candidate[1], Jon Hiles, Pharm.D., BCPS (AQ-ID)[2]; [1]Butler University Pharm.D. Candidate at Indiana University Health, Indianapolis, IN [2]Indiana University Health, Indianapolis, IN

INTRODUCTION: Candidemia is a major cause of mortality in hospitalized patients. Rapid identification and treatment of these patients can improve outcomes. New direct blood PCR based detection methods are available, but traditional candidemia prediction models fail to identify enough patients to screen. This study analyzed a new candidemia prediction model in a large academic medical center, comprised of two hospitals, to determine if candidemia screens were ordered appropriately and if time to active therapy was shortened by utilizing candidemia screens.

RESEARCH QUESTION OR HYPOTHESIS: This new candidemia prediction model will identify the majority of candidemia patients. Practitioners will utilize this model to order candidemia screens, which will shorten time to active therapy.

STUDY DESIGN: Retrospective review of hospitalized patients with candidemia from February 15, 2017 to June 28, 2017.

METHODS: Medical records were reviewed for the following: candidemia screen performed, time to active therapy, and candidemia risk factors met.

RESULTS: Twenty-four patients were identified- four were excluded because candidemia was detected prior to admission or patient was transferred before treatment. Of the twenty patients, 85% met the candidemia prediction model warranting a candidemia screen. Screens were ordered for 30% of candidemia patients. Average time to active therapy was 26.33 hours for patients with candidemia screens versus 39.08 hours.Critical care practitioners had the majority of patients with candidemia but ordered screens in only 30% of candidemia patients. One hospital ordered candidemia screens 23% of the time versus 43% at the second hospital.

CONCLUSION: The candidemia prediction model studied identified the greatest number of patients where the candidemia screen should be applied compared to other prediction models. Candidemia screens shorten time to active therapy and were underutilized for patients with candidemia risk factors. Utilization of candidemia screens varied based on service, patient specific factors, and hospital, further identifying where to focus future education.

11. Evaluation of daptomycin plus ceftaroline for the treatment of methicillin-resistant *Staphylococcus aureus* bacteremia *Chelsea Mitchell, Pharm.D.*[1], Taylor Morrisette, Pharm.D.[1], Justin B. Usery, Pharm.D., BCPS[2], Jennifer Twilla, Pharm.D., BCPS[1]; [1]Department of Pharmacy, Methodist University Hospital, Memphis, TN [2]Methodist University Hospital and University of Tennessee College of Pharmacy, Memphis, TN

INTRODUCTION: Recent *in vitro* data has shown that the combination of daptomycin plus ceftaroline (D+C) can increase the susceptibility of multidrug-resistant Gram positive organisms to daptomycin. Limited clinical data from three case reports and one case series has described the successful use of this combination in patients deemed vancomycin failures with methicillin-resistant *Staphylococcus aureus* (MRSA), methicillin-resistant *Staphylococcus epidermidis*, and vancomycin-resistant *Enterococci* infections.

RESEARCH QUESTION OR HYPOTHESIS: How does D+C therapy impact time to culture clearance in MRSA bacteremia?

STUDY DESIGN: A retrospective case review of patients admitted to Methodist LeBonheur Healthcare, Memphis, TN, from February 2014–May 2017 was conducted.

METHODS: Patients who received D+C therapy for a minimum of 72 hours to treat MRSA bacteremia were included. The primary objective was to determine time to negative blood cultures after start of D+C. Recurrent infection rates and in-hospital mortality were also collected.

RESULTS: D+C therapy was used to treat 20 patients with documented MRSA bacteremia. All isolates displayed susceptibility to vancomycin and daptomycin, with all patients receiving appropriate empiric therapy prior to starting D+C. Blood cultures remained positive on empiric treatment for an average of 5.2 days (range 1–10) prior to the start of D+C therapy. Sixty percent of the patients were initiated on D+C for persistently positive blood cultures, with one patient never clearing blood cultures. The mean time to culture clearance from the start of the D+C therapy was 4.1 days (range 1–11). The average days of daptomycin and ceftaroline treatment were 37.6 and 26 days, respectively. Recurrent bacteremia occurred in 1 patient who was discharged on daptomycin monotherapy, while in-hospital mortality was observed in 20% of patients.

CONCLUSION: D+C therapy may accelerate time to clearance of MRSA bacteremia. This combination provides a useful tool for infections with persistently positive blood cultures on empiric treatment despite susceptibility to vancomycin or daptomycin alone.

Medication Safety

12. Hypoglycemia occurence with treatment of hyperkalemia *Jennifer Austin Szwak, Pharm.D., BCPS*[1], Tara Fallah, Pharm.D.[2]; [1]University of Chicago Medicine, Chicago, IL [2]Tampa General Hospital, Tampa, FL

INTRODUCTION: Hyperkalemia is a life-threatening condition that warrants emergent treatment to prevent cardiac arrhythmias and subsequent complications. Treatment of hyperkalemia typically involves stabilizing the cardiac membrane, creating an intracellular potassium shift, and eliminating potassium from the body. Insulin and dextrose are often used in combination to treat hyperkalemia through an intracellular shift, but this can lead to hypoglycemia.

RESEARCH QUESTION OR HYPOTHESIS: What are the rates of hypoglycemia in patients treated with insulin through a hyperkalemia order set?

STUDY DESIGN: This is a retrospective review of patients treated for hyperkalemia using the hyperkalemia order set.

METHODS: Chart review was performed on all patients admitted from January 2013 through February 2017 who had an order placed with the hyperkalemia order set. The primary endpoint was the proportion of patients with a hypoglycemic event. Secondary endpoints included characterization of agents used for hyperkalemia, reduction in potassium levels, and effect of renal function on hypoglycemia rates.

RESULTS: Of the 150 patients evaluated, 147 (98%) patients received insulin and 141 (94%) received dextrose for treatment of hyperkalemia. Additional agents included in the order set were used in 114 (76%) of patients, including calcium gluconate (63%), sodium polystyrene sulfonate (45%), furosemide (8%), and albuterol (7%). Median potassium reduction was 0.8 mmol/L. Hypoglycemia occurred in 36 (24%) patients; 21 (14%) patients experienced severe hypoglycemia. Hypoglycemia occurred with similar frequencies in patients with serum creatinine less than 1.5 g/dL (21%), 1.6–3.5 g/dL (30%), and >3.5 g/dL (22%).

CONCLUSION: Insulin and dextrose are the primary agents used to treat hyperkalemia resulting in a large number of patients becoming hypoglycemic. More studies are needed to identify the optimal dose of insulin and dextrose to provide treatment for hyperkalemia without subsequent hypoglycemia.

13. Patient-level medication regimen complexity in an adolescent and adult population with autism spectrum disorders
Debra Barnette, Pharm.D.; Department of Pharmacy Practice and Science, The Ohio State University, Columbus, OH
INTRODUCTION: The Center for Autism Services and Transition (CAST) was established to address the needs of adolescents and adults with Autism Spectrum Disorders (ASD) as they transition into adult primary care services. This population is often on complex medication regimens that may potentially impact adherence and ultimately therapeutic response.
RESEARCH QUESTION OR HYPOTHESIS: The Medication Regimen Complexity Index (MRCI) tool was used to identify factors that impact regimen complexity in this unstudied unique population.
STUDY DESIGN: This retrospective review was completed in 143 CAST patients enrolled in the first year.
METHODS: Demographic data, medication count, total MRCI score, MRCI component scores were collected. The mean MRCI scores were also divided into prescription and OTC components. Mean total MRCI was reported for different demographic and psychotropic medication groups. Differences in total MRCI scores between demographic or medication groups were evaluated by Wilcoxon rank-sum test.
RESULTS: Demographics data included 112 males, 43 age 7 - 17 years, and 100 age 18 - 45 years. The mean medication count was 6.4 (SD 5.6), and total MRCI score 14.9 (SD 15.1). The mean scores for three MRCI components were dosage form 2.7 (SD 2.7), frequency 8.2 (SD 9.4) and additional directions 4.0 (SD 4.4). Mean scores for prescription and OTC medications were 9.9 (SD 8.7) and 5.0 (SD 9.0), respectively. Results of Wilcoxon rank sum tests indicated that median MRCI was significantly greater for patients on more medications, and for patients taking antidepressants, antiepileptics, antipsychotics, benzodiazepines, or stimulants/non-stimulant ADHD medication (all $p < 0.001$ except antidepressants, $p = 0.003$). Total MRCI did not differ significantly by age group or sex.
CONCLUSION: Contributions to the medication regimen complexity in this adult population with ASD was influenced by the frequency of administration and OTC use. Using the MRCI in adults with ASD taking psychotropic medications may provide a useful screening tool for medication therapy management reviews.

Oncology

14. Extended versus intermittent infusions of cefepime for the treatment of febrile neutropenia
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INTRODUCTION: Neutropenic fever is an oncologic emergency that requires quick intervention with anti-pseudomonal beta-lactam antibiotics. Previous literature from other settings suggests extended infusions of beta-lactam antibiotics may improve clinical outcomes. To date, there is only one previous study investigating extended infusions for febrile neutropenia which demonstrated no benefit.
RESEARCH QUESTION OR HYPOTHESIS: Extended infusions of cefepime will increase the proportion of patients who defervesce at 24 hours in patients with febrile neutropenia.
STUDY DESIGN: A retrospective chart review comparing extended and intermittent infusions of cefepime for febrile neutropenia.
METHODS: Adult patients admitted to the hospital with a diagnosis of febrile neutropenia were included. Patients who defervesced before receiving cefepime were excluded. The primary outcome was defervescence at 24 hours and the main secondary outcome was time to defervescence. Statistical analysis was preformed with SPSS version 24.0.
RESULTS: In total 166 patients were included in this study, 28 patients received extended infusions and 138 patients received intermittent infusions of cefepime. Overall, baseline characteristics were similar between groups besides receipt of prior chemotherapy, duration of neutropenia, optimal renal dosing, and presence of documented mucositis. In the extended infusion arm, defervescence at 24 hours was more frequent (82% v. 51%, $p = 0.002$) and median time to defervescence was decreased by 14 hours (10 v. 24 hours, $p = 0.02$). Furthermore, extended infusions increased the odds of defervescence at 24 hours by 4.28 (95% CI 1.43 – 12.75, $p = 0.009$) and doubled the likelihood of defervescence at any particular time (HR 2.02, 95% CI 1.23 – 3.32, $p = 0.005$).
CONCLUSION: Contrary to prior literature, extended infusions of cefepime significantly decreased the time to defervescence and increased the proportion of those with defervescence at 24 hours. This suggests that extended infusions of cefepime may be able to improve clinical outcomes in febrile neutropenia, but future prospective studies are needed to confirm these findings.

15. Collaborative physician-pharmacist multiple myeloma clinic improves guideline adherence and prevents treatment delays
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INTRODUCTION: Although survival of patients with multiple myeloma (MM) has improved in the last decade, achieving optimal outcomes requires timely delivery of anti-myeloma therapy as well as adherence to supportive care guidelines and patient education.
RESEARCH QUESTION OR HYPOTHESIS: We hypothesized that a multidisciplinary approach of a collaborative physician-pharmacist MM clinic would have a positive impact on clinical measures such as guideline adherence as well as prevent treatment delays.
STUDY DESIGN: From 2014 to 2015, we initiated a collaborative MM clinic, whereby in addition to normal physician care, a dedicated BCOP-certified pharmacist provided consultation on patients.

METHODS: Outcomes were compared to those of patients being treated by the same physician during the previous year, when ad-hoc pharmacist consultation was available (traditional model).
RESULTS: In the collaborative clinic, 399 pharmacist consultations occurred during 551 physician visits (n = 57 patients). During the prior year, there were 26 pharmacist consultations on 355 physician encounters (n = 44 patients) (7.3% vs. 72.4%, $p < 0.0001$). We observed improved adherence to bisphosphonates (BP) in the collaborative clinic (55 vs. 30 patients, $p = 0.0002$). The time to BP initiation from diagnosis as well as re-initiation after autologous transplant was shorter in the collaborative clinic (5.5 vs. 97.5 days ($p < 0.001$) and 12.5 vs. 135 days ($p < 0.001$). Appropriate VTE (52 vs. 29 patients, $p < 0.0002$) and antiviral (98% vs. 56%, $p = 0.004$) prophylaxis was prescribed more frequently in the collaborative clinic. Influenza vaccination administration was higher in the collaborative clinic (76 vs. 24 percent, $p < 0.001$). The median time to first IMiD fill was longer in the traditional clinic (15 vs. 7 days, $p = 0.0018$). There was a reduction in treatment delays observed in the collaborative clinic (21.4% vs. 85.2%, $p < 0.0001$).
CONCLUSION: Here we pilot a multidisciplinary approach including clinical pharmacist input in MM management that leads to improved guideline adherence and prevents delay in anti-myeloma treatment.

16. NKTR-102 efficacy against conventional chemotherapy for the treatment of CNS metastasis of breast cancer
Katherine Jarrell, B.S., Pharm.D. Candidate, Neal Shah, Pharm.D., Paul Lockman, Ph.D.; West Virginia University Department of Pharmaceutical Sciences, Morgantown, WV
INTRODUCTION: CNS metastases are one of the leading causes of death in advanced breast cancer. Brain metastases present a

unique therapeutic challenge since typical chemotherapeutic agents have difficulty crossing the highly selective blood-brain barrier (BBB). NKTR-102 is a pegylated irinotecan polymer that successfully crosses the BBB and releases SN-38 over time.
RESEARCH QUESTION OR HYPOTHESIS: Mice with brain metastases treated with NKTR-102 have longer survival and better tumor control than those given conventional treatments, especially since NKTR-102 preferentially accumulates in tumors.
STUDY DESIGN: This study aims to compare the survival and tumor burden of mice treated with NKTR-102 and traditional breast cancer chemotherapy, to determine survival advantages via Kaplan-Meier curve comparisons.
METHODS: Female mice were given intracardiac injections of triple negative or HER2+ cancer cells. In the triple negative model, gemcitabine and eribulin were dosed via intraperitoneal injection every 4 days, while NKTR-102, irinotecan, paclitaxel, vinorelbine, docetaxel, or vehicle were administered via tail vein every 7 days. Secondarily, ^{14}C-NKTR was injected to see distribution in the brain. In the HER2+ model, NKTR-102 and vehicle were administered via tail vein every 7 days and lapatinib was given orally twice daily. Bioluminescent images were captured biweekly to quantify tumor burden. Survival data was collected and brains were extracted to confirm tumor burden on Graphpad Prism. MCID software was utilized to determine accumulation of ^{14}C-NKTR.
RESULTS: Mice treated with NKTR-102 exhibited less tumor burden than those treated with conventional therapies, and it was the only treatment with a prolonged survival compared to vehicle ($p < 0.05$) in both the triple negative and HER2 + lines. ^{14}C-NKTR accumulated preferentially in tumor versus normal tissue.
CONCLUSION: NKTR-102 shows improved survival in both triple negative and HER2 + breast cancer brain metastases when compared to conventional therapies.

Pain Management/Analgesia

17. Efficacy of preoperative pregabalin and ketamine as a bariatric surgery multimodal pain management strategy *Elizabeth Badgley, Pharm.D., BCPS*; Pharmacy, Parham Doctors' Hospital, Richmond, VA
INTRODUCTION: Guidelines on the Management of Postoperative Pain recommend the use of multimodal pain management given superior pain relief and decreased opioid consumption. Use of a preoperative pregabalin and ketamine is recommended as adjunctive therapy to reduced opioid requirements and lower postoperative pain scores after minor or major surgical procedures. Guidelines specific to bariatric surgical patients do not exist.
RESEARCH QUESTION OR HYPOTHESIS: Does the addition of preoperative pregabalin and ketamine reduce opioid consumption and pain scores in primary bariatric surgery?
STUDY DESIGN: A retrospective, single-center cohort study was conducted. This study was exempt from the institutional research review board. Fifty primary bariatric surgical patients prior to the institutions change in pain management protocol were compared to fifty patients that received preoperative pregabalin 150 mg orally and ketamine 40 mg intravenously. Chronic pain patients and secondary revision surgeries were excluded. Data collected included demographics, length of stay, morphine equivalents (MED), and pain scores.
METHODS: The primary objective was to determine if pregabalin and ketamine reduced opioid consumption. Secondary outcomes included reduction of pain scores and medication safety.Assuming a Cohen-d effect size of 0.8 between groups with 80% power and 5% *alpha* would require at least 26 patients in each group. Microsoft Excel© was used to calculate a two-tailed, student t-test for the primary objective, and $p < 0.05$ was considered statistically significant.
RESULTS: Pregabalin and ketamine reduced the total median MED by 58.5 mg MED ($p < 0.018$) and IV by 52 mg ($p < 0.012$). There was no difference in total median oral MED ($p < 0.912$). Average pain scores were lower on the day of surgery in post-intervention group and similar on postoperative day one. No adverse drug reactions occurred.
CONCLUSION: Preoperative pregabalin and ketamine reduced opioid consumption and pain scores in patients undergoing primary bariatric surgery.

Pharmacoeconomics/Outcomes

18. Retrospective financial evaluation of an adult intravenous immunoglobulin (IVIG) dosing protocol based on ideal body weight (IBW) at a large academic medical center *Christan Mychajlonka, Pharm.D.*[1], Lauren Cherrier, Pharm.D., BCPS[2]; [1]Pharmacy, St. Joseph's Hospital and Medical Center, Phoenix, AZ [2]Department of Pharmacy, St. Joseph's Hospital and Medical Center, Phoenix, AZ
INTRODUCTION: Intravenous immunoglobulin (IVIG) poses a significant cost for hospital budgets based on utilization and price. Recent literature in adult patients has shown the correlation between IVIG dose and change in IgG level is strongest when doses are calculated using IBW. The study hospital implemented a pharmacy-driven dosing protocol in August 2016 where IVIG orders would be based on ideal body weight (IBW) and rounded to the nearest vial size.
RESEARCH QUESTION OR HYPOTHESIS: The study evaluated the financial impact of dosing based on IBW versus actual body weight (ABW) post implementation of the aforementioned inpatient dosing protocol at a large academic medical center. In addition, it assessed the frequency of how often the protocol was followed.
STUDY DESIGN: This was a retrospective, observational, single center study.
METHODS: Retrospective patient specific data were collected from January to March 2017; these included age, height, gender, ABW, IBW and adjusted body weight (AdjBW), IVIG dose and dose duration. Data was analyzed post protocol approval and implementation.
RESULTS: A total of seventy seven patients were evaluated, with 208 of 211 doses compliant with the institutional guidelines of IVIG dosing based on IBW. Pharmacy dispensed a total of 7,834 g of IVIG during the three month period reviewed. A theoretical total of 2,595 g of IVIG was averted based on dosing by IBW and vial rounding. The Flebogamma® unit drug cost (average wholesale price) was compared to the differences in doses (grams) between ABW versus IBW yielded potential cost savings of $277,425. Flebogamma® was the primary product used. The annual extrapolation of these savings would be $1,109,700.
CONCLUSION: This study highlights the potential financial benefit of a dosing protocol for IVIG based on ideal body weight and rounding to nearest vial size. The study observations and outcomes can be used for discussion between hospital pharmacy and therapeutics committees and clinicians.

Pharmacokinetics/Pharmacodynamics/Drug Metabolism/Drug Delivery

20. Adoption of a simplified, targeted dosage regimen algorithm for gentamicin in newborns based upon population pharmacokinetics as determined locally *Ronald Floyd, Pharm.D., M.S.*[1], Michael Neely, M.D.[2], Adrian Allen, Pharm.D.[1], Roger Jelliffe, M.D.[3]; [1]Department of Pharmacy, Sharp Mary Birch Hospital for Women and Newborns, San Diego, CA [2]Saban Research Institute, Children's Hospital Los Angeles, Los Angeles, CA [3]Laboratory of Applied Pharmacokinetics and Bioinformatics, University of Southern California, Los Angeles, CA
INTRODUCTION: Predictive dosing of gentamicin for neonates has been an important goal at our facility for many years. Previous approaches had been empirical and often did not achieve serum concentration targets for our neonatal population.

RESEARCH QUESTION OR HYPOTHESIS: To develop and implement a gentamicin dosage regimen algorithm based on a predictive pharmacokinetic model for targeted serum concentrations in our neonates.
STUDY DESIGN: Retrospective, observational.
METHODS: Data were validated on all NICU patients who received gentamicin from September 2009, through July 2014. We used the Pmetrics iterative 2-stage Bayesian population pharmacokinetic modeling program to estimate population parameter values for the one compartment model with multiple infusion inputs. Using SIMrun, the Pmetrics Monte Carlo simulator, we ran 1000 simulations for neonatal archetypes characterized by weight, day of life (DOL), serum creatinine (SCr) and gestational age (GA) to achieve gentamicin peaks of 6 to 10 and troughs less than 2.
RESULTS: We collected and analyzed data for 163 neonates (105 males, GA 22 to 42 weeks [90 less than 28 weeks], DOL 2–125 [76 less than 29 days], weights between 395 and 4,930 grams, 9 had SCr exceeding 0.8 mg/dl). Our overall predictive model, based on weight, DOL, and SCr yielded an r^2 of 0.885. From 200,000 Monte Carlo simulations, our covariate-based dosing algorithm, which offered 18 choices (doses of 3.2, 4 and 5 mg/kg; intervals, 18–96 hours) was simplified to our current algorithm of 6 alternatives (dose, 4 mg/kg; intervals, 18–48 hours).
CONCLUSION: Our predictive model for serum gentamicin levels in neonates of GA greater than 23 weeks who have SCr that are age appropriate and who are DOL through 70 days was simplified into a dosing algorithm which was formally accepted by our neonatologists and which targets appropriate serum gentamicin ranges for both peak and trough concentrations.

Women's Health

21. Vaccination rates in obstetric opioid-addicted patients *Alicia B. Forinash, Pharm.D., FCCP, BCPS, BCACP*[1], Abigail M. Yancey, Pharm.D., FCCP, BCPS[2], Katelynn Pike, Pharm.D. Candidate[3], Kayla Braswell, Pharm.D. Candidate[3], Collin Miller, M.S.W.[4], Jaye Shyken, M.D.[4]; [1]Maternal Fetal Care Center, SSM Health St. Mary's, St Louis, MO [2]St. Louis College of Pharmacy, St. Louis, MO [3]St Louis College of Pharmacy, St Louis, MO [4]St. Louis University/SSM Health St. Mary's, St. Louis, MO
INTRODUCTION: Despite recent efforts to increase immunization rates throughout the healthcare system, little evidence about the impact of pharmacists' involvement on immunization rates in outpatient opioid addicted obstetric clinic setting exist.
RESEARCH QUESTION OR HYPOTHESIS: Are patients at the Women's and Infants Substance abuse Help Center (WISH) in compliance with the 2016 Advisory Committee on Immunization Practices (ACIP) recommendations for hepatitis A, hepatitis B, influenza, tetanus/diphtheria/pertussis (Tdap), human papillomavirus (HPV) and pneumococcal-23 vaccines?
STUDY DESIGN: Retrospective chart review.
METHODS: All patients with at least two WISH visits from 9/1/14–1/22/17 were included. The primary objective evaluated compliance with ACIP recommendations. Data extraction included baseline demographics, patient specific vaccine indications, and vaccine history.
RESULTS: Ninety-nine WISH patients receiving buprenorphine (n = 80), methadone (n = 14), or no therapy (n = 4) were included. On average, patients were 28 years-old and had the first visit at 19 gestational weeks (range 6–35 weeks). WISH vaccination compliance were higher than the CDC reported national average rates for hepatitis A (84.7% vs. 9%), hepatitis B (77.7% vs. 24.5%), Tdap during pregnancy (88.1% vs. 48.8%), influenza during pregnancy (68 vs. 49.9%), pneumococcal-23 (38.4% vs. 20.3%), and HPV (48.5% vs. 40.2%) respectively. No difference was found between patients receiving buprenorphine (n = 80) and methadone (n = 14). Patients who had at least 1 pharmacy visit (n = 90) had significantly higher compliance with hepatitis A (92.1% vs. 22.2%, $p < 0.0001$), hepatitis B (86.4% vs. 11.1%, $p < 0.0001$), and influenza vaccines (71.6% vs. 33.3%, $p < 0.0001$) compared to those that did not (n = 9), respectively. Common reasons for vaccine non-compliance were patient refusal, did not return to the clinic, or missed opportunity by the health-care professional despite pharmacist recommendation.
CONCLUSION: Overall vaccination rates are higher than the national average, and pharmacy intervention significantly increased administration rates for the hepatitis A, hepatitis B, and influenza vaccines.

Original Research
ADR/Drug Interactions

22E. Use of interacting drugs did not modify treatment effects of apixaban versus warfarin for atrial fibrillation: Results from the ARISTOTLE Trial *Jeffrey Washam, Pharm.D.*[1], Stefan Hohnloser, M.D.[2], Daniel Wojdyla, M.S.[3], Dragos Vinereanu, M.D., Ph.D.[4], John Alexander, M.D.[3], Renato Lopes, M.D., Ph.D.[3], Bernard Gersh, M.B., Ch.B., D.Phil.[5], Michael Hanna, M.D.[6], John Horowitz, MBBS, Ph.D.[7], Elaine Hylek, M.D., M.P.H.[8], Steen Husted, M.D.[9], Denis Xavier, M.D., MBBS, M.S.[10], Freek Verheugt, M.D.[11], Lars Wallentin, M.D., Ph.D.[12], Christopher Granger, M.D.[3]; [1]Duke Heart Center, Duke University Medical Center, Durham, NC [2]Frankfurt, Germany [3]Durham, NC [4]Bucharest, Romania [5]Rochester, MN [6]Princeton, NJ [7]Adelaide, Australia [8]Boston, MA [9]Århus, NJ [10]Bangaluru, India [11]Amsterdam, Netherlands [12]Uppsala, Sweden
Presented at the American College of Cardiology Annual Scientific Session, Washington, DC, March 17-19, 2017.

Adult Medicine

23. Assessment of glycemic control in diabetic patients while unable to eat Joseph Huenecke, Pharm.D.[1], Natalie Tuttle, Pharm.D., BCPS[1], Jeremy Patton, Pharm.D. Candidate[2], *Sarah Petite, Pharm.D., BCPS*[2]; [1]Department of Pharmacy, University of Toledo Medical Center, Toledo, OH [2]College of Pharmacy and Pharmaceutical Sciences, University of Toledo, Toledo, OH
INTRODUCTION: The American Diabetes Association guidelines recommend a basal plus correction or basal insulin regimen for type 2 diabetes mellitus (T2DM) patients unable to eat (NPO) in the non-intensive care unit (ICU) setting. In the perioperative setting, 60–80% of long-acting insulin or half dose morning insulin NPH is recommended. There is limited evidence supporting these recommended insulin dose reductions for T2DM patients while NPO.
RESEARCH QUESTION OR HYPOTHESIS: Administration of > 50% of home basal insulin is associated with higher hypoglycemic rates compared to receipt of ≤ 50% of home basal insulin in NPO patients with T2DM
STUDY DESIGN: Retrospective, cohort, single-center study.
METHODS: Included patients were adults admitted to a non-ICU setting with T2DM, prescribed outpatient basal insulin and were NPO during hospital admission. The primary outcome was the difference in hypoglycemic events (blood glucose [BG] < 70 mg/dL) between patients receiving ≤ 50% or > 50% of their home basal insulin dose while NPO. Secondary outcomes included comparing severe hypoglycemic events (BG < 40 mg/dL), hyperglycemic events (BG > 180 mg/dL) and hospital length of stay (LOS). Categorical data were analyzed using Chi-square or Fisher's exact test and continuous data were analyzed using Mann-Whitney U test.
RESULTS: Two hundred and fifty-eight patient encounters were included, of which 85 and 173 patients received ≤ 50% and > 50% of their home basal insulin dose. There were no significant differences in hypoglycemia (21.2% vs. 21.4%; P = 0.97), severe hypoglycemia (1.2% vs. 2.9%; P = 0.67) and hospital LOS (3 [2.13–6.74] days versus 4.66 [2.94–8.17] days; P = 0.74). Hyperglycemia occurred at a higher rate in patients receiving ≤ 50% of their home basal insulin dose (97.6% vs. 89%; P = 0.02).
CONCLUSION: No differences were observed in hypoglycemic events between those patients receiving ≤ 50% and > 50% of their

home basal insulin. Administration of ≤ 50% of home basal insulin was associated with higher hyperglycemia rates.

24. Evaluation of intraoperative, local site injections of liposomal bupivacaine as an alternative to standard local anesthetics in patients undergoing total hip arthroplasty Ed Rainville, M.S.Pharm, Carl Asche, Ph.D.[2], Jinma Ren, Ph.D.[3], MinChul Kim, Ph.D.[4], Meagin McManus, OTR/L, MOT[5], Daniel Knolhoff, Pharm.D.[6], Brian (Ted) Maurer, M.D.[7], Susan Peterson, M.S., R.N.[8], Jason Weinberg, M.S.[9], Lucas Walker, B.A.[10], Kyle Shick, Pharm.D.[6]; [1]Department of Pharmacy, OSF Saint Francis Medical Center, Peoria, IL [2]Center for Outcomes Research, University of Illinois College of Medicine at Peoria, Peoria, IL [3]Center for Outcomes Research, Uinversity of Illinois College of Medicine at Peoria, Peoria, IL [4]Center for Outcomes Research, University of Illinois College of Medicine, Peoria, IL [5]Department of Physical Therapy, OSF Saint Francis Medical Center, Peoria, IL [6]Department of Pharmacy, OSF Saint Anthony's Medical Center, Rockford, IL [7]Department of Orthopedics, Great Plains Orthopaedics, Peoria, IL [8]OSF Healthcare Analytics, OSF Healthcare System, Peoria, IL [9]Heathcare Analytics, OSF Saint Francis Medical Center, Peoria, IL [10]School of Medicine, University of Illinois College of Medicine at Peoria, Peoria, IL

INTRODUCTION: Liposomal bupivacaine (LB) has a longer duration of action and thus could be used as an alternative to standard treatment to better control postoperative pain and improve other parameters.

RESEARCH QUESTION OR HYPOTHESIS: Evaluate the clinical outcomes of LB versus standard therapy in total hip arthroplasty (THA).

STUDY DESIGN: Following univariate analyses, multivariable generalized linear models were used to estimate the effects while controlling for patient factors.

METHODS: This was a retrospective cohort study of patients undergoing THA at 3 hospitals from January 2013 to July 2016. The control group received the standard of care (plain bupivacaine or ropivacaine), while the LB group received a 20 ml injection as a part of their revised regimen. Length of stay (LOS), discharge status, pain scores, opioid consumption, adverse effects, physical function, costs, and payments were compared.

RESULTS: 70 patients received LB and 103 were in the control group. The demographics and opioid consumption were similar between groups. The LB group had a shorter LOS and walked further on the day of surgery and first post-op day. Within the first 3 days of surgery, the control group was more likely to use metoclopramide, while the LB group were prescribed more laxatives. No significant difference between the two groups was found in pain scores and discharge status. The LB group had lower average total hospital cost per case ($16,399 vs. $17,716) compared to the control group. No statistical differences were found between both groups at 30-, 60- and 90-days post discharge related to readmissions or payments.

CONCLUSION: This study shows that LB as an alternative to plain bupivacaine or ropivacaine significantly reduced LOS and improved physical function in patients undergoing THA. The LB group showed lower in-patient total costs and similar 90-day post-discharge readmissions and payments compared to the control group.

25. Evaluation of antibiotic de-escalation on internal medicine services at an academic medical center with rounding pharmacists compared to services without rounding pharmacists *Bethany Miller, Pharm.D., BCPS*[1], Jay L. Martello, Pharm.D., BCPS[2], Jon P. Wietholter, Pharm.D., BCPS[3], Kara Piechowski, Pharm.D., BCPS[4]; [1]Pharmacy, WVU Medicine, Morgantown, WV [2]West Virginia University School of Pharmacy, Morgantown, WV [3]Department of Clinical Pharmacy, West Virginia University School of Pharmacy, Morgantown, WV [4]WVU Medicine, Morgantown, WV

INTRODUCTION: Antibiotic resistance is becoming more prevalent worldwide. Antimicrobial stewardship programs ensure antibiotic therapy is used appropriately; this includes de-escalation when clinical status or culture data indicates no need for broad-spectrum agents. Although the impact of infectious diseases clinical pharmacists has been well documented, there is limited research evaluating the impact of adult internal medicine clinical pharmacists on broad-spectrum antibiotic de-escalation.

RESEARCH QUESTION OR HYPOTHESIS: The evaluators wanted to study the impact of internal medicine pharmacists on rounding services regarding broad-spectrum antibiotic de-escalation compared to services without rounding pharmacists.

STUDY DESIGN: Prospective observational cohort chart review.

METHODS: Data was collected from January through March 2017 from three adult internal medicine services with a rounding pharmacist and two services without a rounding pharmacist. Patients were included if broad-spectrum antibiotics were initiated within 24 hours of admission and the patient remained on the internal medicine service for at least 72 hours. Patients were excluded if they were transferred to another service after antibiotics were initiated, had an infectious disease consultation, documented antibiotic allergy, long-term outpatient antibiotic use, or cystic fibrosis. The primary endpoint was broad-spectrum antibiotic de-escalation within 72 hours or upon return of culture results.

RESULTS: A total of 64 patients were included in this study with 39 in the pharmacist group and 25 in the without pharmacist group. De-escalation happened in 35/39 patients on services with pharmacists and in 13/25 on services without pharmacists ($p < 0.05$). Services with pharmacists saw patients on MRSA coverage for 26.6% of their length of stay compared to 34.7% without pharmacists. Services with pharmacists saw patients on *Pseudomonas*coverage for 25.0% of their length of stay compared to 37.1% without pharmacists ($p < 0.05$).

CONCLUSION: This data shows that broad-spectrum antibiotics were de-escalated more frequently on medicine services with pharmacists compared to services without pharmacists.

26. Evaluating the safety and efficacy of dexmedetomidine in non-intubated patients treated for severe alcohol withdrawal syndrome outside of the intensive care unit *Tyson Bigelow, Pharm.D., BCPS*[1], Jim Yorgason, Pharm.D.[1], Christian Larsen, Pharm.D., BCPS[1], Aleesha Galeria, Pharm.D., BCPS[1], Brittany Bryan, Pharm.D., BCPS[2], Dustin Waters, Pharm.D., BCPS[3]; [1]Intermountain Healthcare, Ogden, UT [2]Intermountain Healthcare, Provo, UT [3]Department of Pharmacy, Intermountain Healthcare - McKay-Dee Hospital, Ogden, UT

INTRODUCTION: The use of dexmedetomidine as an adjunctive agent to benzodiazepines in treating alcohol withdrawal syndrome (AWS) has increased in recent years. However, the majority of the literature on this topic involves surrogate endpoints for critically ill patients who are often intubated and mechanically ventilated in the intensive care unit (ICU). The purpose of this study is to assess the safety and efficacy of adjunctive dexmedetomidine in non-intubated AWS patients treated outside of the ICU.

RESEARCH QUESTION OR HYPOTHESIS: Does adjunctive dexmedetomidine reduce rates of endotracheal intubation or escalation of care to the ICU?

STUDY DESIGN: IRB-approved retrospective cohort study.

METHODS: Adult patients admitted for AWS between 9/30/13 and 9/30/15 were included in the study, with treatment-group patients receiving dexmedetomidine and control-group patients receiving at least one dose of lorazepam 4 mg or diazepam 20 mg. Patients initially admitted to the ICU or endotracheally intubated were excluded.

RESULTS: 128 patients met inclusion criteria (30 in the treatment group and 98 in the control group). Rates between the treatment and control groups were similar regarding endotracheal

intubation or transfer to the ICU (23.3% vs. 12.2%; p = 0.223), as well as intervention due to adverse drug reactions (20.0% vs. 9.2%; p = 0.1841). Mean cumulative daily benzodiazepine doses were significantly greater in the treatment group versus control group (19.9 mg vs. 11.8 mg; p < 0.00001).
CONCLUSION: Treatment with adjunctive dexmedetomidine was not found to reduce rates of escalation of care for AWS patients or intervention due to adverse drug reactions in this study. However, the study was ultimately underpowered with respect to answering the primary endpoint and the significantly greater mean cumulative daily benzodiazepine doses in the dexmedetomidine group suggests that these patients had more severe AWS symptoms than those not receiving dexmedetomidine. Further research is needed to analyze clinically-significant endpoints about the safety and efficacy of dexmedetomidine as an adjunctive agent for AWS.

27. Safety of apixaban versus warfarin in severe kidney disease
Joseph Schafer, Pharm.D., Kristina Dupré, Pharm.D., Ashley Casey, Pharm.D., *Britta Staubes, Pharm.D.*; Department of Pharmacy, Ochsner Medical Center, Jefferson, LA
INTRODUCTION: Due to a lack of data on the comparison of anticoagulants in the severe kidney disease population, guidelines recommend warfarin as the anticoagulant of choice for atrial fibrillation and venous thromboembolism (VTE) treatment in these patients. However, apixaban has specific dosing recommendations for use in all stages of chronic kidney disease (CKD) leading to its use in clinical practice.
RESEARCH QUESTION OR HYPOTHESIS: The aim of this study is to evaluate major bleeding, stroke, and thromboembolism rates in patients with CKD stage 4, stage 5, and dialysis on apixaban or warfarin therapy.
STUDY DESIGN: Retrospective cohort study.
METHODS: Electronic medical record data was collected at the time of study enrollment. The primary outcome was the occurrence of major bleeding at 3 months after enrollment. Secondary outcomes included occurrence of major bleeding at 6 and 12 months, occurrence of ischemic stroke at 3, 6, and 12 months, and recurrence of VTE at 3, 6, and 12 months.
RESULTS: A total of 604 patients were included in the analysis. The percentage of apixaban and warfarin patients with a major bleed at 3, 6, and 12 months were 8.3% versus 9.9% (p = 0.48), 9.6% versus 13.6% (p = 0.13), and 10.9% versus 20.9% (p < 0.001), respectively. Fatal bleeding rates for apixaban and warfarin patients were 0.7% versus 3.3% (p = 0.037), respectively. The percentage of apixaban and warfarin patients with an ischemic stroke at 12 months were 1.7% versus 1.3% (p = 1.00). The percentage of apixaban and warfarin patients with a recurrent VTE at 12 months were 1.0% versus 1.7% (p = 0.72).
CONCLUSION: Patients with severe kidney disease taking apixaban had similar bleeding rates at 3 months compared to those taking warfarin. However, when examined over a 12 month period, warfarin had significantly higher major and fatal bleeding rates. There were no differences in ischemic stroke or recurrent VTE rates.

28. Evaluation of appropriate sodium polystyrene sulfonate use with a hyperkalemia order set
Andrew J. Crannage, Pharm.D., BCPS[1], Zachary Mueller, Pharm.D.[2]; [1]St. Louis College of Pharmacy, St. Louis, MO [2]St. Louis College of Pharmacy/Mercy Hospital St. Louis, St. Louis, MO
INTRODUCTION: No consensus guidelines exist to assist practitioners in treating hyperkalemia. Sodium polystyrene sulfonate (SPS) is a common treatment option for hyperkalemia; however, rates of appropriate use have been reported to be suboptimal due to overtreatment of slightly elevated potassium levels. To assist healthcare professionals, a pharmacy-developed hyperkalemia order set was created at a 979-bed community teaching hospital.
RESEARCH QUESTION OR HYPOTHESIS: Is utilization of a hyperkalemia order set associated with appropriate use of SPS?
STUDY DESIGN: Retrospective Cohort.
METHODS: Orders for SPS were evaluated for appropriateness in adult patients from December 1, 2015 to December 31, 2016. All orders for SPS not from an order set were randomly matched to those from the order set in a 2:1 fashion. Appropriate use was defined as a potassium level >5.5 mEq/L with no contraindications to use. The primary outcome was the absolute difference in the proportion of patients with appropriate SPS. Parametric statistical tests were used for data analyses with an alpha of 0.05 determined a-priori for statistical significance.
RESULTS: A total of 120 patients were analyzed, 40 in the order set group and 80 in the non-order set group. Appropriate use occurred in 97.5% of order set patients, compared to 60% in the non-order set group (p < 0.0001). This difference held true for various subgroup analyses including stratification by age, renal function, and heart failure history. Use of the order set was also associated with a greater reduction in serum potassium (p < 0.0001), quicker laboratory follow-up potassium level (p = 0.002), and lower incidence of gastrointestinal adverse effects (p = 0.022).
CONCLUSION: The use of a hyperkalemia order set is associated with appropriate SPS use. Lower rates of adverse effects combined with greater reductions in serum potassium also support use of the order set. Requiring the use of a pharmacy-developed hyperkalemia order set for administration of SPS may enhance patient care and safety.

29. Evaluation of long-acting bronchodilator use during chronic obstructive pulmonary disease exacerbations in an academic medical center
Julie Murphy, Pharm.D., FASHP, FCCP, BCPS, Sarah Petite, Pharm.D., BCPS; College of Pharmacy and Pharmaceutical Sciences, University of Toledo, Toledo, OH
INTRODUCTION: The Global Initiative for Chronic Obstructive Lung Disease (GOLD) guidelines recommend initiating long-acting bronchodilator (LABD) therapy as soon as possible before hospital discharge for a chronic obstructive pulmonary disease (COPD) exacerbation. There is a paucity of data supporting the optimal time to initiate LABD during hospitalization.
RESEARCH QUESTION OR HYPOTHESIS: What is the impact of the time of LABD initiation during hospitalization for COPD exacerbation on 30-day readmission rates?
STUDY DESIGN: Non-interventional, retrospective, single-center study.
METHODS: Adult patients admitted to an internal medicine service in the non-intensive care unit (ICU) setting from January 1, 2014 to December 31, 2015 for COPD exacerbation were included. Data were collected from date of hospital admission until 30 days following discharge. Early LABD was defined as therapies initiated within 24 hours of hospital admission. Late LABD was defined as therapy initiated greater than 24 hours after hospital admission or if no LABD therapy was initiated during hospitalization. Categorical data were analyzed using Chi-square or Fisher's exact test and continuous data were analyzed using Mann-Whitney U test.
RESULTS: Two hundred twenty unique patient encounters were identified. There were 165 patient encounters in the early LABD group (75%) and 55 patient encounters in the late LABD group (25%). Thirty day readmission rates were similar (15.2% vs. 18.2%, p = 0.60) between the early and late LABD groups, respectively. Length of stay (LOS) was similar for the two groups (4 days [3–6] for both, p = 0.34). The total number of short-acting bronchodilator doses administered during hospitalization (15.5 [9–24] versus 19 [10–29.5], p = 0.13) was similar between the early and late LABD treatment groups, respectively.
CONCLUSION: This study did not detect a difference in 30-day readmission rates or hospital LOS for early LABD compared to late LABD therapy in patients with COPD exacerbations in the non-ICU setting. For these patients, administration of LABD is appropriate for the management of COPD exacerbations.

30. Intravenous histamine H2-receptor antagonists for treatment of upper gastrointestinal bleeds during a national drug shortage *Julia Shlensky, Pharm.D.*; Department of Pharmacy, Mayo Clinic, Rochester, MN

INTRODUCTION: Annually, 20,000 deaths occur from upper gastrointestinal bleeds (UGIBs). Per the American College of Gastroenterology, proton pump inhibitors (PPIs) are the recommended medication therapy. Limited studies have compared outcomes using IV PPIs versus IV histamine H2-receptor antagonists (H2RAs) for patients with an UGIB.

RESEARCH QUESTION OR HYPOTHESIS: Does treatment with an IV H2RA infusion for an UGIB result in worse outcomes than the standard of care?

STUDY DESIGN: This study is a retrospective analysis of patients with an UGIB admitted to Methodist LeBonheur Healthcare adult hospitals.

METHODS: Patients admitted between January 1, 2014, and January 14, 2016, were identified via a Cerner Powervision report. Exclusion criteria included variceal bleeding; concomitant sucralfate; IV push H2RA; IV push PPI as monotherapy or while receiving an IV H2RA infusion; pregnancy, or breastfeeding.

RESULTS: 1780 patients were screened with 240 included (PPI group = 120, H2RA group = 120). The primary outcome resulted in fewer 3-day rebleeds in the H2RA group compared to the PPI group, 2 (1.7%) versus 4 (3.3%), p = 0.68. The average length of stay was longer in the H2RA group, 5.5 (± 5.1) versus 4.9 (± 3.9) days, p = 0.33, with more patients transferred to the ICU, 8 (6.7%) versus 2 (1.7%), p = 0.05. On presentation, more patients in the PPI group received pRBC and FFP, 72 (60%) versus 65 (54.2%), p = 0.36 and 23 (19.2%) versus 8 (6.7%), p = 0.004, respectively.

CONCLUSION: There was no significant difference in outcomes for patients treated with IV H2RAs versus IV PPIs for active UGIBs. Although patients in the H2RA group had a higher rate of transfers to the ICU and longer hospital length of stay, the type of bleed may have been more severe for the PPI group based on the usage of pRBC and FFP.

31. Classification of medication changes after Roux-en-Y gastric bypass or sleeve gastrectomy: A focus on narrow therapeutic index and high-risk drugs *Kayla Popova, Pharm.D.*[1], Kelly McMonigal, Pharm.D., BCPS[1], Lei Zhang, MS[2], Diana Langworthy, Pharm.D., BCPS[3]; [1]Fairview Pharmacy Services, University of Minnesota Medical Center, Minneapolis, MN [2]Clinical and Translational Sciences Institute, University of Minnesota, Minneapolis, MN [3]College of Pharmacy, University of Minnesota, Minneapolis, MN

INTRODUCTION: Several physiologic changes occur as a result of gastric bypass surgery with the most common surgeries being Roux-en-Y gastric bypass (RYGB) and sleeve gastrectomy (SG). There is a paucity of data describing the effect of bariatric surgery on postoperative medication requirements for oral medications including narrow therapeutic index (NTI) and high-risk drugs.

RESEARCH QUESTION OR HYPOTHESIS: Patients who have undergone RYGB or SG will demonstrate increased postoperative dose requirements for NTI drugs.

STUDY DESIGN: Retrospective cohort study.

METHODS: Adult patients who underwent RYGB or SG and were consistently taking at least one author defined NTI or high-risk medication at the time of bariatric surgery were included. Data was collected via electronic medical records from January 2010–July 2016. Descriptive statistics were performed to assess if a change in dose occurred for each medication postoperatively at 0–6 months and at 6–12 months compared to baseline.

RESULTS: One hundred and ninety-six patients were included for analysis. Of these, 52.6% (n = 103) had undergone RYGB and 47.4% (n = 93) had undergone SG. The majority were taking levothyroxine (n = 164/196 (83.7%)) and most patients did not have documented changes in medication requirements at 0–6 months (147/196 (80.8%)) or 6–12 months (118/196 (60.2%)) post-op. Of the 164 patients taking levothyroxine, 5 patients demonstrated increased dose requirements (RYGB = 3; SG = 2) and 25 patients demonstrated reduced dose requirements (RYGB = 11; SG = 14). Of the 15 patients on warfarin, 4 patients required lower doses (RYGB = 3) and 1 RYGB patient required increased doses.

CONCLUSION: A majority of patients taking NTI drugs did not have documented changes in medication requirements within 12-months after bariatric surgery. Further research is warranted to confirm the impact of bariatric surgery on absorption of NTI drugs.

32. Daptomycin dosing in obese patients: use of adjusted body weight versus actual body weight *Ashley N. Fox, Pharm.D.*[1], Winter J. Smith, Pharm.D., BCPS[2], Katherine E. Kupiec, Pharm.D., BCPS[3], Stephanie J. Kuhn, Pharm.D., BCPS-AQID[4], Beth Resman-Targoff, Pharm.D., FCCP[5], Stephen B. Neely, MPH[6], Bryan P. White, Pharm.D., BCPS[3], Ryan E. Owens, Pharm.D., BCPS[7]; [1]Department of Pharmacy: Clinical and Administrative Sciences, University of Oklahoma College of Pharmacy, Oklahoma City, OK [2]Adult Medicine Division, Texas Tech University Health Sciences Center School of Pharmacy, Dallas, TX [3]Clinical Pharmacy Services, OU Medical Center, Oklahoma City, OK [4]Clinical Pharmacy Services, Wesley Medical Center, Wichita, KS [5]Department of Pharmacy: Clinical and Administrative Sciences, University of Oklahoma Health Sciences Center, College of Pharmacy, Oklahoma City, OK [6]Office of Instructional Science and Assessment, University of Oklahoma Health Sciences Center, College of Pharmacy, Oklahoma City, OK [7]Department of Pharmacy Practice, Wingate University School of Pharmacy, Hendersonville, NC

INTRODUCTION: FDA-approved daptomycin dosing is based on actual body weight (ABW), despite limited information regarding appropriate dosing for obese patients. Previous studies have indicated alterations in daptomycin pharmacokinetic parameters in obese patients, as well as elevations in creatine phosphokinase (CPK) associated with higher weight-based doses. There is a paucity of information available comparing clinical outcomes with alternative daptomycin dosing strategies in obesity.

RESEARCH QUESTION OR HYPOTHESIS: There is no difference in clinical and safety outcomes for obese patients when daptomycin doses are based on adjusted body weight (AdjBW) versus ABW.

STUDY DESIGN: Single-center, retrospective cohort.

METHODS: Daptomycin therapy was reviewed for an AdjBW-dosed cohort (4/1/2014–12/31/2015) and a historical ABW-dosed cohort (12/1/2012–12/31/2013). Inclusion criteria: age ≥18 years with a body mass index (BMI) ≥30 kg/m^2 and daptomycin use ≥72 hours. Exclusion criteria: daptomycin start prior to hospital admission, infections with retained hardware, renal dysfunction, infection with daptomycin-resistant isolates, or rhabdomyolysis upon admission. The primary outcome was clinical failure defined as: development of resistance or recurrent signs and symptoms of infection necessitating antibiotic modification. Secondary outcomes included a combined safety endpoint: elevation in CPK, patient-reported myalgia, and rhabdomyolysis requiring daptomycin discontinuation.

RESULTS: Of the 667 patients screened, 101 met inclusion criteria (n = 51 AdjBW cohort; n = 50 ABW cohort). Similar rates of clinical failure were observed between those dosed with AdjBW versus ABW (4% vs. 2% respectively; p = 0.39). Of note, microbiologic data was available for 44 patients which showed no significant difference in microbiologic success (69% AdjBW vs. 56% ABW; p = 0.52). Additionally, there was no statistical difference in the composite safety endpoint between groups (18% AdjBW vs. 10% ABW; p = 0.39).

CONCLUSION: No difference in clinical or safety endpoints between the two daptomycin dosing cohorts was observed. More data is needed to adequately determine the utility of dosing daptomycin with AdjBW in the setting of higher weight-based doses used in obesity.

33. Evaluation of appropriateness of direct oral anticoagulant dosing for discharge prescriptions *Laura M Lemens, Pharm.D.*[1], Anne B. Reaves, Pharm.D., BCACP[2], David Shoop, Pharm.D.[1], Mary E.D. Yates, Pharm.D., BCPS[1]; [1]Department of Pharmacy, Methodist Le Bonheur Healthcare Germantown Hospital, Germantown, TN [2]Department of Pharmacy, Methodist University Hospital, Memphis, TN

INTRODUCTION: Warfarin was traditionally first-line treatment for deep vein thrombosis (DVT), pulmonary embolism (PE), and stroke prevention in atrial fibrillation. Today, direct oral anticoagulants (DOACs) have become the preferred treatment for these conditions. Dosing these drugs can vary depending on indication, renal function, age, and body weight. Studies have concluded up to 50% of patients receive the incorrect DOAC dose. To date, there has not been a study to examine the accuracy of discharge prescriptions for all approved DOACs.

RESEARCH QUESTION OR HYPOTHESIS: Does an inappropriate DOAC dose lead to a higher incidence of readmissions for a thromboembolism or bleed?

STUDY DESIGN: Multi-site, retrospective chart review.

METHODS: Patients who were discharged from the hospital or emergency department from November 2010 through August 2016 with a new DOAC prescription were reviewed. Inclusion criteria: age ≥18 years and diagnosis of atrial fibrillation, DVT, or PE. The primary objective was to evaluate the appropriateness of a DOAC dose on discharge based on FDA labeling. Secondary objectives included: appropriateness of dose based on drug, indication, and discharge area of the hospital, the number of patients on concomitant anticoagulation, antithrombotic, or an interacting medication, and readmission rates for thromboembolism and/or bleed within 90 days.

RESULTS: A total of 729 patients were screened and 471 patients were included. 108 (22.9%) of discharge prescriptions were inappropriately dosed. Of these prescriptions, 79.6% were dosed too low. We found a significant number of inappropriately dosed prescriptions for apixaban ($p < 0.001$), rivaroxaban ($p = 0.003$), the indication of atrial fibrillation ($p = 0.007$), and for the treatment of DVT ($p = 0.001$). There was a 5% readmission rate within 90 days for a thromboembolism and/or bleed. There was no difference in readmission rates between appropriate and inappropriate dosing ($p = 0.203$).

CONCLUSION: This study found that DOACs are often prescribed at inappropriate doses. These results have identified opportunities for provider and pharmacist education regarding proper dosing of DOACs.

34. Restricted calcitonin use for hypercalcemia efficacy and cost savings evaluation *Kendall Day, BS*[1], Yong Gu Lee, Pharm.D.[2], John J. Radosevich, Pharm.D., BCPS, BCCCP[2]; [1]University of Arizona College of Pharmacy, Tucson, AZ [2]St. Joseph's Hospital & Medical Center - Dignity Health, Phoenix, AZ

INTRODUCTION: Calcitonin is utilized in the management of hypercalcemia due to its ability to rapidly reduce calcium levels. Unfortunately, calcitonin has diminishing effect through development of tachyphylaxis after approximately 48 hr of therapy. Appropriate utilization via institutional criteria may help decrease unnecessary use resulting in significant cost savings.

RESEARCH QUESTION OR HYPOTHESIS: The objective of this study was to evaluate the efficacy and cost savings associated with development of hypercalcemia calcitonin use guidelines (serum calcium > 12 mg/dL or symptomatic, 4 units/kg IBW, max 4 doses) pre-intervention versus post-intervention.

STUDY DESIGN: Retrospective, observational.

METHODS: The study was conducted in an academic medical center in the United States. Medical records for patients receiving calcitonin for hypercalcemia between January and May of 2016 (pre-intervention) and 2017 (post-intervention) were evaluated. The primary efficacy outcome was the corrected calcium levels at 24 hr, 48 hr, and 72 hr. The secondary outcome was the cost savings pre-intervention versus post-intervention. Categorical data was analyzed using Chi-square or Fisher's exact test and continuous data was analyzed using Wilcoxon rank-sum.

RESULTS: A total 7 pre-intervention and 13 post-intervention subjects were included. The median total dose was reduced in the post-intervention group with 440 units (IQR 200 - 990 units) administered compared to the pre-intervention group with 1600 units (IQR 400 – 6580 units) administered ($p = 0.02$). The corrected calcium at 24 hr after therapy initiation was 11.5 mg/dL (IQR 11.0 – 12.2 mg/dL) in the pre-intervention group and 11.4 mg/dL (IQR 11 – 12.8 mg/dL) in the post-intervention group ($p = 0.5$).The calcium levels continued to decrease appropriately in both groups at 48 hr and 72 hr after calcitonin initiation, with no differences between the groups. The estimated annualized cost savings in the post-intervention group was ~ $250,000.

CONCLUSION: Utilization of hypercalcemia calcitonin use guidelines produced significant cost savings by reducing the total amount of calcitonin utilized without effecting efficacy at 24 hr, 48 hr, or 72 hr after therapy initiation.

35. Impact of a pharmacist-led vancomycin dosing and monitoring service at an academic medical center *Kiya K. Harrison, Pharm.D., BCPS*[1], Katherine E. Kupiec, Pharm.D., BCPS[2], Stephen B. Neely, MPH[3], Karen K. Kinney, M.D.[4], Winter J. Smith, Pharm.D., BCPS[5]; [1]Department of Pharmacy: Clinical and Administrative Sciences, University of Oklahoma College of Pharmacy, Oklahoma City, OK [2]Department of Pharmacy, OU Medical Center, Oklahoma City, OK [3]Office of Instructional Science and Assessment, University of Oklahoma Health Sciences Center, College of Pharmacy, Oklahoma City, OK [4]Department of Medicine, Section of Infectious Diseases, University of Oklahoma College of Medicine, Oklahoma City, OK [5]Adult Medicine Division, Texas Tech University Health Sciences Center School of Pharmacy, Dallas, TX

INTRODUCTION: Methicillin-resistant *Staphylococcus aureus* (MRSA) infections are increasingly prevalent, with vancomycin being the most common antimicrobial agent used in inpatient settings. Vancomycin dosing and monitoring by pharmacists has been implemented at many institutions to optimize efficacy and safety outcomes. However, a paucity of literature evaluating the impact of pharmacist dosing and monitoring of vancomycin exists.

RESEARCH QUESTION OR HYPOTHESIS: Implementation of a pharmacist-to-dose (PTD) vancomycin protocol incorporating loading doses will result in a decreased time to therapeutic trough compared to vancomycin dosed by prescribers (pre-PTD).

STUDY DESIGN: Retrospective, pre/post intervention study conducted at a 350-bed academic medical center.

METHODS: Adult patients receiving vancomycin for ≥ 72 hours were included. Patients with end-stage renal disease on hemodialysis were excluded. The pre-PTD group included patients on vancomycin between August 2013 and October 2013 and the PTD group included patients between August 2015 and October 2015. The primary outcome, time to therapeutic trough, was compared using the Mann-Whitney U test and time-to-event analysis. Statistical analyses were performed with SAS v9.4 (SAS Institute, Cary, NC) with the *a priori* alpha set at 0.05.

RESULTS: There were 163 patients in the PTD and 156 in the pre-PTD group. Median (IQR) time to therapeutic trough was 3 days (2.0–5.0) in the PTD and 5 days (3.0–7.5) in the pre-PTD group ($p = 0.0059$). Fifty-two percent of PTD patients never reached a therapeutic trough versus 72% in the pre-PTD group ($p = 0.0002$). The PTD group had fewer troughs below 10 mcg/mL ($p = 0.0054$), and more above 20 mcg/mL ($p = 0.0213$). There was no difference in secondary outcomes of number of mistimed troughs ($p = 0.1087$), hospital length of stay ($p = 0.1053$), or nephrotoxicity ($p = 0.5988$).

CONCLUSION: A pharmacist-to-dose vancomycin protocol incorporating loading doses was associated with a decreased time to therapeutic trough. Further study is needed to assess the correlation to clinical outcomes.

Ambulatory Care

36. Joint pharmacist-physician visit billing model and its impact on charges for pharmacist services Amani Alshehri, B.S.Pharm, Pharm.D., R.Ph.[1], Marion Slack, Ph.D.[2], Julio Valencia, BS[3], *Maryam Fazel, Pharm.D., BCPS, BCACP, CDE*[4]; [1]Department of Phamracy Practice and Science, The University of Arizona College of Pharmacy, Tucson, AZ [2]Department of Pharmacy Practice and Science, The University of Arizona College of Pharmacy, Tucson, AZ [3]Department of Medicine, The University of Arizona, Tucson, AZ [4]Department of Pharmacy Practice and Science, University of Arizona College of Pharmacy, Tucson, AZ

INTRODUCTION: Despite the recognition of pharmacists' clinical services, barriers to pharmacist billing continue to exist. Pharmacists are not reimbursed based on the complexity of the services they provide and are mainly reimbursed based on the time spent providing services. This approach undervalues the reimbursement for pharmacists' clinical services. Pharmacist-physician joint visit billing model allows for charges based on the complexity of services.

RESEARCH QUESTION OR HYPOTHESIS: The primary objective of this study was to evaluate the impact of pharmacist-physician billing model on improving charges for pharmacist services. We hypothesized that this billing model would result in higher charges improving charges for pharmacists' services as compared with those using Medication Therapy Management (MTM) or lower level Current Procedural Terminology (CPT) codes.

STUDY DESIGN: The study is a retrospective chart review.

METHODS: We compared the average charges generated from pharmacist-physician joint visits to charges using the time spent by physicians (level-1 and level-2 CPT codes, 5 and 10 minutes respectively), or MTM codes. All captured joint pharmacist-physician visits (November-2014 to August-2016) for adult patients with diabetes at Banner University Medical Center-South Campus Endocrinology Clinic were included. Data were analyzed using descriptive analysis and one-sample T-test utilizing STATA software. The a priori alpha level was 0.05.

RESULTS: A total of 240 visits were included. The average charge per visit from pharmacist-physician billing model ($305.3 ± 61.6) was significantly higher than those from level-1 ($57), level-2 ($112), or MTM ($106) codes, P-vale (<0.001).

CONCLUSION: Joint pharmacist-physician visit billing model resulted in significantly higher charges per visit compared to those from level-1, level-2, or MTM billing codes. This billing model could improve reimbursement for pharmacist provided clinical services in the outpatient settings.

37. Comparative effectiveness of GLP-1 Receptor Agonists versus SGLT-2 Inhibitors on ambulatory patient outcomes: A retrospective study Haley Kessinger, Pharm.D.[1], Drew Roberts, Pharm.D., Ph.D.[2], *Emily Knezevich, Pharm.D., BCPS, CDE*[1]; [1]Department of Pharmacy Practice, Creighton University, School of Pharmacy and Health Professi, Omaha, NE [2]Creighton University Center for Health Services Research and Patient Safety, Omaha, NE

INTRODUCTION: Currently, no head-to-head studies have compared the glucagon-like peptide-1 receptor agonists (GLP-1 RAs) versus the sodium-glucose co-transporter-2 (SGLT-2) inhibitors. Drug selection is mainly dependent on patient-specific factors including adverse drug reactions (ADRs), route of administration, and cost. Both drug classes have been shown to be very effective at reducing hemoglobin A1c (HbA1c) in patients with Type 2 Diabetes Mellitus (T2DM).

RESEARCH QUESTION OR HYPOTHESIS: The purpose of this study was to compare outcomes, primarily HbA1c, in patients taking GLP-1 RAs versus patients taking SGLT-2 inhibitors. Multiple secondary outcomes were also collected to determine and compare other effects of these two drug classes including changes in body mass index (BMI), weight (kilograms), and blood pressure (mm Hg).

STUDY DESIGN: This study was a retrospective cohort of patients with T2DM that utilized data from an electronic health record (EHR) between the dates of January 1st, 2014 to August 1st, 2016.

METHODS: Patient demographics were documented at the patient's initial visit when the patient started on a GLP-1 RA or SGLT-2 inhibitor. Follow-up data was documented for one or two follow-up visits after the patient was initially started on the medication.

RESULTS: Adjusted linear regression models were used to compare outcomes, controlling for age, gender, insurance coverage, and time to follow-up. There were no statistically significant differences between the GLP-1 RAs or the SGLT-2 inhibitors with regards to HbA1c, weight, BMI, or systolic blood pressure. However, patients taking SGLT-2 inhibitors experienced a statistically significant decrease in diastolic blood pressure compared to patients on GLP-1 RAs at both first and second follow-up visits.

CONCLUSION: This study did not show superior HbA1c reduction of either the GLP-1 RA or SGLT-2 inhibitor therapeutic drug classes. Second-line therapy drug selection should be tailored to the individual based on patient-specific factors.

38. Comparing regimens of insulin R U-500 to glargine U-300 plus lispro (U-100 or U-200) in patients requiring conversion to concentrated insulin *Daniel Longyhore, Pharm.D., M.S., BCACP*[1], Shari Williams, Pharm.D.[2]; [1]Department of Pharmacy Practice, Wilkes University, Wilkes-Barre, PA [2]Pharmacy, St. Luke's University Health Network, Bethlehem, PA

INTRODUCTION: It is unclear which concentrated regimen may yield the greatest glucose lowering potential. The purpose of our investigation is to compare usage and efficacy outcomes for different concentrated insulin regimens.

RESEARCH QUESTION OR HYPOTHESIS: In patients switching from standard concentration insulin (100 units/ml) to concentrated insulin (>100 units/ml), how do different regimens compare for insulin use and glycemic control?

STUDY DESIGN: Retrospective chart review.

METHODS: Patients' records were included in this study if the patient was prescribed a concentrated-insulin formulation for at least 6 months within an internal medicine or endocrinology practice. Patient demographics, insulin regimen, non-insulin agents, total daily insulin dose, number of daily injections, and A1C were recorded immediately prior to conversion to concentrated-insulin. Data was then collected on post-conversion insulin regimens, other insulin and non-insulin therapies, total daily dose, number of daily injections, and A1C most recent to January 2017. Differences between pre- and post-transition A1C, total daily insulin dose, and number of injections per day were compared between concentrated-insulin regimens.

RESULTS: A total of 119 patient records were included, comparing R U-500 ($n = 41$) with glargine U-300 plus lispro U-100 ($n = 57$) or glargine U300 plus lispro U-200 ($n = 21$). All patients demonstrated a significant decrease in A1C from baseline (−0.86% to −1.35%) without significant dose changes. Only R U-500 demonstrated fewer injections per day (−0.93, $p < 0.001$). Insulin R U-500, compared to glargine U-300 plus lispro U-100, produced a significantly greater reduction in hemoglobin A1C (delta −0.82%, $p = 0.032$) and number of injections per day (−1.3, $p < 0.001$). Compared to glargine U-300 plus lispro U-200, only number of injections per day was significantly fewer with R U-500 insulin (−1.3, $p < 0.001$).

CONCLUSION: All studied concentrated-insulin regimens more effectively reduced blood glucose. Clinicians may consider R U-500 over other concentrated-insulin regimens to reduce the daily injection burden for patients.

39E. Factors critical in forming collaborative physician-pharmacist relationships in the delivery of comprehensive medication management (CMM) *Kyle Turner, Pharm.D.*[1], Cory Nelson, Pharm.D.[2], Deborah L. Pestka, Pharm.D.[3], Todd Sorensen, Pharm.D.[4]; [1]Department of Pharmacotherapy, University of Utah College of Pharmacy, Salt Lake City, UT [2]Kaweah Delta Health Care District, Visalia, CA [3]Social and Administrative Pharmacy, University of Minnesota College of Pharmacy, Minneapolis, MN [4]Pharmaceutical Care & Health Systems, University of Minnesota College of Pharmacy, Minneapolis, MN
Presented at the American Society of Health-Systems Pharmacists Summer Meeting and Exhibitions, Minneapolis, MN, June 3-7, 2017.

40. Medication adherence: algorithms for success (MED-ALS) *Tyler Gums, Pharm.D., MS*, Barry Carter, Pharm.D.[2], Eric Foster, Ph.D.[3]; [1]Health Outcomes & Pharmacy Practice, University of Texas, Austin, TX [2]Pharmacy Practice and Science, University of Iowa, Iowa City, IA [3]Biostatistics, University of Iowa, Iowa City, IA

INTRODUCTION: There is a fundamental gap concerning the most efficient strategies to identify nonadherence within primary care offices. Existence of this gap presents an important problem because, until it is filled, poor medication adherence continues to increase morbidity, death, and health care costs; which are estimated at $100 billion annually. MED-ALS begins to address this gap by calibrating a predictive model that can identify patients at high risk for nonadherence within an electronic health record (EHR).

RESEARCH QUESTION OR HYPOTHESIS: *Aim:* To build EMR-based algorithms that can identify medication nonadherence. *Primary Hypothesis:* Recognition of nonadherence will be equally sensitive when compared to usual strategies to identify nonadherence.

STUDY DESIGN: Prospective pilot study within an active cluster randomized clinical trial (MED-FOCUS; PI: Carter) that included patients from 20 primary care offices across the United States.

METHODS: In MED-ALS, a random forest model utilized patient data to generate demographic and clinical variables that were correlated with nonadherence. These variables were then confirmed with previous literature and weighted for their ability to predict nonadherence by machine learning. The MED-FOCUS pharmacists used the MED-ALS predictive model to assess nonadherence.

RESULTS : MED-ALS weighted 28 demographic and clinical variables that were found correlated with non-adherence. MED-ALS pharmacist-based interventions were completed in May 2017. The model identified 51 of 194 patients enrolled in the intervention arm of MED-FOCUS as high risk for nonadherence. The MED-FOCUS pharmacists deemed 49 of the 51 patients were correctly classified as nonadherent based on their clinical assessment (96% agreement). MED-FOCUS pharmacists provided at least one adherence intervention to 24 of the 51 patients (47%).

CONCLUSION: MED-ALS was highly innovative, because it developed predictive algorithms that allowed pharmacists to use targeted adherence interventions. Future studies will examine the statistical validity of a nonadherence algorithm-based intervention and better EHR integration.

41. Evaluation of a pharmacist-led protocol to initiate metformin therapy based on the Food and Drug Administration estimated glomerular filtration rate recommendations in patients previously contraindicated or intolerant to metformin *Kristi Smith, Pharm.D. Candidate*[1], Jillian Bishop, Pharm.D.[1], Liza Wilson, Pharm.D., BCACP[2], Joseph Saseen, Pharm.D.[2]; [1]University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO [2]Department of Clinical Pharmacy, University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO

INTRODUCTION: Metformin is a first-line treatment for type 2 diabetes mellitus (T2DM) according to American Diabetes Association guidelines. In April 2016, the FDA updated metformin prescribing information to use estimated glomerular filtration rate (eGFR) in lieu of serum creatinine cut-offs for safe use of this medication. There are limited data describing a systematic approach of initiation or re-initiation of metformin for eligible patients following these updated FDA prescribing parameters.

RESEARCH QUESTION OR HYPOTHESIS: What percentage of patients started metformin following pharmacist to medical provider recommendations using an eligibility protocol?

STUDY DESIGN: Retrospective review of clinical data.

METHODS: Clinical pharmacists reviewed the medical records of patients aged 18–89 years, with a diagnosis of T2DM, A1C $\geq$ 8%, and eGFR $\geq$45 mL/min/1.73 m^2 who were not prescribed metformin. Information related to prior metformin use and discontinuation were documented, where applicable. Recommendations were documented in the EHR and sent to medical providers for approval. If the recommendation was accepted, the patient was contacted to discuss initiation of metformin. Clinical data were continuously documented. Outcomes of recommendations were evaluated using descriptive statistics.

RESULTS: Of the 863 patients with a diagnosis of T2DM, 65 (8%) were not prescribed metformin and had an A1C $\geq$8%. Of these, 27 (42%) patients were eligible to initiate or re-initiate metformin. Medical providers accepted recommendations for 17 (63%) patients and 9 (53 %) of these patients were initiated on metformin.

CONCLUSION: A pharmacist driven protocol was easily implemented at our family medicine clinic and medical providers had a high acceptance of the clinical pharmacy team's recommendations. Overall, a small number of patients were eligible but not prescribed metformin, suggesting that providers had likely already adapted prescribing based on eGFR as opposed to serum creatinine cutoffs.

42. Outcomes of chronic care management (CCM) in primary care practice *Insaf Mohammad, Pharm.D.*[1], Peter Whittaker, Ph.D.[2], Candice L. Garwood, Pharm.D., FCCP, BCPS[3]; [1]Department of Pharmacy Services, Harper University Hospital, Detroit Medical Center, Detroit, MI [2]Wayne State University School of Medicine, Cardiovascular Research Institute and Dept of Emergency Medicine, Detroit, MI [3]Department of Pharmacy Practice, Eugene Applebaum College of Pharmacy and Health Sciences, Wayne State University, Detroit, MI

INTRODUCTION: Large practice gaps exist in the care of patients with chronic conditions. Introduced in 2015, Medicare's Chronic Care Management (CCM) service reimburses non-face-to-face care provided to patients with chronic conditions. CCM focuses on medication management, care coordination, and management at transitions of care. Pharmacist engagement in CCM continues to grow. However, no CCM practice model has been evaluated.

RESEARCH QUESTION OR HYPOTHESIS: What is the impact of pharmacist-led CCM on (1) systolic blood pressure (SBP), (2) hemoglobin A1c (HgbA1c), (3) influenza vaccination, and (4) mammogram screening?

STUDY DESIGN: This is a quasi-experimental pre-post intervention study.

METHODS: Patients received either "usual care" (UC) or were enrolled in CCM. We used interrupted time series analysis for primary outcomes: comparison of average SBP, proportion of patients at SBP goal, average HgbA1c, influenza vaccination, and mammogram screening pre- versus post- the intervention period. Prism was used for statistics with t test or Mann-Whitney U for continuous variables, and Fisher's exact or chi square test for categorical data (statistical significance defined as $p < 0.05$). Linear regression and relative risk were used for analyses and comparison.

RESULTS: This study included 89 patients (UC=22, CCM group=67). In UC patients, average SBP increased (0.4 mmHg/month; p = 0.003), the proportion at SBP goal decreased (0.9%/month; p = 0.01), while HgbA1c remained unchanged (p = 0.98). In CCM patients, SBP also increased (0.05 mmHg/month; p = 0.75) pre-enrollment, but decreased (0.7 mmHg/month; p = 0.01) post-enrollment. Similarly, the proportion of patients at SBP goal declined (0.9%/month; p = 0.25) pre-enrollment, but increased (1%/month; p = 0.1) post-enrollment. Average HgbA1c decreased (0.02%/month; p = 0.7) pre-enrollment and increased (0.05%/month; p = 0.09) post-enrollment. No difference was found for influenza vaccination (RR=1.14, 95% CI 0.90–1.45, p = 0.26) or mammogram screening (RR=0.90, 95% CI 0.64–1.26, p = 0.05) post-enrollment.
CONCLUSION: CCM was associated with reduction in SBP, but did not impact HgbA1c, influenza vaccination, or mammogram screening status.

43. Impact of clinical pharmacy teams on diabetes-related knowledge and medication adherence for patients in a patient-centered medical home *Rory Kim, Pharm.D.*[1], Geoffrey Joyce, Ph.D.[2], Steven Chen, Pharm.D., FASHP, FCSHP[3], Mimi Lou, Ph.D., MS,[3], Rocio Ribero,[4]; [1]Department of Clinical Pharmacy, University of Southern California School of Pharmacy, Los Angeles, CA [2]Department of Pharmaceutical and Health Economics, University of Southern California School of Pharmacy, Los Angeles, CA [3]School of Pharmacy, University of Southern California, Los Angeles, CA [4]Leonard D. Schaeffer Center for Health Policy and Economics, University of Southern California, Los Angeles, CA
INTRODUCTION: In order to achieve and maintain glycemic control, patients with diabetes must receive appropriate medication therapy and learn self-management behaviors. Evidence has shown that outcomes improve when pharmacists are integrated into the care team, however the impact of pharmacists on patient knowledge about diabetes self-management behaviors has not been well-studied.
RESEARCH QUESTION OR HYPOTHESIS: Do patients who have received clinical pharmacy services (CPS) have a higher level of diabetes-related knowledge of self-management behaviors and self-reported adherence than patients who do not receive CPS?
STUDY DESIGN: Prospective survey study of adult patients with diabetes seen in a patient-centered medical home.
METHODS: The spoken knowledge in low literacy in diabetes (SKILLD) scale, a validated oral survey assessing knowledge about diabetes management, was administered to patients in the treatment group, patients who had received CPS, and compared to a control group who were not offered CPS.
RESULTS: 197 surveys were completed in the treatment population and 168 were completed in the control population. Baseline demographics were similar between groups and patients were predominantly Hispanic, female, low income, and with a mean age in the mid-50s. For the SKILLD knowledge assessment, patients in the treatment group had statistically significantly better performance on all ten knowledge questions as well as the composite score (6.2 vs. 3.9, p < 0.0001) when compared to the control group. In the treatment group 54.6% of patients knew their hemoglobin A1C goal compared to 21.3% in the control group (p < 0.001). Finally, treatment group patients self-reported fewer missed doses of oral medications (1.1 vs. 3.4, p < 0.0001) as well as fewer missed insulin doses (1.2 vs. 3.6, p < 0.001) per week. The Wilcoxon Mann-Whitney test was used for continuous variable comparison and the Chi-square test was used for categorical variable comparison.
CONCLUSION: Patients who had received care from the clinical pharmacy team had improved knowledge of diabetes self-management behaviors compared to the control population.

44. Utilization of concomitant nonopioid and nonpharmacologic therapies to opioid regimens for the management of chronic pain in an ambulatory care setting *Jacqueline Dunning, Pharm.D., R.Ph.*, Alfred Yeung, Pharm.D., R.Ph., Themio Papadopoulos, Pharm.D., R.Ph., Debra Reid, Pharm.D., BC-ADM, CDE, BCACP, Michael Conley, Pharm.D., BCACP, Thomas Matta, Pharm.D., Carla Bouwmeester, MS, Pharm.D., BCPS, BCGP, FASCP; Northeastern University, Boston, MA
INTRODUCTION: The Centers for Disease Control (CDC) published updated recommendations on prescribing opioid therapy for managing chronic pain, emphasizing the importance of concomitant nonpharmacologic and nonopioid therapies. However, minimal data is available to show the utilization of these adjunctive therapies in the treatment of chronic pain.
RESEARCH QUESTION OR HYPOTHESIS: To assess the prevalence of nonpharmacologic and nonopioid therapies in patients on chronic opioids in an ambulatory care setting.
STUDY DESIGN: An observational, multi-center study conducted at three Federally Qualified Health Centers and one Program of All-Inclusive Care for the Elderly.
METHODS: Patients on chronic Schedule II opioid therapy, receiving continuous opioid prescriptions from a provider at the health center from November 2016 to January 2017 were included. Demographics and prescription medications (opioid and nonopioid) were extracted from electronic health records. Patients or their caregivers were interviewed to obtain data on nonpharmacologic and over-the-counter therapies. Descriptive statistics were used to analyze the data.
RESULTS: Forty-four patients were included in the analysis. The majority of patients were female (72.7%) and Caucasian (81.8%), with a mean age of 67.6 years and average mean morphine equivalent (MME) of 34.3 per day. The most common opioids used were oxycodone (54.5%) and oxycodone/acetaminophen (25%) followed by hydrocodone (6.8%) and hydrocodone/acetaminophen (6.8%). All patients were utilizing nonopioid therapy and 43.2% utilized both nonpharmacologic and nonopioid therapy in conjunction with their opioid. The most common nonpharmacologic therapies were topical pain medications (75%) and non-steroidal anti-inflammatory drugs (59.1%); whereas the most common nonpharmacologic therapies were massage (20.5%), strength training (13.6%), and yoga (13.6%).
CONCLUSION: Patients on chronic opioid therapy were utilizing alternative forms of pain therapy in addition to their opioid medications as recommended by the CDC guidelines. Further studies are needed to assess pain control in these patients.

45. Impact of pharmacist-led transitions of care initiative on 30-day all-cause hospital readmissions: a single-center study *Sibyl Cherian, Pharm.D., BCPS, BCGP*[1], Amulya Uppala, Pharm.D.[2], Patrick Curtin, Pharm.D., BCPS[2]; [1]School of Pharmacy, Fairleigh Dickinson University, Florham Park, NJ [2]Department of Pharmacy, Overlook Medical Center, Summit, NJ
INTRODUCTION: Previous literature has suggested that pharmacists can play a direct role in improving transition of care (TOC) through medication reconciliation, discharge counseling and post-discharge follow-up phone calls. The purpose of this study was to examine the impact of pharmacists inpatient TOC services to patients within our Accountable Care Organization (ACO).
RESEARCH QUESTION OR HYPOTHESIS: The authors hypothesize that pharmacist-led TOC services will reduce rate of 30-day all cause readmissions.
STUDY DESIGN: This was a retrospective, single center chart review at a 500-bed community teaching medical center.
METHODS: A pharmacy quality improvement project was initiated in unit 1, a cardiology-based unit from September 2016 to November 2016 and unit 2, a general medicine/respiratory unit, from February 2017 to April 2017. Within each unit, ACO patients who received TOC services will be compared to ACO

patients who received standard of care. Pharmacy interventions include admission medication reconciliation, inpatient pharmacotherapy interventions, discharge counseling, follow-up appointment scheduling, discharge with MedAction® plan, and follow-up phone calls within 3–5 days and if necessary within 12–14 days. The primary objective is 30-day all-cause readmission rate in patients who received pharmacy TOC services in each unit. The secondary objectives are the rate of 30-day all-cause hospital reutilization and rate of 30-day medication-related hospital reutilization.

RESULTS: 30-day all-cause readmissions was 8.9% (5 of 56 patients) and 19.6% (11 of 56 patients) in the unit 1 active and control group, respectively ($p = 0.17$). Similarly, the 30-day all-cause readmissions was 11.3% (5 of 44 patients) and 16.6% (7 of 42 patients) in the unit 2 active and control groups, respectively ($p = 0.54$). All secondary objectives showed no difference between the two treatment arms.

CONCLUSION: This study demonstrates a trending decrease in 30-day readmissions in the pharmacist intervention arm compared to the standard of care. Further resources in TOC can increase the number of patients receiving pharmacy interventions and further improve 30-day readmissions.

46. The philosophy of practice of comprehensive medication management: Evaluating its definition and application in practice *Deborah L. Pestka, Pharm.D.*[1], Lindsay Sorge, Pharm.D., MPH, BCACP[2], Mary Roth McClurg, Pharm.D., MHS[3], Caitlin K. Frail, Pharm.D., MS, BCACP[2], Kylee Funk, Pharm.D., BCPS[2], Todd D. Sorensen, Pharm.D.[2]; [1]Social and Administrative Pharmacy, University of Minnesota College of Pharmacy, Minneapolis, MN [2]Pharmaceutical Care and Health Systems, University of Minnesota College of Pharmacy, Minneapolis, MN [3]UNC Eshelman School of Pharmacy, Chapel Hill, NC

INTRODUCTION: Philosophy of practice is foundational to any patient care practice as it provides a set of professional values and beliefs that guide actions and decisions in practice. Philosophy of practice is a topic that has garnered attention in other health professions, but has received little emphasis within pharmacy.

RESEARCH QUESTION OR HYPOTHESIS: (1) How do pharmacists providing comprehensive medication management (CMM) describe their philosophy of practice? (2) How do the identified components of participants' philosophy of practice compare with the tenets of a CMM philosophy of practice?

STUDY DESIGN: Qualitative content analysis.

METHODS: This study was part of a large implementation and outcomes evaluation project enrolling 35 primary care clinics delivering CMM across five states. A survey with closed and open-ended items was developed and administered online to the lead pharmacist at each participating clinic. Each participant was asked to describe their philosophy of practice, rank how well their current practice activities align with the five CMM philosophy of practice tenets, provide examples of how they carry out each tenet, and how they could improve. Responses were coded and analyzed in NVivo.

RESULTS: Thirty pharmacists completed the evaluation. A total of 12 unique codes emerged that participants used to describe their philosophy of practice. These codes were mapped to the five tenets. Only 3 (10%) participants included all five tenets in their philosophy of practice, 8 (26.7%) included four, 8 (26.7%) included three, 6 (20%) included two, and 5 (16.7%) included one tenet.

CONCLUSION: There was significant variability in how participants described their philosophy of practice and how they incorporated existing tenets. To establish consistency across the practice of CMM, pharmacists should be exposed to and reflect on the philosophy of practice of CMM to ensure their services are in alignment with the core tenets.

47. Impact of obesity shared medical appointments on weight loss and other cardiometabolic risk factors *Stephanie Yager, Pharm.D.*[1], Nayyer Varghai, M.D.[2], Jennifer Luxenburg, Pharm.D.[3], Marcie Parker, Pharm.D.[4]; [1]Department of Pharmacy, Cleveland Clinic, Cleveland, OH [2]Department of Family Medicine, Cleveland Clinic, Beachwood, OH [3]Department of Pharmacy, Louis Stoke Cleveland VA Medical Center, Cleveland, OH [4]Department of Pharmacy, Cleveland Clinic, Beachwood, OH

INTRODUCTION: More than one-third of US adults are obese. Weight loss in obese individuals reduces risk factors for diabetes and cardiovascular disease. An obesity shared medical appointment (SMA) program was designed to assist patients with weight loss. This study was designed to evaluate the effectiveness of this method of promoting weight loss.

RESEARCH QUESTION OR HYPOTHESIS: This study aimed to determine amount of weight loss over 3 months and the percent change in weight in patients participating in an obesity SMA. Additionally, the change in patients' glycolated hemoglobin (A1c), lipids, blood pressure (BP), and body mass index (BMI) and the proportion of patients achieving 5% weight loss was quantified. The correlation between the number of appointments attended and change in weight was also evaluated.

STUDY DESIGN: This was a retrospective observational study.

METHODS: Patients who attended at least 1 obesity SMA over a 9 month period were included in the study. Weight loss and other cardiometabolic risk factors were compared from the time of the patients' first SMA, 3 months after the first SMA, and the end of the study period. The changes in laboratory values and vital signs were analyzed using the paired t-test. The correlation between appointments attended and weight loss was evaluated using linear regression.

RESULTS: A total of 173 patients attended at least one obesity SMA during the study. The mean weight loss was 4.0 ± 5.1 kg (3.8%) at 3 months and 38.7% of patients achieved 5% weight loss. Patients had a significant reduction in weight ($p < 0.001$), BMI ($p < 0.001$), BP ($p = 0.003$), and A1c ($p = 0.007$). There was also a significant correlation between the number of SMA visits and weight loss ($p < 0.001$).

CONCLUSION: Patients who attended an obesity SMA lost weight and improved cardiometabolic risk factors. Obesity SMAs are a promising option to assist patients with weight loss.

48E. Evaluation of Antibiotic Prescribing for Acute Respiratory Tract Infections in the Ambulatory Care Setting Suzanne Molino, Pharm.D.[1], *Paul Stranges, Pharm.D.*[1], Susan C Bleasdale, M.D.[2], Katie Suda, Pharm.D.[1], Nancy L Shapiro, Pharm.D.[1], Alan Gross, Pharm.D.[1]; [1]University of Illinois at Chicago College of Pharmacy, Chicago, IL [2]Section of Infectious Disease, University of Illinois at Chicago, Chicago, IL

Presented at IDWeek 2017, San Diego, CA, October 4-8, 2017.

49. Fluoroquinolone use in uncomplicated cystitis in the ambulatory setting John Shilka, Pharm.D.[1], Alan Gross, Pharm.D.[1], Susan Bleasdale, M.D.[2], Katie Suda, Pharm.D.[1], Nancy L Shapiro, Pharm.D.[1], *Paul Stranges, Pharm.D.*[1]; [1]University of Illinois at Chicago College of Pharmacy, Chicago, IL [2]University of Illinois at Chicago, Chicago, IL

INTRODUCTION: IDSA guidelines recommend nitrofurantoin, trimethoprim-sulfamethoxazole, and fosfomycin as first-line agents for the treatment of uncomplicated cystitis. However, previous studies have demonstrated that up to half of patients with uncomplicated cystitis receive a fluoroquinolone. Fluoroquinolones are not first-line for cystitis secondary to concern for serious adverse events. A recent FDA safety warning announced that serious fluoroquinolone side effects outweigh the benefits for patients being treated for uncomplicated cystitis. Prescribing habits for the treatment of uncomplicated cystitis at our institution are unknown.

RESEARCH QUESTION OR HYPOTHESIS: Our objective was to determine the frequency that fluoroquinolones and other antibiotics were prescribed to women with uncomplicated cystitis at ambulatory clinics in an urban, public academic medical center.
STUDY DESIGN: A retrospective, single-center, cohort study.
METHODS: Cases of uncomplicated cystitis in women diagnosed during ambulatory clinic visits at an urban, public, academic medical center between January 1, 2015 and July 1, 2016 were identified by ICD9/10 codes. Antibiotics prescription information, patient demographics, medical history, allergies, and prescriber information were collected.
RESULTS: 647 patient visits were included and 28.3% of those visits resulted in a fluoroquinolone prescription. First-line antibiotics accounted for 65% of antibiotics with nitrofurantoin prescribed the most frequently (41.2%) followed by trimethoprim-sufamethoxazole (23.8%). Fosfomycin was not prescribed at any patient visit. Consistent with the guidelines, β-lactam antibiotics were infrequently prescribed (6.5%).
CONCLUSION: Although a majority of antibiotic use was consistent with guidelines, more than one-fourth of antibiotic use was accounted for by fluoroquinolones. This highlights potential opportunities for antimicrobial stewardship interventions, such as targeted educational interventions or audit and feedback. Continued oversight of antibiotic prescribing patterns is still warranted.

50. Prescriber adoption of an opiate standard of care MME recommendation in a federally qualified health center *Bridget Bradley, Pharm.D., BCPP*[1], Brigg Turner, Pharm.D., BCPS-AQ ID[1], Edward Saito, Pharm.D., BCACP[2]; [1]School of Pharmacy, Pacific University, HIllsboro, OR [2]School of Pharmacy, Pacific University, Hillsboro, OR
INTRODUCTION: Virginia Garcia Memorial Health Center (VGMHC) is a federally qualified health center (FQHC) whose mission is to provide primary care to underserved communities. In 2011 VGMHC began working to improve the safe prescribing of opiates with the development of an opiate standard of care which implemented a maximum morphine milligram equivalent (MME) dose of 60. Primary care is a significant area for education due to 70% of opioid analgesics being prescribed in this setting. With the release of the 2016 CDC guideline for the treatment of patients with chronic pain, the standard of care was updated and the recommended MME stayed at 60.
RESEARCH QUESTION OR HYPOTHESIS: To determine the change in MME prescribed to chronic pain patients after implementation of an opiate standard of care.
STUDY DESIGN: Retrospective interrupted time series analysis of monthly median MME prescribed from 03/01/2010 to 11/30/2016 with the pre- and post-intervention periods comprised of 16 and 64 months, respectively.
METHODS: The electronic medical record was used to identify patients 18 or older with chronic pain (defined as 3 or more consecutive monthly opiate prescriptions). Patients were excluded if they were pregnant or had a diagnosis of cancer or enrolled in palliative care or hospice. All opiate doses were converted to MME based on CDC conversion standards.
RESULTS: 1948 patients who met inclusion criteria were identified. An initial 11% reduction in median monthly MME/patient (p-value, <0.001) and an annual 9.6% (p-value, < 0.001) reduction were observed post intervention. A relative reduction of 17.8% (p-value, < 0.001) was immediately realized in percentage of patients with MME > 50/day with an annual 3.9% (p-value, <0.001) reduction following the intervention.
CONCLUSION: These findings suggest that implementation of an opiate standard of care at a federally qualified health center was effective at reducing the morphine milligram equivalent dose prescribed for chronic pain patients.

51. Assessment of pharmacist-led point of care testing and medication optimization for H. pylori and malaria on a medical mission trip to Uganda Laura A. Rhodes, Pharm.D.[1], Mariette Sourial, Pharm.D.[2], Harm Maarsingh, Ph.D.[2], *Erin C. Brannick, Pharm.D. Candidate*[1], Adwoa O. Nornoo, Ph.D.[2]; [1]UNC Eshelman School of Pharmacy, University of North Carolina at Chapel Hill, Chapel Hill, NC [2]Lloyd L Gregory School of Pharmacy, Palm Beach Atlantic University, West Palm Beach, FL
INTRODUCTION: Pharmacists receive training in medications and point of care testing (POCT) devices. Physicians and pharmacists leverage collaborative practice agreements (CPAs) to define protocols by which pharmacists modify and optimize prescription drug therapy. In theory, this framework could be applied to non-USA based medical mission clinics.
RESEARCH QUESTION OR HYPOTHESIS: A CPA enabling pharmacist-led *H. pylori* or malaria POCT and medication optimization in non-USA based medical mission clinics enables evidence-based dispensing of antimicrobial and antimalarial medications.
STUDY DESIGN: This IRB-approved, prospective study was conducted in three Ugandan villages from May 16–22, 2017.
METHODS: Patients diagnosed at the clinic with gastritis, GERD, PUD, or malaria were included. Individuals receiving *H. pylori* or malaria treatment prior to enrollment were excluded. A CPA was established between visiting pharmacists and Ugandan physicians describing allowances for pharmacist-led medication optimization. Patients were seen by a physician or nurse, received a preliminary prescription, referred for POCT and provided informed consent. A pharmacist evaluated POCT results, optimized medications, and generated a final prescription. Collected data included demographics, preliminary prescription, POCT result, and final prescription.
RESULTS: A total of 234 patients were included: *H. pylori*, n = 70 (85.7% females, mean age (±SD) 48.1 ± 17.3 years) with 0 positive POCT (0.0%); malaria, n = 164 (61.6% females, mean age (±SD) 13.8 ± 14.4 years) with 61 positive POCT (37.2%). Of 234 POCTs, 76.1% were ordered by physicians, 5.1% by nurses, and 18.8% by pharmacists. Of preliminary prescriptions, 78.6% requested pharmacy to dose. Final prescriptions were 42.7% optimized by pharmacists, 3.0% by physician or nurse, and 54.7% required no changes. After POCT, evidence-based diagnoses prevented the dispensing of ten antimicrobial prescriptions for *H. pylori*, and all 61 patients with positive malaria POCT results received appropriate weight-based treatment.
CONCLUSION: Utilization of a CPA in non-USA based medical mission clinics allowed for pharmacist-led POCT and medication optimization, resulting in evidence-based allocation of available antimicrobial and antimalarial medications.

52. Developing a tool to assess the essential components of practice management for comprehensive medication management within primary care clinics *Deborah L. Pestka, Pharm.D.*[1], Caitlin K. Frail, Pharm.D., MS, BCACP[2], Lindsay Sorge, Pharm.D., MPH, BCACP[2], Kylee Funk, Pharm.D., BCPS[2], Mary Roth McClurg, Pharm.D., MHS[3], Todd D. Sorensen, Pharm.D.[2]; [1]Social and Administrative Pharmacy, University of Minnesota College of Pharmacy, Minneapolis, MN [2]Pharmaceutical Care and Health Systems, University of Minnesota College of Pharmacy, Minneapolis, MN [3]UNC Eshelman School of Pharmacy, Chapel Hill, NC
INTRODUCTION: Significant attention has been given to developing a consistent patient care process for providing comprehensive medication management (CMM). However, little research exists that examines the necessary supports to effectively manage a CMM practice.
RESEARCH QUESTION OR HYPOTHESIS: (1) What are the essential components of CMM practice management? (2) How are these components being carried out in practice?
STUDY DESIGN: Phenomenographic case study design.

METHODS: CMM pharmacists from 36 participating primary care clinics across five states were divided into three similar cohorts. Semi-structured interviews were carried out with pharmacists from cohort one. Participants were asked to describe what they consider the essential components of CMM practice management and what these components look like in their practice. Themes were defined by two investigators and coded using NVivo. A descriptive practice assessment tool was developed from emergent themes. Using the think-aloud method, participants in cohorts two and three completed sections of the tool while verbalizing their thought process and providing feedback. This process led to simultaneous development and refinement of the tool as well as achieving content validity. Throughout tool development, a series of four focus groups with CMM managers occurred to obtain their perspectives on the essential components of practice management and their feedback on the tool.
RESULTS: Five domains of CMM practice management emerged: (1) organizational support, (2) care team engagement, (3) care delivery processes, (4) evaluation of CMM program, and (5) ensuring consistent and quality care. Each domain consists of two to three components for a total of 13 components. Each component contains several questions which form a 78-item descriptive practice management assessment tool.
CONCLUSION: This is the first study to develop a framework for the practice management of CMM. Understanding CMM practice management and the components that define it is critical to enhancing and expanding the practice of CMM.

53. Assessing the state of comprehensive medication management in a sample of primary care clinics *Jordan Mendkoff, B.A.*[1], Deborah L. Pestka, Pharm.D.[2], Caitlin K. Frail, Pharm.D., MS, BCACP[3], Lindsay Sorge, Pharm.D., MPH, BCACP[3], Kylee Funk, Pharm.D., BCPS[3], Jennifer Carroll, M.D. MPH[4], Todd D. Sorensen, Pharm.D.[3], Mary Roth McClurg, Pharm.D., MHS[5]; [1]University of Minnesota, Minneapolis, MN [2]Social and Administrative Pharmacy, University of Minnesota College of Pharmacy, Minneapolis, MN [3]Pharmaceutical Care and Health Systems, University of Minnesota College of Pharmacy, Minneapolis, MN [4]University of Colorado, Denver, CO [5]UNC Eshelman School of Pharmacy, Chapel Hill, NC
INTRODUCTION: Comprehensive medication management (CMM) is a standard of care that ensures each patient's medications are appropriate, effective, safe, and being taken as intended. Many primary care clinics offer this service, but it is unclear how closely providers adhere to this definition of CMM.
RESEARCH QUESTION OR HYPOTHESIS: What is the state of CMM across a sample of primary care clinics?
STUDY DESIGN: Exploratory descriptive survey.
METHODS: This study was part of a large implementation and outcomes evaluation project enrolling 40 primary care clinics across five states organized into three cohorts (University of North Carolina, University of Minnesota, American Academy of Family Physicians National Research Network). To be included in this study, all sites self-reported delivering CMM services as defined by the ACCP Standards of Practice for Clinical Pharmacists and the Patient-Centered Primary Care Collaborative. A 70-question demographic and 80-question baseline survey was administered to the lead pharmacist of each participating practice site. Data were analyzed descriptively and using Chi-square ($p < .05$) in Microsoft Excel.
RESULTS: Pharmacists from all 40 participating clinics completed the surveys. Among participants, 31 (77.5%) stated that throughout the course of working with a CMM patient they always assess the indication of every medication, 24 (60%) always assess effectiveness, 25 (62.5%) always assess safety, and 27 (67.5%) always assess adherence. There were no statistically significant differences among cohorts in delivering the patient care process except always assessing effectiveness ($p = .03$) and employing a systematic process for categorizing medication-related problems ($p < .001$).
CONCLUSION: These data suggest that the degree to which the practice sites carry out the CMM patient care process varies within and among cohorts. Further research is needed to address these gaps in order to advance CMM services and optimize medication use.

55E. The Impact of a Pharmacist-Led Transition of Care Clinic Karen Francoforte, Doctorate of Pharmacy; Florida Hospital East Orlando, Orlando, FL
Presented at the Third National Primary Care Ambulatory Patient Safety Conference in Research and Education, Bethesda, MD, February 23-24, 2017.

Cardiovascular

56E. Patient Navigator Team Approach Successfully Reduces 30-Day Heart Failure Readmission Rate *Katherine Di Palo, Pharm.D.*, Manaf Assafin, M.D., Wanda Mojica, RN, Ileana Piña, M.D., MPH; Montefiore Medical Center, Bronx, NY
Presented at the American College of Cardiology Scientific Sessions, Washington DC, March 17-19, 2017.

57E. Interleukin-1 Blockade in Recently Decompensated Systolic Heart Failure: the REcently Decompensated Heart failure Anakinra Response Trial (REDHART) *Benjamin Van Tassell, Pharm.D.*[1], Leo Buckley, Pharm.D.[1], Justin Canada, MS[1], Salvatore Carbone, MS[1], Cory Trankle, M.D.[1], Claudi Oddi Erdle, RN[1], Nayef Abouzaki, M.D.[1], Dave Dixon, Pharm.D.[1], Dinesh Kadariya, M.D.[1], Sofanit Dessie, M.D.[1], Sanah Christopher, M.D.[1], Hayley Billingsley, BS[1], Jessica Regan, M.D.[1], Amit Bhatnagar, M.D.[1], Michele Viscusi, M.D.[1], Ross Arena, Ph.D.[2], Edward Lesfnefsky, M.D.[1], Antonio Abbate, M.D., Ph.D.[1]; [1]Virginia Commonwealth University, Richmond, VA [2]University of Illinois-Chicago, Chicago, IL
Presented at the 4th World Congress on Acute Heart Failure, Paris, France, April 29 - May 2, 2017.

58E. Evaluation of warfarin requirements in hospitalized, obese patients admitted with a therapeutic INR *Katie B. Tellor, Pharm.D., BCPS*, Amanda C. Bultas, Pharm.D., Steffany N. Nguyen, Pharm.D., Anastasia L. Armbruster, Pharm.D., BCPS, Nicholas A. Greenwald, Pharm.D. Candidate, Abigail M. Yancey, Pharm.D., FCCP, BCPS; St. Louis College of Pharmacy, St. Louis, MO
Presented at American College of Clinical Pharmacy Virtual Poster Symposium, May 17, 2017.

59. Evaluation of inpatient dosing requirements in obese patients newly initiated on warfarin *Katie B. Tellor, Pharm.D., BCPS*, Steffany N. Nguyen, Pharm.D., Amanda C. Bultas, Pharm.D., Anastasia L. Armbruster, Pharm.D., BCPS, Nicholas A. Greenwald, Pharm.D. Candidate, Abigail M. Yancey, Pharm.D., FCCP, BCPS; St. Louis College of Pharmacy, St. Louis, MO
INTRODUCTION: Despite decades of experience with initiating warfarin in hospitalized patients, the impact of body weight on warfarin dosing remains unclear. One study found a statistically significant difference in the percentage of normal weight patients discharged with a therapeutic INR compared to obese and morbidly obese patients, and a difference in average daily dose (ADD) between weight classifications to achieve a therapeutic INR.
RESEARCH QUESTION OR HYPOTHESIS: Is there a difference in the ADD in hospitalized patients initiated on warfarin, stratified by BMI?

STUDY DESIGN: Retrospective chart review.
METHODS: Patients were included if initiated on warfarin during the index hospitalization (INR goal 2.0–3.0). Exclusion criteria included: age <18 years, pregnancy, orthopedic thromboprophylaxis, and <4 days of therapy. The primary outcome was mean ADD of patients with a therapeutic INR at discharge based on body weight classification: underweight (BMI <18 kg/m^2), normal/overweight (BMI 18–29.9 kg/m^2), obese (BMI 30–39.9 kg/m^2), and morbidly obese (BMI ≥ 40 kg/m^2). Data was extracted from two community hospitals in reverse chronologic order from July 2015 through June 2013 until both institutions evaluated 100 patients in each BMI classification or until all patients had been evaluated.
RESULTS: A total of 379 patients were included in the analysis (9 underweight, 166 normal/overweight, 152 obese, 52 morbidly obese). Overall, 190 patients had a therapeutic INR on discharge (88.9% underweight, 52.1% normal/overweight, 44.1% obese, 60.4% morbidly obese, $p = 0.02$). There was a statistically significant difference in ADD between groups as determined by one-way ANOVA ($p = 0.015$). A Tukey post hoc test revealed a statistically significantly higher ADD in the morbidly obese (5.9 mg) compared to underweight patients (3.5 mg, $p < 0.05$). There were no statistically significant differences between the other groups or days to therapeutic INR.
CONCLUSION: Morbidly obese patients being initiated on warfarin may require a higher ADD to achieve a therapeutic INR.

60. Real-world use of PCSK-9 inhibitors by early adopters: cardiovascular risk factors, statin co-treatment, and short-term adherence in routine clinical practice Kathleen A. Fairman, MA[1], *Lindsay E. Davis, Pharm.D., BCPS, ASH-CHC*[2], David A. Sclar, B.Pharm., Ph.D.[1]; [1]Department of Pharmacy Practice, Midwestern University, College of Pharmacy-Glendale, Glendale, AZ [2]Department of Pharmacy Practice, Midwestern University College of Pharmacy, Glendale, AZ
INTRODUCTION: Inconsistency of real-world medication use with labeled indications may affect cost and clinical value of pharmacotherapy. Proprotein convertase subtilisin/kexin-9 (PCSK-9) inhibitors are labeled for use with statins to reduce low-density lipoprotein cholesterol in patients with atherosclerotic cardiovascular disease (ASCVD) or familial hypercholesterolemia (FH).
RESEARCH QUESTION OR HYPOTHESIS: Assess consistency with labeled indications and treatment persistency for early (first 5 post-launch months) adopters of PCSK-9 inhibitor pharmacotherapy.
STUDY DESIGN: Retrospective analysis of commercially insured cohorts derived from the Truven Health MarketScan® database.
METHODS: Subjects were aged 18–64 years, initiated PCSK-9 inhibitor or highest-intensity statin (rosuvastatin 40 milligrams [mg] or atorvastatin 80 mg daily) pharmacotherapy from August-December 2015, and were enrolled throughout 2015 and during separate baseline (pre-treatment) periods of 6 and 18 months. Baseline ASCVD, FH, and ASCVD events (myocardial infarction, transient ischemic attack, and cerebrovascular occlusion) were measured. Persistency was measured through December 2015 for subcohorts of patients initiating treatment in August-September 2015.
RESULTS: Baseline disease rates were higher for patients treated with PCSK-9 inhibitors ($n = 390$) compared with highest-intensity statins ($n = 26{,}306$): ASCVD (68.5% vs. 33.4%, respectively); FH (39.7% vs. 15.5%); both $p < 0.001$. In the 18-month pre-treatment period, 35.6% of PCSK-9 inhibitor-treated patients had ≥1 ASCVD event, and 87.9% had a labeled indication. Rates of 60-day nonpersistency for PCSK-9 inhibitors and highest-intensity statins were 33.3% and 39.8%, respectively ($p = 0.207$). During PCSK-9 inhibitor pharmacotherapy, 33.8% of patients had evidence of statin supply and, of those initiating treatment in August-September, 40.9% filled ≥1 statin prescription. Of those with sustained pre-treatment statin use, 34.8% had no statin supply during PCSK-9 inhibitor pharmacotherapy.
CONCLUSION: Among early-adopting PCSK-9 inhibitor-treated patients, the off-label diagnosis rate was 12%; a majority lacked statin co-treatment; and one-third filled prescriptions for ≤60 days. Inconsistency with labeled uses may reflect prescriber/patient decisions, health-insurance coverage determinations, or statin intolerance not reported on claims.

61. Impact of a pharmacist-driven transition of care program for patients with acute coronary syndromes *Emma Gorman, Pharm.D.*[1], Ashley Woodruff, Pharm.D.[2], Jessica Costello, Pharm.D. Candidate 2018[3], Geoffrey Brown, Pharm.D. Candidate 2018[3]; [1]Department of Pharmacy, Buffalo General Medical Center, Buffalo, NY [2]Department of Pharmacy Practice, University at Buffalo School of Pharmacy and Pharmaceutical Sciences, Buffalo, NY [3]University at Buffalo School of Pharmacy and Pharmaceutical Sciences, Buffalo, NY
INTRODUCTION: Pharmacist transition of care (TOC) intervention has been shown to increase patient understanding and adherence to medications and decrease hospital readmissions in high-risk patients. A pharmacist TOC service was implemented at Buffalo General Medical Center (BGMC) in July 2016 for patients admitted to the cardiac care team. These patients received pharmacist conducted medication reconciliation, discharge counseling, and post-discharge phone call.
RESEARCH QUESTION OR HYPOTHESIS: The purpose of this study was to determine if pharmacist TOC intervention would decrease readmission rates for patients admitted with acute coronary syndromes.
STUDY DESIGN: This was a retrospective, pre-post observational cohort study.
METHODS: This study was conducted at Buffalo General Medical Center. Patients with an acute coronary syndrome (ACS) admitted to the cardiac care team who received pharmacist TOC intervention were matched to a historical cohort who received no pharmacist TOC intervention. Patients in each cohort were matched for age, gender, and ACS type. The co-primary outcomes were 30-day and 90-day all-cause readmission rates. Secondary outcomes included cardiovascular-related readmission at 30 days. Patients were excluded if they were discharged to a post-acute care facility, left against medical advice, or had scheduled CABG surgery within 30 days.
RESULTS: A total of 300 patients were included in the study (150 patients per group). There was a statistically significant reduction in all-cause readmissions at 90 days in the pharmacist TOC group (24.7% vs. 13.3%, $p = 0.0124$) and a non-significant reduction in all-cause readmissions at 30 days in the pharmacist TOC group (14.6% vs. 9.3%, $p = 0.1552$). There was a statistically significant reduction in cardiovascular-related readmissions at 30 days in the pharmacist TOC group (11.3% vs. 4.7%, $p = 0.0333$).
CONCLUSION: The implementation of a pharmacist transition of care service targeting patients with acute coronary syndromes was associated with reductions in all-cause and cardiovascular-related readmissions.

62E. Calcium/calmodulin-dependent protein kinase II regulates KCNQ1 to reduce the slow component of the delayed rectifier potassium current, IKs *Tyler Shugg, Pharm.D.*[1], Minghai Shao, Ph.D.[1], Aarti Chawla, Ph.D.[2], Michael Rubart-von der Lohe, M.D.[3], Andy Hudmon, Ph.D.[2], Brian Overholser, Pharm.D.[1]; [1]Department of Pharmacy Practice, Purdue University, Indianapolis, IN [2]Department of Biochemistry and Molecular Biology, Indiana University School of Medicine, Indianapolis, IN [3]Herman B. Wells Center for Pediatric Research, Indiana University School of Medicine, Indianapolis, IN
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63. Bariatric surgery's effect on ticagrelor pharmacodynamics *Nicholas Norgard, Ph.D. Pharm. D.*, Pharm. D,[1],Qing Ma,[2], Scott Monte,, Pharm. D,[3]; [1]InternalMedicine, University of Missouri Kansasy City School of Medicine, Kansas City, MO [2]Translational Pharmacology Core, Center of Excellence in Bioinformatics and Life Sciences, School of Pharmacy and Pharmaceutical Sciences, University at Buffalo, Buffalo, NY [3]Department of Pharmacy Practice, University at Buffalo, School of Pharmacy and Pharmaceutical Sciences, Buffalo, NY

INTRODUCTION: Obesity-related, pathogenic factors that increase platelet reactivity may result in a less-than-expected pharmacodynamic effect of antiplatelet drugs. It is unknown whether bariatric surgery can reverse the negative impact obesity has on antiplatelet pharmacodynamics.

RESEARCH QUESTION OR HYPOTHESIS: This study investigated ticagrelor pharmacodynamics in obese patients and whether bariatric surgery alters the ticagrelor effect.

STUDY DESIGN: This was a dose-response pharmacodynamic study to define the inhibitory capacity of ticagrelor.

METHODS: Blood samples were drawn from obese patients 6 weeks before and 12 weeks after bariatric surgery as well as from healthy, normal weighted subjects. Whole blood impedance platelet aggregability induced by 20 micromolar adenosine diphosphate was measured in the presence of increasing concentrations of ticagrelor: 0, 1, 3, 5, 10, 30, 50, 100 nanomolar (nM). Nonlinear regression was used to calculate an IC50.

RESULTS: The IC50 of ticagrelor was 34.0 nM in obese patients (n = 8) before surgery. After bariatric surgery, the IC50 was reduced to 23.1 nM. Normal weighted subjects (n = 5) had the lowest IC50 at 14.5 nM.

CONCLUSION: Bariatric surgery may improve the ticagrelor pharmacodynamic response that was blunted by obesity. The results justify the need for a larger, confirmatory study.

64E. Intravenous amiodarone for prevention of atrial fibrillation following esophagectomy: A propensity score-matched analysis *James Tisdale, Pharm.D.*[1], Heather Jaynes, MSN[1], Matthew Watson, Pharm.D.[2], Andi Corya, Pharm.D.[3], Kenneth Kesler, M.D.[4]; [1]College of Pharmacy, Purdue University, Indianapolis, IN [2]Wake Forest Baptist Health, Winston-Salem, NC [3]Indiana University Health, Indianapolis, IN [4]Indiana University, Indianapolis, IN

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65. Diagnoses of cardiovascular disease or addiction in U.S. adults treated for ADHD with stimulants or atomoxetine: is use consistent with product labeling? Lindsay E. Davis, Pharm.D., BCPS, ASHCHC[1], *Kathleen A. Fairman, MA*[2], Alyssa M. Peckham, Pharm.D., BCPP[2], David A. Sclar, B.Pharm., Ph.D.[2]; [1]Department of Pharmacy Practice, Midwestern University College of Pharmacy, Glendale, AZ [2]Department of Pharmacy Practice, Midwestern University, College of Pharmacy-Glendale, Glendale, AZ

INTRODUCTION: Among U.S. adults, utilization of pharmacotherapy for attention-deficit hyperactivity disorder (ADHD) has increased >9-fold since 1995–1996. U.S. Food and Drug Administration (FDA) product labels indicate that stimulants and atomoxetine should not be used by patients with serious cardiovascular disease. No published study has assessed cardiovascular histories of adults using these medications in routine clinical practice, although prevalence of cardiovascular disease generally increases with age.

RESEARCH QUESTION OR HYPOTHESIS: Assess prevalence of cardiovascular diseases and other potential contraindications (psychoses, addiction) among adults treated with stimulants or atomoxetine for ADHD.

STUDY DESIGN: Retrospective analysis of cohorts derived from the Truven Health MarketScan® database.

METHODS: Subjects filled ≥1 prescription for atomoxetine, amphetamine, or methylphenidate in 2014–2015; were aged 18–64 years; commercially insured during the 12 months prior to pharmacotherapy initiation; and diagnosed with ADHD on ≥2 medical claims. Diagnoses and medical procedures were measured during the12-month pre-pharmacotherapy period. A summary measure of serious cardiovascular disease comprised cardiomegaly, cardiomyopathy, congestive heart failure, myocardial infarction, cerebrovascular occlusion, pacemaker, or valvular disorder.

RESULTS: Within the sample overall (n = 91,588), most individual cardiovascular diagnoses were rare (≤0.5% prevalence); only 2.0% of patients had ≥1 diagnosis indicating serious disease. However, cardiovascular disease prevalence increased monotonically with age. Of patients aged 55–64 years (n = 5,237), 7.2% had serious disease; 15.9% had any cardiovascular disease (serious disease, arrhythmia, congenital heart defect, or atherosclerotic cardiovascular disease); and 1.9% were hospitalized with ≥1 cardiovascular disease diagnosis. Of patients treated with stimulants (n = 87,167), 18.6% were diagnosed with addiction and 4.1% with bipolar disorder.

CONCLUSION: Although cardiovascular disease is generally rare among adults using ADHD medication, a substantial minority of adults aged 55–64 years have cardiovascular histories inconsistent with FDA labels. Nearly one-fifth of adults treated for ADHD with stimulants have a recent diagnosis of addiction. Future research should assess possible harms associated with potentially contraindicated uses.

66. Venous thromboembolism prophylaxis and risk in the inpatient and outpatient continuum of care among acutely ill medical patients in the US *Alpesh Amin, M.D.*[1], W Richey Neuman, M.D., MPH[2], Melissa Lingohr-Smith, Ph.D.[3], Brandy Menges, Ph.D.[3], Jay Lin, Ph.D., MBA[3]; [1]UC Irvine College of Medicine, Irvine, CA [2]Portola Pharmaceuticals, South San Francisco, CA [3]Novosys Health, Green Brook, NJ

INTRODUCTION: Among hospitalized acutely ill patients, the risk for venous thromboembolism (VTE) is high.

RESEARCH QUESTION OR HYPOTHESIS: What is the frequency of VTE prophylaxis among at-risk patients and VTE risk during hospitalization and in the outpatient continuum of care?

STUDY DESIGN: Retrospective claims analysis.

METHODS: Acutely ill hospitalized patients (i.e., with heart failure, respiratory diseases, ischemic stroke, cancer, infectious diseases, and rheumatic diseases) were identified from the MarketScan databases (1/1/2012–6/30/2015). Patients were required to have 6 months of continuous insurance coverage prior to (baseline period) and after (follow-up period) the index hospitalization. Proportions of patients receiving inpatient and outpatient VTE prophylaxis were determined. Risk for VTE events after the index admission was determined using Kaplan-Meier analysis.

RESULTS: Of the population of acutely ill patients (n = 17,895, mean age: 58.4 years) most were hospitalized for infectious diseases (40.6%), followed by respiratory diseases (31.0%), cancer (10.7%), heart failure (10.4%), ischemic stroke (6.4%), and rheumatic diseases (0.9%). Average index hospital length of stay was 5 days. Of those with inpatient prophylaxis (38.2%, n = 6,843), 76.7% received enoxaparin only; 15.2% warfarin only; 5.3% enoxaparin and warfarin; and approximately 2% a direct oral anticoagulant (DOAC) only. In the outpatient setting, 9.7% (n = 1,738) of patients received VTE prophylaxis, among whom most received warfarin only (43.8%); 13.7% received a DOAC only; 10.1% enoxaparin only; 7.6% enoxaparin and warfarin; and 24.8% other types of prophylaxis. Among the entire study population, 59.1% (n = 10,581) did not receive any VTE prophylaxis and only 7.1% (n = 1,267) received both inpatient and outpatient VTE prophylaxis. VTE event risk in the inpatient and outpatient continuum of care remained elevated up to 30–40 days after hospital admission.

CONCLUSION: Despite significant VTE risk extending into the post-hospitalization period, only a small portion of at-risk patients (7.1%) received VTE prophylaxis in both the inpatient and outpatient continuum of care.

67. Candesartan as a potential protective agent against Doxorubicin cardiomyopathy in rats *Nancy Younis, Ph.D.*; Department of Pharmaceutical Sciences, King Faisal University, Al Ahsa, Saudi Arabia

INTRODUCTION: Doxorubicin (DOX) is an anthracycline antitumor agent; anthracycline chemotherapy in cancer can cause severe cardiomyopathy leading to heart toxicity. Recently, angiotensin-converting enzyme inhibitors have been shown to be effective in the treatment of such toxicity.

RESEARCH QUESTION OR HYPOTHESIS: The purpose of this study was to investigate the effects of angiotensin II type-1 receptor antagonist (candesartan) in a rat model of doxrubcicn-induced cardiomyopathy.

METHODS: Male Sprague Dawley rats were distributed into four groups. Group 1 represented the control, while group 2 was the Candesartan group. In group 3, DOX was given (intraperitoneally, 3 mg/kg/ every other day, for 2 weeks) alone, while group 4 received a combination of Candesartan (200 mg/kg, orally) and DOX same period. DOX induced changes were assessed by recording changes in in electrocardiogram, heart rate, arterial pressure indices, cardiac enzymes and enzymatic antioxidants activities. Graph pad prism software was used for statistical analysis, employing Student's *t*-test, one way ANOVA then Dunnet Post-hoc test.

RESULTS: DOX augmented QTc, QRS interval, deceased heart rate and increased arterial pressure. Furthermore, DOX significantly augmented cardiac indicator enzymes cTnI, aspartate aminotransferase (AST), alkaline phosphatase (ALP) and alanine aminotransferase (ALT) as related with normal group. Moreover; DOX increased lipid peroxidation and declined activities of enzymatic antioxidants (glutathione reductase, superoxide dismutase, glutathione peroxidase, and glutathione-S-transferase) in the myocardium. Treatment with Candesartan significantly ($p < 0.05$) decreased QTc, QRS interval thus, reversing the changes observed in ECG. Moreover, treatment with Candesartan ameliorated heart rate and arterial pressure indices abnormalities induced by DOX. Furthermore; treatment with Candesartan lead to a dramatically fall in cardiac indicator enzymes. Candesartan increased the antioxidant enzymes activities and diminished myocardial lipid peroxidation.

CONCLUSION: These results suggest that Candesartan has the potential of mitigating cardiac changes induced by the treatment with DOX.

68. Effects of oral thiamine on exercise tolerance and quality of life in older adults with acute heart failure *Rachel Comer, Pharm.D., M.S., BCGP*[1], Laila Hammer, RD[2], Kimberly Hayashi, Pharm.D.[1], Jeffery Spray, Pharm.D., MHA, BCPS, BCCCP[2], Jason Call, M.D., FACC[3], Marcia Brackbill, Pharm.D., BCPS[1]; [1]Bernard J. Dunn School of Pharmacy, Shenandoah University, Winchester, VA [2]Winchester Medical Center, Winchester, VA [3]Winchester Cardiology and Vascular Medicine, Winchester, VA

INTRODUCTION: Thiamine is an important metabolic cofactor obtained through diet. Deficiency risk factors include malnutrition, older age, alcohol use, frequent hospitalizations, and diuretic use, while renal insufficiency may be protective. Deficiency can lead to "wet" beriberi, characterized by low vascular resistance, heart failure, lactic acidosis, and peripheral edema. Increasing diuretic doses may lead to deficiency through urinary losses and subsequent heart failure exacerbation.

RESEARCH QUESTION OR HYPOTHESIS: To determine the difference in exercise tolerance and health-related quality of life (HRQOL) in subjects taking thiamine supplementation in addition to standard heart failure treatments and standard treatment without thiamine.

STUDY DESIGN: Single-center, randomized, open-label, crossover study.

METHODS: Adults ≥ 65 years of age admitted to a 455-bed community hospital between December 2015 and January 2017 with a primary admission diagnosis of heart failure and chronic, high dose loop diuretic use were enrolled. Subjects were randomized to 100 mg thiamine twice daily or no thiamine for 6 weeks and then crossed over to the other study arm for 6 additional weeks. At both 6 and 12 week follow-up, exercise tolerance was assessed with the 6-minute walk test (6MWT) and HRQOL was assessed with the Kansas City Cardiomyopathy Questionnaire (KCCQ).

RESULTS: Of the 46 subjects enrolled, 14 completed the study. Subjects with HFrEF had higher brain natriuretic peptide (BNP) levels, lower left ventricular ejection fractions (LVEF), lower estimated glomerular filtration rates (eGFR), and lower thiamine levels. There was no difference in distance walked on the 6MWT or any HRQOL measurements between the two study arms. When evaluating by heart failure type, HFrEF subjects reported lower levels of fatigue during the 6MWT when taking thiamine compared to not taking thiamine.

CONCLUSION: Thiamine supplementation did not increase HRQOL nor distance walked, but may improve symptoms of fatigue in HFrEF patients.

69. Intensive blood pressure control in patients with and without type 2 diabetes mellitus: An analysis of SPRINT and ACCORD BP *Leo Buckley, Pharm.D.*[1], Dave Dixon, Pharm.D.[1], George Wohlford, Pharm.D.[1], Dayanjan Wijesinghe, Ph.D.[1], William Baker, Pharm.D., FCCP, FACC, FAHA[2], Benjamin Van Tassell, Pharm.D.[1]; [1]Virginia Commonwealth University, Richmond, VA [2]University of Connecticut School of Pharmacy, Storrs, CT

INTRODUCTION: The SPRINT study supports an intensive systolic blood pressure (SBP) goal of <120 mm Hg for high-risk patients with hypertension but excluded those with type 2 diabetes mellitus (T2DM). In the ACCORD study, intensive BP control did not benefit patients with T2DM. Evidence to guide pharmacists in the management of hypertension and T2DM is limited.

RESEARCH QUESTION OR HYPOTHESIS: Does intensive BP control exert differential effects on cardiovascular events in patients with and without T2DM?

STUDY DESIGN: Post-hoc analysis of two randomized, controlled trials.

METHODS: Cohort 1 included higher-risk ACCORD participants who would meet criteria for SPRINT (clinical/subclinical cardiovascular disease, chronic kidney disease, age≥75 years, Framingham risk score≥15%) if not for T2DM. ACCORD participants in the intensive glucose control arm (A1c <6.0%) were excluded for consistency with current guidelines and due to increased harm with intensive glucose control. Cohort 2 pooled "SPRINT-eligible" ACCORD participants and SPRINT participants. We utilized Cox proportional hazards regression to compare time-to-event between intensive and standard (<140 mm Hg) SBP control. P-interaction values were used to compare effect heterogeneity according to T2DM status.

RESULTS: Intensive SBP control significantly reduced the composite of cardiovascular death, nonfatal myocardial infarction and nonfatal stroke compared to standard BP control in higher-risk "SPRINT-eligible" ACCORD participants (hazard ratio=0.69; 95% confidence interval=0.51–0.93; $p < 0.001$). Intensive BP control was not beneficial in lower-risk ACCORD participants who were ineligible for SPRINT ($p = 0.93$). In the pooled cohort, intensive BP control reduced cardiovascular outcomes (hazard ratio=0.73; 95% confidence interval=0.62–0.87; $p < 0.001$) and the effect was not different between participants with and without T2DM (p-interaction=0.62).

CONCLUSION: In high-risk T2DM patients receiving a contemporary glucose control strategy, intensive BP control significantly reduced the risk of cardiovascular event compared to standard BP control. These findings support the use of a more stringent BP control strategy in select high-risk T2DM patients.

70. Discontinuation of guideline-directed medical therapies in Veterans hospitalized with heart failure *Serena Cheng, Pharm.D.*[1], Felix K. Yam, Pharm.D., MAS, BCPS[2]; [1]VA San Diego Healthcare System, San Deigo, CA [2]Skaggs School of Pharmacy and Pharmaceutical Sciences, University of California, San Diego,, La Jolla, CA

INTRODUCTION: Patients hospitalized for heart failure (HF) exacerbation often have worsening renal function or hemodynamic compromise leading to the temporary discontinuation of guideline-directed medical therapies (GDMT) such as renin-angiotensin-aldosterone (RAAS) inhibitors or beta-blockers (BB's).

RESEARCH QUESTION OR HYPOTHESIS: The extent to which withheld GDMT's in this patient population is restarted after hospitalization is unknown. The aim of this study was to evaluate the incidence of GDMT discontinuation during HF hospitalization. We hypothesized that patients with GDMT's withheld at discharge would have reduced GDMT use at 60 days post-discharge.

STUDY DESIGN: This was an observational, retrospective cohort study that included Veterans hospitalized for HF at VA San Diego Healthcare System between Jan 1, 2012 to Dec 31, 2015.

METHODS: Veterans were included if they had HF with reduced ejection fraction and were prescribed GDMT prior to hospital admission. We compared the rates of GDMT use at 60 days post-hospital discharge in patients who were discharged on GDMT and those who had their GDMT withheld at discharge.

RESULTS: Two-hundred and eighty four patients met criteria for inclusion in this study. Fifty-five (19%) patients had at least one of their GDMT withheld at discharge. At sixty days post-discharge, 19 (45%) of these patients were restarted on RAAS therapy and 5 (38%) on BB therapy. Patients with GDMT withheld at discharge were less likely to be restarted on GDMT at 60 days compared to patients who were discharged from the hospital on GDMT ($p < 0.001$).

CONCLUSION: Temporary discontinuation of GDMT following HF hospitalization is common and is associated with lower rates of GDMT use at 60 days post-discharge. These results suggest that there is opportunity for improving post-discharge reinitiation of life-saving GDMT. Larger studies are needed to evaluate strategies aimed at improving GDMT reinitiation post-discharge.

71. Impact of a bedside medication delivery service on 30-day readmission in cardiology patients *David Cordwin, Pharm.D.*, Donald G. Klepser, Ph.D., M.B.A., Paul Dobesh, Pharm.D., FCCP, BCPS; College of Pharmacy, University of Nebraska Medical Center, Omaha, NE

INTRODUCTION: Cardiology diseases are among the largest contributor to 30-day readmissions. Lack of understanding of discharge instructions and failure to pick up medications post-discharge are known causes of readmissions. A pharmacist-provided bedside medication delivery service that provides education before discharge may help increase adherence and decrease 30-day readmissions.

RESEARCH QUESTION OR HYPOTHESIS: A bedside medication delivery and education service will help decrease 30-day readmissions in cardiology patients.

STUDY DESIGN: Retrospective, medical record review.

METHODS: Medical records of patients admitted to our institution's cardiology unit between 6/1/2016 and 7/31/ 2016 were reviewed. Patients were included if they were asked to participate in the "meds to beds" program and were not transfers from outside hospitals. Data collection included reason for admission, days to readmission, co-morbid states, prior and discharge medication therapy. The primary endpoint was the 30-day readmission rate between patients that entered the "meds to beds" program compared to patients who chose not to participate. The Chi squared test was used to compare groups.

RESULTS: A total of 93 patients were included. The mean age was 62 years, 69% were male, 81% were Caucasian. Overall, there was no difference in 30-day readmissions in patients participating compared to those who did not (30% vs. 39%; $p = 0.277$). There was also no difference found when separating patients by admitting diagnosis, co-morbid diseases, or prior medication regimen. The program did produce a difference in the 30-day readmission rate when a new prescription for a beta-blocker (13% vs. 60%; $p = 0.005$), P2Y12 inhibitor (10% vs. 33%; $p = 0.034$), or aspirin (13% vs. 67%; $p = 0.016$) was given at discharge.

CONCLUSION: In our analysis, the bedside medication delivery service did not help reduce overall 30-day readmissions. The program did help reduce 30-day readmissions in patients receiving new prescriptions for beta-blockers, P2Y12 inhibitors, and aspirin. Larger numbers may be needed to impact overall 30-day readmissions.

72. Analysis of VerifyNow P2Y12 testing at an urban hospital system *Carrie Oliphant, Pharm.D., FCCP, BCPS-AQ Cardiology, AACC*[1], Ashley Covert, Pharm.D.[1], Megan Van Berkel, Pharm.D., BCPS[1], Lydia Hutchison, Pharm.D., BCPS, BCGP[1], Cortney Swiggart, Pharm.D.[2]; [1]Department of Pharmacy, Methodist University Hospital, Memphis, TN [2]Methodist Healthcare, Memphis, TN

INTRODUCTION: The VerifyNow P2Y12™ assay is a commercially available platelet function test used to assess response to $P2Y_{12}$ inhibitors. Although routine testing is not generally supported by guidelines, there are several clinical scenarios where testing may be useful. High on treatment platelet reactivity (HTPR) within the cardiovascular population has been defined as a platelet reactivity unit (PRU) of 208 or greater. The primary goal of this study was to characterize VerifyNow P2Y12™ assay testing in a real-world setting and identify opportunities for education regarding test interpretation.

RESEARCH QUESTION OR HYPOTHESIS: How is VerifyNow P2Y12™ testing being utilized within a large healthcare system?.

STUDY DESIGN: Multisite, retrospective study.

METHODS: A retrospective chart review of VerifyNow P2Y12™ test results from four adult hospitals over a 2 year period was conducted. Reported noncompliance with outpatient $P2Y_{12}$ inhibitors and glycoprotein IIb/IIIa inhibitor use before testing were defined exclusions. The primary objective was to describe VerifyNow P2Y12™ testing indications. Secondary outcomes included evaluation of physician response to test results in the Acute Coronary Syndrome (ACS)/Percutaneous Coronary Intervention (PCI) population and defining the role of testing prior to Coronary Artery Bypass Grafting (CABG).

RESULTS: A total of 474 test results were analyzed ($n = 44$ ACS/PCI; $n = 60$ CABG; $n = 94$ other surgeries; $n = 125$ neurointerventional procedures; $n = 151$ other indications). Within the ACS/PCI population, 18 HTPR results were identified, with the following responses: change to alternative $P2Y_{12}$ inhibitor ($n = 5$), loading dose administration ($n = 3$), agent discontinued ($n = 2$) and no change ($n = 8$). One-quarter of the testing done prior to CABG surgery resulted in postponement.

CONCLUSION: The VerifyNow P2Y12™ assay is being used in a wide variety of indications within our hospital system. Results from this study have highlighted an area for provider education regarding test interpretation in the ACS/PCI population. Additionally, a large number of tests were performed in the neurointerventional population warranting further investigation.

73. Remote medication management: Continuous specialty pharmacist review to safely optimize HF medications in the rural community setting *Harleen Singh, Pharm.D.*[1], Melissa Smith, Pharm.D.[1], Kim Vo, Pharm.D.[1], Chloe Nguyen, BS[1], Cindy Quale, PA[2], Jessina C. McGregor, Ph.D.[1], Greg C. Larsen, M.D.[2]; [1]College of Pharmacy, Oregon State University/Oregon Health & Science University, Portland, OR [2]Veterans Affairs Portland Health Care System, Portland, OR

INTRODUCTION: For heart failure (HF) patients, achieving target medication dosing is critical to reduce morbidity and mortality. To optimize HF therapy in rural veterans with limited access to specialty care, we previously demonstrated improved HF care through remote medication management by a HF pharmacist. However, the need for ongoing review in this setting remains unknown.

RESEARCH QUESTION OR HYPOTHESIS: To evaluate whether follow-up remote medication review by a HF pharmacist can increase guideline-directed HF therapy in veterans in a rural setting.

STUDY DESIGN: Cross-sectional programmatic evaluation.

METHODS: All living patients that were initially reviewed by the HF pharmacist (those with a baseline ejection fraction (EF) <40%) received a second review after one year. Medication review included assessment of comorbidities; current medications; medical history; and pertinent laboratory values. Specific medication, laboratory, and/or device recommendations were sent to primary care providers (PCPs) via a brief note in electronic medical records. When applicable, pre-prepared orders were also provided. The frequency of PCP acceptance of recommendations was calculated and stratified by recommendation class.

RESULTS: To date, 32 of 113 patients have received a second review. Opportunities for improving medication management were identified in 20 (63%) of the 32 included patients; 42 recommendations were made and 34 (81%) were acted on by the PCP. Eight recommendations were made for up-titration of HF medications, 5 for an updated echo, and 29 for updated labs, device, or medications. Overall, the recommendations were acted on within 2 weeks. Half of all patients had an improved EF (>40%) since the initial mediation management.

CONCLUSION: Despite prior HF pharmacist intervention, additional review still identified opportunities for improved medication management in the majority of patients in this rural setting. While few up-titrations were recommended, this was largely due to improved EF following initial review. Still, updated laboratory values (the most frequent recommendation type) are critical to inform titration and optimize care.

74. Electrocardiographic effects of hawthorn in healthy volunteers: A randomized controlled trial Stephanie Trexler, BS[1], Elaine Nguyen, Pharm.D., MPH[2], *William Baker, Pharm.D., FCCP, FACC, FAHA*[1]; [1]University of Connecticut School of Pharmacy, Storrs, CT [2]Hartford Hospital, Hartford, CT

INTRODUCTION: Animal studies show hawthorn (*Crataegus oxycantha*) can block potassium channels and prolong action potential duration. However, these electrocardiographic effects have not been demonstrated in humans.

RESEARCH QUESTION OR HYPOTHESIS: To evaluate the electrocardiographic and hemodynamic effects of hawthorn in healthy adult volunteers.

STUDY DESIGN: Randomized, placebo-controlled, cross-over trial.

METHODS: We randomized 20 healthy adult volunteers to receive either a single oral 160 mg dose of hawthorn or matching placebo. A 12-lead electrocardiogram, blood pressure (BP; both seated and standing), and heart rate were taken before treatment and at 1, 2, 4, and 6 hours post-dose. Following at least a 7-day washout period, participants were crossed over to the opposing treatment arm and had the measurements repeated. The primary electrocardiographic endpoint was the change in corrected (Fredericia) QT intervals (QT_cI) at 4 and 6 hours. Maximum post-dose QT_cI as well as change in PR and QRS intervals were measured.

RESULTS: No significant differences in 4- or 6-hour QT_cI were seen between hawthorn and placebo. Maximum post-dose QT_cI in the hawthorn and placebo groups were similar (346 ± 35 ms vs. 346 ± 40 ms; p = 0.979). Seated systolic BP (SBP) was higher in the hawthorn versus placebo groups at 4-hours (+4.8 ± 6.3 vs. −2.9 ± 10.5 mmHg; p = 0.011). Standing SBP was also higher in the hawthorn versus placebo groups at both 4-hours (+6.6 ± 10.3 mmHg vs. −4.6 ± 8.4 mmHg; p = 0.001) and 6 hours (+7.5 ± 8.1 mmHg vs. −1.5 ± 7.4 mmHg; p = 0.004). No differences in seated or standing heart rate or incidence of adverse events was seen between groups.

CONCLUSION: A single dose of oral hawthorn had no effect on electrocardiographic parameters but increased seating and standing SBP in healthy volunteers. Differences in SBP could be explained by significant imbalances in standing and seated values at baseline.

75. Evaluation of discharge acid suppression therapy for prevention of gastrointestinal bleeding in left ventricular assist device recipients *Katherine Vodovoz, Pharm.D.*[1], Catherine Floroff, Pharm.D., BCCCP, BCPS[2], Amanda Ingemi, Pharm.D.[2]; [1]Sentara Healthcare, Norfolk, VA, VA [2]Sentara Healthcare, Norfolk, VA

INTRODUCTION: Gastrointestinal bleeding (GIB) is a severe complication of left ventricular assist device (LVAD) support. To date, the optimal regimen for prevention of GIB in LVAD patients has not been determined.

RESEARCH QUESTION OR HYPOTHESIS: The primary objective was to evaluate the time-to-readmission for management of a major bleeding event for patients discharged on prophylactic histamine$_2$ receptor antagonist (H2RA) versus proton pump inhibitor (PPI) therapy following LVAD implant.

STUDY DESIGN: A single-center, retrospective chart review was conducted among patients following LVAD placement initiated on either a histamine-2 receptor antagonist (H_2RA) or a proton pump inhibitor (PPI) for the prevention of GIB.

METHODS: Patients aged 18 to 89 years were included following LVAD implantation at our 572 academic teaching hospital between August 2009 and December 2016. Exclusion criteria included temporary mechanical assist support, death during index admission, or transfer of medical management to another facility. Patients were followed until major bleeding event, LVAD explant, death, or three years.

RESULTS: Of 172 patients included, 18 patients were discharged on a H_2RA and 154 patients were discharged with a PPI after the index admission. Overall, 16.6% (3/18) patients discharged on H_2RA therapy were readmitted due to a GIB compared to 44% (68/154) (44.1%) patients discharged on a PPI (p = 0.04). Average time-to-readmission for patients on H_2RA therapy was 671.8 days, compared to 655.5 days with PPI therapy (p = 0.22). Among patients that developed a bleed on PPI therapy, the average time to bleed with high-dose therapy was 131.5 days, and 346.3 days with low dose PPI therapy (p < 0.001).

CONCLUSION: More patients discharged on a PPI were readmitted due to GIB compared to H_2RA therapy. High-dose acid suppression was not associated with a longer bleed-free survival. Larger studies are needed to determine the impact of GIB prevention on outcomes in LVAD patients.

76. Assessment of thrombosis based on time in therapeutic range for left ventricular assist device patients taking warfarin: A case-control study *Julia Lea, Pharm.D.*, Catherine Floroff, Pharm.D., BCCCP, BCPS, Amanda Ingemi, Pharm.D.; Sentara Healthcare, Norfolk, VA

INTRODUCTION: Pump thrombosis and ischemic stroke are severe complications of left ventricular assist device (LVAD) support. It is not known whether time within the therapeutic international normalized ratio (INR) range for patients with LVADs on warfarin therapy is associated with improved outcomes.

RESEARCH QUESTION OR HYPOTHESIS: The primary objective was to evaluate time in therapeutic range (TTR) using the Rosendaal Method at different time periods prior to suspected or confirmed pump thrombosis as well as ischemic stroke for patients with LVADs on chronic warfarin therapy.
STUDY DESIGN: Retrospective case-control study.
METHODS: Patients aged 18 to 89 years with a suspected/confirmed pump thrombus or ischemic stroke on chronic warfarin treatment were included following initial placement of HeartMate II®, HeartMate III®, or HeartWare®LVADs at our academic medical center between November 2009 and March 2017. Patients served as their own controls. Characteristics and TTR in 1, 2, and 3 months prior to thrombus (thrombus group) were compared to a standard, thrombus-free period during 6 months to 3 months prior to thrombus (control group). Groups were compared based on TTR for INR ranges: 2–3, 1.8–2.5, and patient-specific goal range.
RESULTS: A total of 25 patients were included. Of 30 thrombus events noted, 24 (80%) were suspected/confirmed pump thrombosis. Average TTR (INR=2–3) over 3 months in both the thrombus and control group was 53.4%. TTR (INR=2–3) was 11.4% lower 1 month prior to thrombus than the comparable month in the control group ($p = 0.029$). Two months prior to thrombus, TTR (INR=1.8–2.5) was 11.8% lower than the control group ($p = 0.032$).
CONCLUSION: Our study found an increased risk of thromboembolism with lower TTR in months leading up to thrombus compared to a thrombus-free period. Further investigation is needed to determine the impact of maintaining TTR on outcomes in LVAD patients.

77. Evaluation of post-traumatic stress disorder diagnosis and therapy on diurnal blood pressure patterns from 24-hour ambulatory blood pressure monitoring Brandon Cave, Pharm.D., *Augustus Hough, Pharm.D.*; West Palm Beach VA Medical Center, West Palm Beach, FL
INTRODUCTION: The Veteran population has a high incidence of post-traumatic stress disorder (PTSD), which is associated with increased risk of hypertension and cardiovascular death. Ambulatory blood pressure monitoring (ABPM) can identify abnormal diurnal blood pressure (BP) patterns, which are associated with increased risk of cardiovascular events.
RESEARCH QUESTION OR HYPOTHESIS: Veterans with PTSD undergoing ABPM are more likely to have an abnormal nocturnal dipping pattern compared to the general Veteran population.
STUDY DESIGN: Retrospective chart review of all archived ABPM studies performed at a single VA Medical Center.
METHODS: ABPM studies were classified by nocturnal dipping status and BP control rates. Chart review was performed to identify pertinent patient demographics of age, sex, concomitant PTSD, and use of selected PTSD therapies, at the time of ABPM study. Association between dipping status, BP control rates and patient demographics were analyzed using chi-square test.
RESULTS: A total of 470 ABPM studies were determined to be valid and included. There were no differences in the distribution of abnormal nocturnal dipping patterns in Veterans with or without PTSD. Similarly, rates of nocturnal, awake, and 24-hour hypertension were similar between groups ($p > 0.05$ for all). In patients with PTSD who were treated with evening PTSD therapy there was a higher rate of normal dipping status compared to those without treatment (66.7% vs. 29.7%, $p = 0.03$). Rates of awake and 24-hour hypertension ($p = 0.008$ and $p = 0.02$, respectively) were more frequent in Veterans receiving nocturnal PTSD treatment, however treatment was associated with similar rates of nocturnal hypertension ($p = 0.12$).
CONCLUSION: In a single center review of Veterans referred for ABPM, those with PTSD had similar distributions of dipping patterns and rates of overall, awake, and nocturnal hypertension compared to the general Veteran population. The association of nocturnal PTSD therapy prescription in patients with PTSD and higher rates of normal dipping status and its effect on nocturnal hypertension may warrant further investigation.

78. Diuretic responsiveness in acute decompensated heart failure: influence of underlying ejection fraction *Brent Reed, Pharm.D., BCPS-AQ Cardiology*[1], Christine Shulenberger, Pharm.D.[2], Anthony Jiang, Pharm.D.[3]; [1]Department of Pharmacy Practice and Science, University of Maryland School of Pharmacy, Baltimore, M.D. [2]Penn State Health Milton S. Hershey Medical Center, Hershey, PA [3]UC Davis Medical Center, Sacramento, CA
INTRODUCTION: Most acute decompensated heart failure (ADHF) trials do not distinguish between patients with heart failure with reduced or preserved ejection fraction (HFrEF and HFpEF, respectively). However, emerging evidence indicates that volume overload may present differently in these two subgroups, potentially obscuring efforts to identify an appropriate diuretic management strategy. This is further complicated by diuretic resistance which may require addition of thiazide-type diuretics.
RESEARCH QUESTION OR HYPOTHESIS: Does diuretic responsiveness differ between patients with HFrEF versus HFpEF?.
STUDY DESIGN: Retrospective cohort study.
METHODS: This sub-analysis of a prior study included patients with ADHF and diuretic resistance, defined as >/= 160 mg/day of intravenous furosemide equivalent and addition of metolazone or chlorothiazide. To be included, patients had to also have ejection fraction (EF) documented, and HFpEF was considered an EF > 40%. Endpoints included diuretic use and dosing, changes in urine output and volume status, and rates of renal dysfunction and electrolyte abnormalities. Comparisons were made using ANOVA/t-test and chi-squared/Fisher's exact test as appropriate.
RESULTS: Of 111 patients, 40 (36%) had HFpEF and 71 (64%) had HFrEF. Patients with HFpEF were older (63.7 vs. 55.7 years, $p = 0.004$) and more commonly female (65% vs. 36%, $p = 0.004$), but renal function, home diuretic use, and other characteristics were similar. Despite having similar urine output when a thiazide-type diuretic was added, patients with HFpEF required significantly more loop diuretic to meet diuresis goals (342.3 ± 125 mg vs. 287.0 ± 115.7 mg with HFrEF, $p = 0.021$). Loop diuretic doses were also higher after thiazide-type diuretic use ($p = 0.028$) yet produced similar urine output results. Continuous infusions were used more commonly in HFpEF but this finding did not meet statistical significance ($p = 0.09$).
CONCLUSION: The results of this study suggest that diuretic responsiveness may differ between HFrEF and HFpEF. Future ADHF trials should assess the effects of diuretic therapy separately in these two subgroups.

79. Aldosterone antagonist utilization in a nationally representative heart failure with reduced ejection fraction outpatient population: prevalence and predictors Kayla Joyner, Pharm.D.[1], *Mate Soric, Pharm.D., BCPS*[2], Jaclyn Boyle, M.S., Pharm.D., BCPS[3], John Moorman, Pharm.D., BCPS[4], Mary E. Fredrickson, Pharm.D.[3], Jodie Turosky, R.Ph., BCPS[5]; [1]Department of Pharmacy, University Hospitals Geauga Medical Center, Chardon, OH [2]Department of Pharmacy Practice, Northeast Ohio Medical University and University Hospitals Geauga Medical Center, Rootstown, OH [3]Department of Pharmacy Practice, Northeast Ohio Medical University, Rootstown, OH [4]Department of Pharmacy Practice, Norhteast Ohio Medical University and Akron General Medical Center, Rootstown, OH [5]Department of Pharmacy Practice, Northeast Ohio Medical University and St. Vincent Charity Medical Center, Rootstown, OH
INTRODUCTION: Aldosterone antagonist use improves survival among patients with heart failure with reduced ejection fraction (HFrEF); however, numerous studies have identified low utilization rates for these agents. To date, no study has evaluated the

prevalence of aldosterone antagonist prescribing in a nationally representative cohort of eligible HFrEF outpatients.
RESEARCH QUESTION OR HYPOTHESIS: What percentage of eligible HFrEF outpatients are prescribed aldosterone antagonists and what variables predict use?.
STUDY DESIGN: National cross sectional analysis of the National Ambulatory Medical Care Survey from 2007–2014.
METHODS: All visits for HFrEF in patients aged >55 years were included in the analysis. Office visits involving patients with any history of chronic renal failure, hyperkalemia, Addison's disease, or a diagnosis of heart failure with preserved ejection fraction were excluded. The primary endpoint was aldosterone antagonist prescribing rate. In order to identify predictors of use, multivariate logistic regression models were created for all HFrEF patients and symptomatic HFrEF patients.
RESULTS: In total, 1,259 unweighted visits were eligible for inclusion, representing more than 30 million visits. Aldosterone antagonists were initiated or continued in 11.1% of HFrEF visits (95% confidence interval [CI] 8.8–13.8%) and 14.8% (95% CI 11.2–19.3%) of symptomatic HFrEF visits. In the full model, notable predictors of use were diabetes mellitus (odds ratio [OR] 2.27; 95% CI 1.12–4.61), chronic obstructive pulmonary disease (OR 2.25; 95% CI 1.21–4.20), Northeast region (OR 0.20; 95% CI 0.05–0.74), and ≥4 chronic conditions (OR 0.26; 95% CI 0.10–0.71). Among symptomatic patients, significant predictors included non-Hispanic black patients (OR 4.55; 95% CI 1.81–11.43), patients aged 65–74 (OR 3.38; 95% CI 1.53–7.44), and office systolic blood pressure >130 mmHg (OR 0.31; 95% CI 0.16–0.60). Physician specialty, visit year, patient gender, and payor type were not significant predictors of aldosterone antagonist utilization in either model.
CONCLUSION: Though significant data supports the use of aldosterone antagonists in HFrEF, utilization remains low.

Clinical Administration

80. Clinical pharmacy-generated cost avoidance in a medical intensive care unit at an academic medical center over a twelve-month period *Drayton Hammond, Pharm.D., MBA, BCPS, BCCCP*[1], Heather Flowers, Pharm.D.[2], Jacob Painter, Pharm.D., Ph.D., MBA[3]; [1]Department of Pharmacy, Rush University Medical Center, Chicago, IL [2]University of Arkansas for Medical Sciences, Little Rock, AR [3]Division of Pharmaceutical Evaluation and Policy, University of Arkansas for Medical Sciences, Little Rock, AR
INTRODUCTION: Costs of patient care in the critically ill are substantial. Clinical pharmacist-generated cost avoidance has not been described in a medical intensive care unit (MICU) setting.
RESEARCH QUESTION OR HYPOTHESIS: What are the clinical pharmacist-generated cost avoidance and benefit-cost ratio from employing a clinical pharmacist in the MICU?.
STUDY DESIGN: Retrospective, observational study.
METHODS: All accepted, clinical pharmacist recommendations on a multidisciplinary, rounding service at an academic medical center over a twelve-month period were evaluated. Recommendations were grouped into one of 15 specific categories then subsequently classified into one of four general categories associated with cost avoidance. Total cost avoidance was calculated by summing the cost avoidance for each general category. Average rates of cost avoidance per day and hour were calculated by dividing total cost avoidance by number of days and hours the clinical pharmacist provided care. Average interventions and cost avoidance per day and hour were calculated for weekday and call status. Differences between months, day-of-the-week, and call status were evaluated using chi-square goodness-of-fit test.
RESULTS: 8,836 clinical pharmacist-recommended interventions were implemented, averaging 38.7 interventions/day and 9.7 interventions/hour. The four most commonly accepted interventions were dosage adjustment (n = 3,079), order clarification (n = 1,613), drug information (n = 1,233), and initiation of drug therapy (n = 1,046). Total cost avoidance was $7,459,970, averaging $37,672.17/day and $9,418.04/hour. On Mondays, a significantly greater average number of interventions/hour (12.2, p = 0.001) and average cost avoidance/hour ($11,933.05, p = 0.001) occurred. On call days compared to post-call days, there was a higher average number of interventions/hour (10.1 vs. 9.3, p = 0.013) and average cost avoidance/hour ($9,898.09 vs. $8,972.64, p = 0.001). Based on the clinical pharmacist's salary plus benefits, the benefit-cost ratio was 55.87:1.
CONCLUSION: The clinical pharmacist-generated cost avoidance was $7,459,970 and the benefit-cost ratio was 55.87:1 over a twelve-month period. Employing a clinical pharmacist on a multidisciplinary MICU team reduces healthcare expenditures through cost avoidance.

81. Utility of clinical skills evaluation during PGY1 interviews *Jennifer Austin Szwak, Pharm.D., BCPS*, Hailey Soni, Pharm.D.; University of Chicago Medicine, Chicago, IL
INTRODUCTION: With increasing numbers of applicants for PGY1 residency programs, the interview process must be efficient, objective, and reliable. Determining a candidate's clinical skills from an interview day can be challenging with traditional interviewing techniques. Multiple mini interview (MMI) scores have been correlated to better clinical performance on objective structured clinical examinations and board examinations in the medical field; however, limited data exists in evaluating pharmacy residency candidates.
RESEARCH QUESTION OR HYPOTHESIS: Incorporating a MMI evaluating clinical skills will help distinguish candidates and predict residents who demonstrate stronger clinical skills during PGY1 residency.
STUDY DESIGN: This is a retrospective review of interview scores of all interviewed candidates and clinical performance of residents who matched at the University of Chicago Medicine (UCM).
METHODS: The interview structure for the PGY1 program was modified to include several MMIs, one of which assessed clinical skills, in addition to traditional interviews. During the residency year, residents were ranked by the PGY1 residency program director (RPD) on their clinical skills. Interview scores were compared to candidate ranking and clinical skills during the residency.
RESULTS: During the last three recruitment periods, candidates who were ranked in the top 25% scored 15.4%, 15.5%, and 6% above the average candidate score on the clinical MMI; candidates ranking in the bottom 25% scored 10.7%, 11%, and 4.3% lower than average. Clinical interview scores, weighted for average performance each year, strongly correlated with clinical performance during the 3rd quarter of residency as assessed by the RPD.
CONCLUSION: The clinical skills interview led to clear distinctions among each quartile of candidates in the ranking. For candidates who matched at UCM, the clinical interview scores correlated with perceived clinical skills by the RPD. Additional data is needed to better assess if clinical interview scores can reliably predict clinical performance during residency.

Community Pharmacy Practice

82E. Provider perspectives on building patient care partnerships with community pharmacists *Yardlee S. Kauffman, Pharm.D., MPH*[1], Kim Coley, Pharm.D.[2], Brandon Patterson, Pharm.D., Ph.D.[3], Eric Wright, Pharm.D., MPH[4], Sarah Krahe Dombrowski, Pharm.D.[5], AJ Greco, Pharm.D.[6], Roshni Patel, Pharm.D.[7], Nima Patel-Shori, Pharm.D., BCACP[8], Melissa McGivney, Pharm.D.[2]; [1]Deparment of Pharmacy Practice and Pharmacy Administration, Philadelphia College of Pharmacy, Philadelphia, PA [2]University of Pittsburgh School of Pharmacy, Pittsburgh, PA [3]GlaxoSmithKline, Philadelphia, PA [4]Center for Pharmacy Innovation and Outcomes, Geisinger Health System, Forty Fort, PA [5]Geisinger Health System, State College, PA [6]Duquesne University School of Pharmacy, Pittsburgh, PA [7]Thomas

Jefferson School of Pharmacy, Philadelphia, PA [8]Temple University School of Pharmacy, Philadelphia, PA
Presented at the American Pharmacists Association, San Francisco, CA, March 24-27, 2017.

Critical Care

83. Concomitant vasopressin and hydrocortisone therapy on short-term hemodynamic effects and vasopressor requirements in refractory septic shock *Mitchell Buckley, Pharm.D., FASHP, FCCM, FCCP, BCCCP*[1], Robert MacLaren, Pharm.D., MPH[2]; [1]Department of Pharmacy, Banner – University Medical Center Phoenix, Phoenix, AZ [2]Department of Clinical Pharmacy, University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO

INTRODUCTION: Few studies have investigated the hemodynamic effects of concomitant hydrocortisone (HCT) and arginine vasopressin (AVP) in septic shock. Unfortunately, all of these studies only compared concomitant AVP/HCT with AVP monotherapy without any direct comparison to HCT monotherapy.

RESEARCH QUESTION OR HYPOTHESIS: the purpose was to comparatively evaluate short-term hemodynamic effects of AVP, HCT, and AVP with HCT to determine whether combination therapy resulted in greater hemodynamic response.

STUDY DESIGN: Single-center, retrospective, cohort study.

METHODS: Adult refractory septic shock patients requiring norepinephrine were identified through the electronic medical record database who received adjunctive therapy: (1) HCT only; (2) AVP only; or (3) concomitant AVP with HCT over a 4-year period. The primary objective was to evaluate the "response" rate in the AVP/HCT group compared to either agent alone at 4 hours from baseline. Secondary analyses included "response" rates at 12 and 24 hours as well as mortality, length of stay, and organ dysfunction. "Response" was defined as patients achieving ≥50% norepinephrine dose reduction at 4 hours from baseline without any reduction in mean arterial pressure.

RESULTS: A total of 300 patients (100 per group) were evaluated. The "response" rate at 4 hours from baseline was significantly higher in the AVP/HCT group (88.5%) compared to HCT (62.3%) or AVP alone (72.9%) ($p = 0.0003$). The AVP/HCT group had higher "response" rates over the HCT and AVP groups at 12 ($p = 0.051$) and 24 hours ($p = 0.035$). Multivariate regression analyses showed AVP/HCT versus HCT alone (OR=2.89, 1.27–6.56, $p = 0.012$), AVP/HCT versus AVP alone (OR=3.8, 1.39–10.45, $p = 0.01$), increasing SOFA scores (OR=1.15, 1.04–1.28, $p = 0.008$), and increasing age (OR=1.03, 1.0–1.06, $p = 0.01$) to be independently associated with "response" at 4 hours.

CONCLUSION: Concomitant AVP/HCT was associated with an immediate, additive catecholamine-sparing effect over either agent alone in patients with refractory septic shock as well as independently associated with hemodynamic response.

84. The predictive performances of equations that estimate unbound phenytoin concentrations in a medical ICU population and the impact of exogenous albumin administration *Labdhi Parikh, Pharm.D.*, Robert MacLaren, Pharm.D., MPH; Department of Clinical Pharmacy, University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO

INTRODUCTION: Many equations are available for estimating unbound phenytoin concentrations but none are validated for use in the medical intensive care unit (MICU).

RESEARCH QUESTION OR HYPOTHESIS: To evaluate the predictive performances of four equations for estimating unbound phenytoin concentrations when compared to measured unbound concentrations and assess the impact of exogenously administered albumin on predictive performances.

STUDY DESIGN: Retrospective cohort study of 30 subjects receiving phenytoin in an academic MICU.

METHODS: Assessment of the predictive performance of each equation as determined by the mean absolute error (MAE), mean prediction error (MPE), and root mean squared error (RMSE). Linear regression and Bland-Altman analyses were then conducted for each equation. MAE, MPE, RMSE, and linear regression correlations were further delineated for each equation according to whether exogenous albumin was administered within 12 hours of measuring concentrations.

RESULTS: A total of 90 concentrations were assessed; 58 without albumin and 32 after albumin administration. The measured unbound phenytoin concentration for all 90 levels was 2.14 ± 0.84 μg/mL. R^2 values for estimated unbound concentrations were below 0.4 for all four equations. The Sheiner-Tozer (ST) equation significantly over-predicted unbound phenytoin concentrations whereas the three other equations under-estimated unbound concentrations. All equations possessed considerable bias and lacked precision. Bland-Altman plots demonstrated substantial bias of each equation with the ST equation possessing the greatest bias. Albumin administration introduced additional bias, limited precision, significantly reduced R^2 values, and completely negated the performance of two equations as determined by slope and intercept of the regression line.

CONCLUSION: The use of quations to predict unbound phenytoin concentrations in the MICU lacks accuracy and thus clinical generalizability. Albumin administration further limits the validity of the equations. To ensure efficacy and avoid adverse effects, unbound phenytoin concentrations should be measured and the use of equations to estimate unbound concentrations in the MICU should be discouraged.

85. Perceptions of assessment and management of acute alcohol withdrawal amongst acute care pharmacists in the United States *Susanne Dyal, BS*, Robert MacLaren, Pharm.D., MPH; Department of Clinical Pharmacy, University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO

INTRODUCTION: Severe alcohol withdrawal occurs commonly but diagnosis and therapeutic strategies have not been described.

RESEARCH QUESTION OR HYPOTHESIS: To elucidate practices and perceptions of assessing and treating alcohol withdrawal.

STUDY DESIGN: Survey.

METHODS: A random sample of 500 US program directors of critical care or emergency medicine specialty residencies and pharmacy practice residencies received the pretested, electronically distributed questionnaire (one recipient per institution).

RESULTS: 94 (20%) of 471 eligible recipients responded with diverse representation. Assuming 3000 eligible recipients, the margin of error was 10% around a 95% confidence interval. Manifestations of alcohol withdrawal that were rated as severe by the majority of respondents were seizures (91.3%), not oriented to person/place/date (84.1%), delusions (73.8%), diastolic blood pressure >110 mmHg (51.7%), inconsolable agitation (50.7%), and tachycardia (50.7%). Scoring tools were considered highly effective for assessing severity by 45.7%. Management protocols existed in 91.2% of institutions. 72.1% of respondents indicated protocols were used often/routinely for initial management but only 24.1% for adjunctive therapies ($p < 0.0001$). Agents employed for initial and adjunctive management were benzodiazepines (92.7% and 62.1%, respectively, $p < 0.0001$), clonidine (29.4% and 34.5%, respectively), haloperidol (26.5% and 32.8%, respectively), and barbiturates (20.6% and 24.1%, respectively). Adjunctive agents were most commonly added to reduce dosage regimens of benzodiazepines (antipsychotics, barbiturates, alpha-2 agonists), prevent respiratory depression (alpha-2 agonists), prevent or treat autonomic symptoms (alpha-2 agonists), and prevent or treat agitation/delusions (antipsychotics, barbiturates, alpha-2 agonists). Agents with common barriers to use that were ranked as moderate/severe were dexmedetomidine (bradycardia, hypotension, cost), propofol (hypotension, tracheal intubation required), and ketamine (lack of supportive data).

CONCLUSION: Diagnosis of severity and management strategies of severe alcohol withdrawal vary considerably. Benzodiazepines are the mainstay of treatment. Other agents are commonly used as adjunctive strategies, primarily to prevent complications from benzodiazepines or treat agitation/delusions. Additional studies assessing the safety and effectiveness of adjunctive therapies are warranted.

86. Practical application of the Stewart acid-base model in Surgical Intensive Care Unit patients undergoing intravenous diuresis *Kathryn Connor, Pharm.D.*[1], Kelly Conn, Ph.D., MPH[1], Mattthew Grunert, M.D.[2], Jacinta Gardner, NP[3], Kathryn Maloney, NP[3], Tedd Vineyard, NP[3], Erin Bodekor, NP[4], Jennifer Mercandetti, NP[3], David Kaufman, M.D.[3], Curtis Haas, Pharm.D.[5]; [1]Wegmans School of Pharmacy, St. John Fisher College, Rochester, NY [2]Department of Anesthesiology, Brigham and Women's Hospital, Boston, MA [3]Department of Surgery, The University of Rochester Medical Center-Strong Memorial Hospital, Rochester, NY [4]Department of Emergency Medicine, The University of Rochester Medical Center-Highland Hospital, Rochester, NY [5]Department of Pharmacy, The University of Rochester Medical Center-Strong Memorial Hospital, Rochester, NY

INTRODUCTION: Acid-base disturbances in the ICU have traditionally been analyzed using a qualitative bicarbonate-based approach that has been widely criticized. A more contemporary, quantitative approach, the Stewart model, provides a more physiochemical, clinically relevant method to interpret acid-base disturbances. Continuous infusion (CI) loop diuretic therapy is often utilized to manage fluid overload and weaning from mechanical ventilation in the ICU, but may cause an increase in Strong Ion Difference (SID) and metabolic alkalosis. There is currently no data characterizing the effects of loop diuretics using the Stewart model, which may reveal practical management options to prevent or delay the development of metabolic alkalosis.

RESEARCH QUESTION OR HYPOTHESIS: Based on Stewart model calculations, we sought to test the strength of correlation between predicted and observed systemic acid-based status during CI loop diuretic therapy in the ICU.

STUDY DESIGN: A prospective, single-center, observational study conducted in the Surgical ICU of a large academic medical center.

METHODS: Ten critically ill patients who received CI furosemide were included. Over a 72-hour period, intake and output volumes, electrolyte content of all fluids administered, plasma and urine electrolytes, urine pH, and venous blood gases were collected. The predicted (calculated using volume status, SID of fluids in, SID of urine out, and baseline SID) and observed change in acid-based status was compared for each day using Spearmans Correlation Coefficient. Statistical analyses were conducted using SPSS Statistics (v24, SPSS Inc.)

RESULTS: At day 1 the mean observed plasma SID was 47.49 (3.46) mEq/L and the predicted SID value was 49.54 (5.6) mEq/L. Day 1 observed plasma SID was positively correlated with the predicted SID value ($r = .080$, $p = 0.01$). Day 2 and 3 correlations of observed and predicted SID were not statistically significant.

CONCLUSION: Using the Stewart model, the expected increase in SID and metabolic alkalosis was able to be predicted for a group of ICU patients receiving CI furosemide.

87E. Norepinephrine and Vasopressin versus Norepinephrine Monotherapy for Septic Shock: Randomized Controlled Trial *Drayton Hammond, Pharm.D., MBA, BCPS, BCCCP*[1], Oktawia Clem, BS[2], Jacob Painter, Pharm.D., Ph.D., MBA[3], Julia Cullen, Pharm.D.[2], Kelsey McCain, Pharm.D.[2], Nikhil Meena, M.D.[4]; [1]Department of Pharmacy, Rush University Medical Center, Chicago, IL [2]University of Arkansas for Medical Sciences College of Pharmacy, Little Rock, AR [3]Division of Pharmaceutical Evaluation and Policy, University of Arkansas for Medical Sciences, Little Rock, AR [4]University of Arkansas for Medical Sciences, Little Rock, AR

Presented at Critical Care Congress, Honolulu, HI, January 21-25, 2017.

88E. Validation of an insulin infusion nomogram for the coronary ICU *Seann Seto, Pharm.D., ACPR*, Yvonne Kwan, BScPhm, ACPR, Amita Woods, Pharm.D., ACPR; Department of Pharmacy, University Health Network, Toronto, ON, Canada

Presented at the American Diabetes Association 77th Scientific Sessions, San Diego, CA, June 9-13, 2017.

89. Early intensive blood pressure control following intracerebral hemorrhage (ICH): a safety analysis of patients presenting with severe hypertension *Hannah Hewgley, Pharm.D.*[1], Stephen C. Turner, Pharm.D. Candidate[2], Morgan Jones, Pharm.D.[3]; [1]Pharmacy, Methodist University Hospital, Memphis, TN [2]Pharmacy Department, Methodist University Hospital, Memphis, TN [3]Department of Pharmacy, Methodist University Hospital, Memphis, TN

INTRODUCTION: Current intracerebral hemorrhage (ICH) guidelines recommend that rapid lowering of systolic blood pressure (SBP) to < 140 mmHg may be considered in patients presenting with severe hypertension. However, limited safety data exists regarding this intervention in those with severe hypertension (SBP ≥ 220 mmHg).

RESEARCH QUESTION OR HYPOTHESIS: What is the impact of acute SBP lowering on the incidence of acute kidney injury (AKI) in ICH patients presenting with severe hypertension?

STUDY DESIGN: This retrospective, cohort study evaluated ICH patients treated with intensive blood pressure control.

METHODS: The primary objective was to identify if those with severe hypertension had an increased incidence of AKI within 7 days of hospital admission compared to those with a SBP of 141–219 mmHg. The incidence of AKI was assessed utilizing the Acute Kidney Injury Network (AKIN) criteria. Secondary outcomes included length of hospitalization and to determine if the presence of severe hypertension on admission predicted the development of AKI. All statistical tests were performed using SPSS®, version 24.

RESULTS: A total of 401 patients were included (SBP ≥ 220 mmHg n = 100; SBP 141–219 mmHg n = 301). There was a significant increase in the incidence of AKI in the severe hypertension group (56% vs. 31.9%; $p < 0.001$). The presence of severe hypertension was also found to independently predict the development of AKI (odds ratio 2.6; $p < 0.001$).

CONCLUSION: Our study observed significantly higher rates of AKI in patients presenting with severe hypertension as compared to patients presenting with a SBP between 141–219 mmHg. Further research is needed to determine the safety of intensive blood pressure control in ICH patients presenting with SBP ≥ 220 mmHg and current guideline recommendations should be re-evaluated.

90. Incidence of thromboembolic events after four-factor prothrombin complex concentrate (PCC4) administration for emergent reversal of warfarin or direct oral anticoagulants in intracranial hemorrhage *Rachael Scott, Pharm.D.*; Department of Pharmacy, Buffalo General Medical Center, Buffalo, NY

INTRODUCTION: Four factor prothrombin complex concentrate (PCC4) has become the gold standard for urgent warfarin reversal in the setting of major bleeding and is being used off-label for direct oral anticoagulant (DOAC) reversal in similar scenarios. PCC4 contains the clotting factors inhibited by warfarin and administration results in rapid reversal of the international normalized ratio (INR). Unlike warfarin, DOACs act directly on

factor Xa, thus it remains unclear whether PCC4 is an effective strategy for urgent reversal or if it increases the risk of thromboembolic events.
RESEARCH QUESTION OR HYPOTHESIS: Does PCC4 administration for DOAC reversal result in more thromboembolic events than warfarin reversal?.
STUDY DESIGN: A single center, retrospective chart review.
METHODS: We compared patients who were treated with PCC4 for intracranial hemorrhage while on warfarin or a DOAC. The primary endpoint was incidences of acute thromboembolic events within 14 days of PCC4 administration. Secondary endpoints included in-hospital mortality and discharge disposition.
RESULTS: We included 31 patients in the warfarin group and 29 patients in the DOAC group. The median dose was 2120 IU and 2112 IU, respectively. One patient on warfarin therapy and six patients on DOAC therapy were found to have an acute thromboembolic event (3.2% vs. 20.6%, p = 0.035). There was no difference between the warfarin group and the DOAC group in mortality (25.8% vs. 31%, p = 0.65) or rate of discharge to home (19.4% vs. 13.7%, p = 0.56).
CONCLUSION: Patients who received PCC4 for intracranial hemorrhage while on DOAC therapy were more likely to develop thromboembolic events than similar patients treated with warfarin.

91. Risk of acute kidney injury in critically-Ill patients receiving concomitant vancomycin and piperacillin-tazobactam compared to vancomycin and cefepime *Kyle Molina, B.S.*[1], Cyrus Yazdani, MS, B Pharm.[2], Jeffrey Barletta, Pharm.D., FCCM[1], Scott Hall, Pharm.D.[2], Vanthida Huang, Pharm.D.[1]; [1]Department of Pharmacy Practice, Midwestern University, College of Pharmacy-Glendale, Glendale, AZ [2]HonorHealth John C. Lincoln Medical Center, Phoenix, AZ
INTRODUCTION: Recent studies have demonstrated an elevated risk of acute kidney injury (AKI) in patients receiving concomitant vancomycin and piperacillin-tazobactam (VPT) compared to concomitant vancomycin and cefepime (VC). However, data that are exclusive to critically ill patients is limited.
RESEARCH QUESTION OR HYPOTHESIS: Does VPT increase the risk of AKI compared to VC in critically-ill patients?.
STUDY DESIGN: Retrospective cohort study.
METHODS: Adult patients admitted to an intensive care unit between September 2012 and December 2016 were identified. Patients were included if they received combination therapy with VPT or VC whereby the combination was given for ≥ 48 hours. Patients were excluded if their CrCl was <60 mL/min or were receiving renal replacement therapy. The primary endpoint was AKI, determined by the serum creatinine component of Acute Kidney Injury Network criteria, during or within 48 hours of therapy completion. The incidence of AKI was compared between groups and multivariate analysis was performed to control for relevant confounding.
RESULTS: A total of 394 patients received either VPT (n = 258) or VC (n = 136). There were no differences in baseline creatinine (0.7 ± 0.3 vs. 0.8 ± 0.3 p = 0.207), need for vasopressors (38% vs. 44%, p = 0.255), mechanical ventilation (40% vs. 45%, p = 0.350) and mean vancomycin trough (14.0 ± 5.2 vs. 14.1 ± 5.1, p = 0.831) between VPT and VC groups, respectively. The incidence of AKI was 28.7% for VPT patients versus 21.3% for VC patients (p = 0.114). Multivariate analysis revealed vancomycin trough >20 mg/dL [OR (95% CI)=2.69 (1.62–4.47)], baseline creatinine [OR (95% CI)=3.34 (1.43–7.80)], vasopressors [OR (95% CI)=1.78 [1.04–3.04]) and duration of combined therapy [OR (95% CI)=1.01 (1.00–1.02)] as risk factors for AKI. VPT was not associated with increased risk of AKI.
CONCLUSION: In critically-ill patients, the risk of AKI was similar between VPT and VC groups. Risk factors for AKI were related to baseline renal function, supratherapeutic vancomycin troughs and severity of illness.

92E. Glycemic control outcomes in the medical intensive care unit with pharmacy-driven intervention *Ruben Patel, Pharm. D., BCPS*, Mona Philips, R.Ph., MAS, Jennifer Sternbach, Pharm.D., BCPS, BCACP, Mitesh Patel, Pharm.D., BCCCP, David Silverman, Pharm. D., BCPS, BCCCP, Soo Kang, Pharm. D., BCCCP; Clara Maass Medical Center, Belleville, NJ
Presented at the Annual Meeting of the New Jersey Society of Health-System Pharmacists, Long Branch, NJ, April 7, 2017.

93. Impact of deep sedation in the emergency department upon transfer to the intensive care unit *Elena Telebak, Pharm.D.*, Megan A. Rech, Pharm.D., MS, BCPS, BCCCP, Brian Monzon, Pharm.D., BCPS, Whitney Chaney, Pharm.D., BCPS; Department of Pharmacy, Loyola University Medical Center, Maywood, IL
INTRODUCTION: Oversedation, along with pain and delirium, is associated with increased morbidity and mortality. The early phase of sedation in the intensive care unit (ICU), the first 48 hours, and the effect of initial depth of sedation on clinical outcomes is not well studied.
RESEARCH QUESTION OR HYPOTHESIS: The purpose of this study was to assess the impact of early deep sedation on clinical outcomes including number of ventilator-free days, ICU and hospital length of stay (LOS), and ICU and hospital mortality.
STUDY DESIGN: A retrospective single-center chart review of adult patients initially intubated and sedated in the emergency department (ED) and transferred to the medical ICU or the surgical/trauma ICU at an academic medical center in the Midwest.
METHODS: We evaluated medical records of patients intubated and sedated in our ED from August 2014 to January 2017, and transferred to the ICU under deep sedation (RASS −5 to −3) compared to sedation within goal (RASS −2 to 0). The primary endpoint was the number of ventilator-free days during a 28-day period.
RESULTS: Of the 422 patients evaluated, 100 patients were included for analysis. The groups were similar at baseline. The median ventilator-free time was 17.3 days (IQR 12–20) and 16 days (IQR 8–21) in the deep sedation and within goal group, respectively (p = 0.61). Patients had a median ICU LOS of 7.16 days (4–15) in deep sedation group and 6.15 days (IQR 4–13) in within goal group (p = 0.82). Overall, hospital mortality was 4% for deep sedation group and 9% for within goal group (p = 0.24). Use of antipsychotics within first 7 days of hospital stay was more prevalent in deep sedation group (n = 18 vs. n = 4; p < 0.01).
CONCLUSION: No difference in ventilator-free days, hospital and ICU mortality or LOS was detected between the deep sedation and within goal group. Early deep sedation was associated with development of delirium.

94. Lacosamide for early post traumatic seizure prophylaxis in traumatic brain injury *Samuel Kwon, Pharm.D.*[1], Scott Hall, Pharm.D.[2], Victor Zach, M.D.[3], Alicia Mangram, M.D.[2], James Dzandu, Ph.D.[4], Jeffrey Barletta, Pharm.D., FCCM[5]; [1]HonorHealth – John C. Lincoln Medical Center, Phoenix, AZ [2]HonorHealth John C. Lincoln Medical Center, Phoenix, AZ [3]Department of Neurocritical Care, HonorHealth - John C. Lincoln Medical Center, Phoenix, AZ [4]Department of Trauma and Acute Care Surgery, HonorHealth - John C. Lincoln Medical Center, Phoenix, AZ [5]Department of Pharmacy Practice, Midwestern University, College of Pharmacy-Glendale, Glendale, AZ
INTRODUCTION: Phenytoin has historically been recommended for seizure prophylaxis following traumatic brain injury (TBI), but alternatives are commonly being considered due to a more favorable adverse effect profile. These alternatives however have been poorly studied.
RESEARCH QUESTION OR HYPOTHESIS: Lacosamide is a safe and effective alternative to phenytoin for seizure prophylaxis following TBI.
STUDY DESIGN: Retrospective cohort study.

METHODS: Adult TBI patients who received phenytoin or lacosamide were retrospectively identified. Patients were included if they presented within 24 hours of injury and had seizure prophylaxis initiated within 24 hours of admission. Patients were excluded if they received anti-epileptic medications prior to admission, had multiple anti-seizure medications administered, had a seizure before prophylaxis was initiated, were transferred within 24 hours or had a moribund prognosis. The primary outcomes were the incidence of early seizures occurring within the first 7 days following injury and adverse drug events (ADE) requiring drug discontinuation. A planned sub-group analysis was performed for patients with severe TBI defined as head AIS ≥3. Multivariate analysis was performed to control for identified confounders.
RESULTS: There were 481 patients (phenytoin, n = 116; lacosamide, n = 365). Demographics were similar but age (50 ± 21 vs. 58 ± 22 years, $p < 0.001$) and admission GCS (11.3 ± 4.3 vs. 12.5 ± 3.8, $p = 0.010$) were lower in the phenytoin group, while the need for mechanical ventilation was higher (53% vs. 38%, $p = 0.003$). Seizures occurred in 0.9% of the phenytoin group and 1.4% of the lacosamide group ($p = 1.00$). ADEs were significantly higher in the phenytoin group (5.2% vs. 0.5%, $p = 0.003$). This difference remained significant upon multivariate analysis. Subgroup analysis for patients with severe TBI revealed no difference in seizures (phenytoin, 0.9% vs. lacosamide, 1.5%; $p = 1.00$) but more ADEs with phenytoin (5.4% vs. 0.6%, $p = 0.004$).
CONCLUSION: Lacosamide is as effective as phenytoin for seizure prophylaxis following TBI but has a more tolerable side effect profile.

95. Hyperoncotic albumin reduces net fluid loss associated with hemodialysis *Mitchell Buckley, Pharm.D., FASHP, FCCM, FCCP, BCCCP*[1], Brian L. Erstad, Pharm.D., FASHP, FCCM, FCCP, BCPS[2], Jake Lansburg, B.S.[3], Sumit Agarwal, MBBS, MBA[4]; [1]Department of Pharmacy, Banner - University Medical Center Phoenix, Phoenix, AZ [2]Department of Pharmacy Practice and Science, The University of Arizona College of Pharmacy, Tucson, AZ [3]Care Transformation, Banner - University Medical Center Phoenix, Phoenix,, AZ [4]Care Transformation, Banner - University Medical Center Phoenix, Phoenix, AZ
INTRODUCTION: Intra-dialytic administration of 25% albumin may benefit patients with anasarca requiring hemodialysis. Theoretically, hyper-oncotic albumin would result in shifting interstitial fluid into the intravascular space and allow for increasing ultrafiltration during hemodialysis.
RESEARCH QUESTION OR HYPOTHESIS: The purpose of this study was to evaluate the effectiveness of intra-dialytic 25% albumin increasing fluid removal at the end of hemodialysis.
STUDY DESIGN: Single-center, retrospective, cohort study.
METHODS: Patients were identified through the hospital electronic medical record database who received hemodialysis over a six-month period (January 1, 2016 – June 30, 2016). Inclusion criteria consisted of the following: (1) ≥18 years of age; (2) intermittent hemodialysis administered as an inpatient; and (3) patients either received 25% albumin 100 mL administered during hemodialysis or no albumin. Patients were excluded if iso-oncotic (5%) albumin was utilized, indication for albumin was other than for improving ultrafiltration, sustained low-efficiency daily dialysis was employed, or pregnancy.
RESULTS: A total of 223 patients consisting of 916 unique hemodialysis sessions were evaluated. The mean overall net fluid removed by hemodialysis in the 25% albumin and no albumin groups were 1242 mL and 1899 mL, $p < 0.001$ respectively. The no albumin group was found to have significantly higher mean fluid loss compared to patients receiving 25% albumin for a total dose of either 25 grams ($p = 0.001$) or 50 grams ($p = 0.001$). There were no significant differences in mean fluid loss between the no albumin group and patients receiving 75 grams or 100 grams of albumin, but there were only 10 patients (6 or 4, respectively) in the latter groups. Post-hoc analysis failed to demonstrate a dose-dependent response in those patients receiving 25% albumin and no albumin.
CONCLUSION: Hyper-oncotic albumin administered during hemodialysis sessions reduced net fluid loss associated with hemodialysis. The findings of this study do not support the routine use of 25% albumin to improve fluid removal during dialysis.

Drug Information

96. Systematic evaluation of clinical practice guidelines for pharmacogenomics *Robert Beckett, Pharm.D., BCPS*, David Kisor, BS, Pharm.D., Thomas Smith, Pharm.D., BCPP, Brooke Vonada, Pharm.D. Candidate; Manchester University College of Pharmacy, Fort Wayne, IN
INTRODUCTION: Pharmacists improve outcomes by applying clinical practice guidelines through patient-centered and population-based care. However, questions regarding guideline methodological quality and transparency have been raised. Pharmacogenomics is an important emerging consideration for pharmacists. Although pharmacogenomics guidelines are available, no published study has systematically evaluated their content.
RESEARCH QUESTION OR HYPOTHESIS: What is the quality of pharmacogenomics guidelines according to the Appraisal of Guidelines for Research and Evaluation II Instrument (AGREE II)?.
STUDY DESIGN: A cross-sectional study of pharmacogenomics guidelines was conducted according to the AGREE II User Manual. AGREE II consists of 23 evaluative items grouped into 6 domains, and 2 overall assessment items.
METHODS: A search of National Guideline Clearinghouse, the PharmGKB website, and PubMed identified pharmacogenomics guidelines published through December 2015. Each guideline was reviewed using AGREE II by three independent, trained reviewers: a drug information specialist, pharmacogenomics expert, and student pharmacist. Following independent guideline reviews, AGREE II quality scores, the primary endpoint, were calculated for each domain of each guideline according to the AGREE II formula. Descriptive statistics (mean with standard deviation due to low skew) were used to aggregate results in Microsoft Excel.
RESULTS: Forty-two articles were reviewed for inclusion. Seventeen were excluded, most often for lack of focus on pharmacogenomics (n = 11). All included guidelines were published as peer-reviewed articles and 88% were endorsed by a professional organization. AGREE II domain quality scores were 47.1 ± 12.4% (Domain 5, Applicability), 56.8 ± 9.8% (Domain 2, Stakeholder Involvement), 60.7 ± 17.6% (Domain 3, Development Rigor), 71.4 ± 20.4% (Domain 6, Editorial Independence) 75.8 ± 15.7% (Domain 1, Scope and Purpose), and 81.1 ± 10.9% (Domain 4, Presentation Clarity). For Item 24 ("Rate the overall quality"), mean score was 67.4 ± 20.3%. For Item 25 ("Do you recommend use?"), 36% of guidelines were recommended for use, and 56% recommended "with modifications."
CONCLUSION: Pharmacogenomics guidelines generally adhered to AGREE II criteria, with key areas for improvement being Domains 2, 5, and 3.

Education/Training

97. Impact of an infectious diseases advanced pharmacy practice experience on student knowledge *Kayla R. Stover, Pharm.D., BCPS-ID*[1], Katie E. Barber, Pharm.D.[1], S. Travis King, Pharm.D., BCPS[2]; [1]Department of Pharmacy Practice, University of Mississippi School of Pharmacy, Jackson, MS [2]School of Pharmacy, University of Mississippi School of Pharmacy, Jackson, MS
INTRODUCTION: Infectious diseases (ID) is an area in which many students struggle. Previous studies have demonstrated that targeted educational initiatives improve student performance, but little information is known about ID in pharmacy education.

RESEARCH QUESTION OR HYPOTHESIS: Does an ID specialty rotation taken during the final year of pharmacy education impact student performance on a knowledge-based exam?.
STUDY DESIGN: Single-center, quasi-experimental study with a pretest-posttest design.
METHODS: A 50-question pre-/post-rotation knowledge-based exam was given to every student on a 5-week ID elective advanced pharmacy practice experience (APPE) between 07/01/2013–05/05/2017. Students were integrated into the Adult ID consult service; experiences were supplemented with patient-related pharmacotherapy discussions. Students were not taught to the test. The exam was also given to control students who did not have an ID APPE after culmination of their fourth professional year. The pre-/post-exams were graded by the same preceptor for consistency. The primary outcome was % change on the exam after completion of the ID APPE. Secondary outcomes included correlations between exam performance and number of previous inpatient clinical rotations (ICR), average score in therapeutic coursework (TC), and rotation block (RB). Descriptive (mean ± SD) and inferential (t-test, correlation) statistics were performed using Microsoft Excel 2013. A p-value of <0.05 was considered statistically significant.
RESULTS: 40 students were included (control=5, experimental=35). Average pre- and post-rotation exam scores were 61.7 ± 10.9% versus 80.2 ± 7.9% ($p < 0.001$) in the experimental group, while control students scored 62.0 ± 5.1% ($p < 0.001$ vs. post-; $p = 0.9$ vs. pre-). ICR (1.3 ± 1.0 rotation), TC (81.5 ± 3.9%), and RB (median=4) had a positive correlation with pre-exam performance ($R = 0.5$, 0.5, and 0.2, respectively). Interestingly, TC scores were above average in students taking an ID APPE.
CONCLUSION: A 5-week ID elective APPE improved student performance on a knowledge-based exam. Consideration should be given to given to more consistent integration of ID principles across all rotation types.

98. The influence of an exploring academic careers elective course on students' post-graduate experiences *Michael J. Gonyeau, BSPharm, Pharm.D., MEd, BCPS, FCCP*[1], Aditi Desai, Pharm.D.[2], Alexandra Kolwicz, Pharm.D.[2], Jenny Van Amburgh, Pharm.D.[3]; [1]School of Pharmacy, Northeastern University, Boston, MA [2]Northeastern University, Boston, MA [3]Department of Pharmacy and Health Systems Sciences, Northeastern University, Boston, MA
INTRODUCTION: The Influence of an Exploring Academic Careers Elective Course on Students' Post-Graduate Experiences
RESEARCH QUESTION OR HYPOTHESIS: Academic pharmacy and the art and science of teaching and learning are unexplored by students. A pharmacy academic elective encouraged students to explore academic careers, investigate and apply teaching and learning theories and faculty academic life. Our objective was to assess the impact of this elective on graduates' professional careers, positions, teaching experience and confidence as effective educators.
STUDY DESIGN: Retrospective online survey.
METHODS: An online survey was developed to gauge any course impact on graduates' careers. Nineteen qualitative and quantitative items regarding participants' careers, past and ongoing experiences with teaching and learning, and self-view as educators were utilized. Information gathered included year of EAC course participation, post graduate training, current primary professional role, and self rated impressions of any course impact, effectiveness as an educator, approach to presentations, and hours devoted to teaching/learning. IRB approval was obtained.
RESULTS: Forty-five (65%) individuals responded, the majority working in hospital and ambulatory settings. All respondents stated daily teaching to patients, students, residents, physicians, mid-level practitioners and pharmacists. The most common teaching/learning strategy utilized was provision of patient cases/examples (82%), followed by topic summaries (76%). Respondents also utilized learning objectives (64%), individual patient counseling sessions (64%), and printed materials (64%). Overall course impact on their current positions was 7.24 + /- 1.91 out of 10.
CONCLUSION: Graduates of the EAC course utilize many course concepts in their daily work. The majority found the course valuable and agreed that knowledge, skills and attitudes learned aided in their educational development and are applicable to patients, trainees and other healthcare providers.

99. Integration of the JCPP pharmacist patient care process into a pharmacotherapeutics course series *Jason Lancaster, Pharm.D., MEd*, Michael Conley, Pharm.D., Margarita V. DiVall, Pharm.D., MEd, BCPS, Michael J. Gonyeau, BSPharm, Pharm.D., MEd, BCPS, FCCP; School of Pharmacy, Northeastern University, Boston, MA
INTRODUCTION: The Accreditation Council for Pharmacy Education Standards 2016 mandate that all schools/colleges of pharmacy must educate student pharmacists to develop knowledge and skills related to the Joint Commission of Pharmacy Practitioners (JCPP) approved pharmacists patient care process (PPCP). Published literature on the incorporation of the PPCP into pharmacy curricula is scant.
RESEARCH QUESTION OR HYPOTHESIS: To implement and evaluate a curricular integration of the PPCP in a 4-semester team-taught therapeutics course series for second and third-year pharmacy students.
STUDY DESIGN: IRB approved retrospective review after curricular redesign evaluating faculty responses to an electronic survey and examination of aggregate student assessments from January 2015 to May 2016.
METHODS: Faculty development sessions were held to foster collaboration, develop templates, and ensure consistency of PPCP integration. A web-based survey was administered to course instructors halfway through the course. Student assessment questions were mapped to one of the 5 PPCP steps and data was extracted for analysis from ExamSoft software. Descriptive statistics were reported using Microsoft Excel.
RESULTS: Nintey-six percent of faculty (N = 22) participated in the survey. Eighteen faculty (78%) modified instructional materials to incorporate PPCP and among these, 87% agreed/strongly agreed that they possessed a clear understanding of the PPCP. Aggregate performance across 61 assessments for 110 students was 83.6% for competencies related to Collect, 79.8% for Assess, 78.0% for Plan, 82.2% for Implement, and 76.0% for Follow-up. When examining minimum competency achievement, defined by 70% or greater aggregate score across all assessments, 99.1% of students achieved this threshold on questions related to Collect and Assess versus 88.2% for Plan, 94.5% for Implement, and 83.6% for Follow-up.
CONCLUSION: Implementing a successful curricular change such as PPCP integration requires a multi-faceted approach, which includes faculty development and collaboration. Assessment results revealed opportunities to further improve instruction and focused assessments for competencies related to Assess, Plan, and Follow-up steps.

100E. Developing a five-discipline interprofessional education patient simulation using a high-fidelity mannequin at a comprehensive university *Elizabeth Englin, Pharm.D., BCPS*[1], Heather Taylor, Pharm.D.[1], Carolyn Graves, MSN, RN[2], Paul Gubbins, Pharm.D.[1]; [1]Division of Pharmacy Practice and Administration, University of Missouri - Kansas City School of Pharmacy, Springfield, MO [2]Department of Nursing, Missouri State University, Springfield, MO
Presented at the American Association of Colleges of Pharmacy Annual Meeting, Nashville, TN, July 17, 2017.

101. Predicting NAPLEX success utilizing performance on skills-based assessments in the patient care laboratory setting
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INTRODUCTION: Many predictors of NAPLEX success have been studied, but little information is available regarding the effect of skills-based assessments on student success. One way to determine if skills-based assessments affect NAPLEX success is to review student performance in Patient Care Lab (PCL) courses, which incorporate such assessments.
RESEARCH QUESTION OR HYPOTHESIS: Is performance on PCL course assessments predictive of NAPLEX pass rates and/or scaled scores?.
STUDY DESIGN: Observational, prospective, cohort study.
METHODS: Students (n = 89) enrolled in a four quarter, skills-based PCL series completed several individual assessments, including drug information (DI) quizzes/final exams, patient case presentations and associated critical thinking questions, and formal DI responses. Student assessment scores were compared to NAPLEX pass rates, total scaled scores, and area 1 and 2 scaled scores. Binary logistic regression was used to assess the relationship between all combined PCL assessments and NAPLEX pass/fail and between groups of assessments and NAPLEX pass/fail. Linear regression assessed the relationship between all PCL assessments and NAPLEX total, area 1, and area 2 scaled scores. Statistical tests were performed using IBM SPSS version 22 with a p-value <0.05 considered statistically significant.
RESULTS: Using logistic regression, student scores on all PCL assessments combined correctly classified NAPLEX pass/fail with 100% success. DI quiz/final exam scores correctly classified pass/fail with 87.5% success, patient case presentations and critical thinking questions with 83.1% success, and formal DI responses with 78.7% success. All models were statistically significant ($p < 0.05$). Using linear regression, student scores on combined PCL assessments predicted 60.7% of variability in total scaled scores on the NAPLEX, 53.9% of variability in area 1 scaled scores, and 65.7% of variability in area 2 scaled scores ($p < 0.05$).
CONCLUSION: Overall student performance on PCL assessments is predictive of pass rates, total, and area scores on the NAPLEX. Students who struggle with these assessments may be targets for early intervention to help improve success.

102. Evaluation of pharmacist use of social media for educational purposes
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INTRODUCTION: The use of social media (SM) in today's society is ubiquitous. However, little is known about pharmacists' use of SM especially for educational reasons.
RESEARCH QUESTION OR HYPOTHESIS: The objectives of this study are to 1) assess which SM platforms are used by pharmacists for educational purposes, and 2) examine factors that are associated with the use of SM for educational purposes.
STUDY DESIGN: A cross-sectional study design was used to assess pharmacists' use of SM for educational purposes, perceptions about professional and personal benefit, usefulness of SM, and demographic characteristics. Infectious Diseases and Ambulatory Care PRNs were surveyed on these factors via the list-serv.
METHODS: Descriptive statistics were used to characterize pharmacists' use of SM for educational purposes. Bivariate analyses and multivariate logistic regression were used to examine factors associated with pharmacists' use of SM for educational purposes.
RESULTS: The online survey was completed by 164 pharmacists [mean age 35.9 years (SD=8.4); majority were female (63%)]. Approximately 77% of respondents indicated using a SM platform for primarily educational purposes. The following SM platforms were used primarily for educational purposes: Twitter (31%), ResearchGate (27%), Youtube (24%), LinkedIn (16%), and Google+ (14%). Bivariate analyses showed that pharmacists who used SM for educational purposes used SM more frequently ($t = 4.55$, $p < 0.05$), had higher perceptions of professional benefit ($t = 4.96$, $p < 0.05$), personal benefit ($t = 2.56$, $p < 0.05$), and usefulness of SM ($t = 5.58$, $p < 0.05$) in comparison to those who did not use SM for educational purposes. Multivariate analysis indicated that pharmacists who had higher perceptions about the professional benefit (OR=1.95, 95%CI: 1.12, 3.40) and usefulness of SM (OR=1.25, 95%CI: 1.06, 1.48) were more likely to use social media for educational purposes.
CONCLUSION: Social media is perceived by infectious disease and ambulatory care pharmacists as a valuable platform for educational purposes providing a professional benefit. Further research is needed for other pharmacy specialties.

103. Pharmacy students′ perception and attitudes toward opioid overdose and naloxone rescue therapy
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INTRODUCTION: As opioid overdose is a growing concern in the United States, some states allow licensed pharmacists to dispense naloxone rescue therapy as a standing order. Therefore, it is critical that pharmacy students receive adequate education on opioid overdose and naloxone rescue therapy to provide proper patient care.
RESEARCH QUESTION OR HYPOTHESIS: The aim of this study is to assess pharmacy students' perception and attitudes toward opioid overdose and dispensing naloxone therapy without a prescription.
STUDY DESIGN: This is a descriptive, pre- and post-survey study.
METHODS: A web-based survey was conducted to assess students' perception and attitudes towards opioid overdose and dispensing naloxone rescue therapy as a standing order prior to completing a mandatory online training on naloxone rescue therapy. After the training, a post-training survey was administered to evaluate changes in students' perception and attitudes towards the topic
RESULTS: A total of 105 and 90 students completed pre- and post-training surveys, respectively. Overall, students perceived opioid abuse as a disease that requires treatment in both pre- (93%) and post-training surveys (91%). Most respondents acknowledged that the availability of naloxone rescue therapy as a standing order would not be a means to promote opioid overdose (pre 65%; post 79%). Additionally, in post-training survey, students indicated that they felt confident or very confident about counseling patients (76%), educating healthcare professionals (79%), and dispensing (68%) naloxone rescue therapy without a prescription.
CONCLUSION: Students perceived that opioid abuse is a disease that requires treatment, and the availability of naloxone rescue therapy as a standing order would not be a means of promoting opioid abuse. Furthermore, the results demonstrated that additional training maybe conducive in building students' confidence in counseling and dispensing naloxone rescue therapy without a prescription impacting their ability to aid in the combat against the opioid epidemic.

104. Simulated iOSCE with pharmacy and physician assistant students – a quantitative study *Tara Storjohann, Pharm.D, BCGP, FASCP*[1], Amber Herrick, MS, PA-C[2], Katherine A. Mitzel, D.O. FACEP[2], Lindsay E. Davis, Pharm.D., BCPS, ASH-CHC[1], Carla Thompson, MSPAS, PA-C[2], Kirsten J. Bonnin, MMS, PA-C[2]; [1]Department of Pharmacy Practice, Midwestern University College of Pharmacy, Glendale, AZ [2]Physician Assistant Program, Midwestern University College of Health Sciences, Glendale, AZ

INTRODUCTION: Interprofessional education (IPE) is a core-curricular requirement in most healthcare fields. However, data is limited regarding interprofessional learning outcomes of the individual learner and team. An interprofessional objective structured clinical exam (iOSCE) was designed to determine if patient care optimization improved when doctor of pharmacy (Pharm.D) and physician assistant (PA) students collaborated as an interprofessional team.

RESEARCH QUESTION OR HYPOTHESIS: To determine if overall patient safety and efficacy outcomes improved when comparing individual to collaborative recommendations of Pharm.D and PA students regarding admission orders for a patient with acute decompensated heart failure.

STUDY DESIGN: This study compared Pharm.D and PA students' individual patient care recommendations to their collaborative recommendations when paired together as an interprofessional team for an iOSCE.

METHODS: A team of faculty experts (2 Pharm.D, 3 PA, and 1 DO) designed an iOSCE case and checklist for a heart failure patient. Students individually reviewed admitting orders to identify if any safety or efficacy interventions should be made to optimize patient care. After individually submitting written interventions, students collaborated as an interprofessional team consisting of one PA student and one to two Pharm.D students. After the team collaborated, they verbally presented their final interventions to an interprofessional faculty panel.

RESULTS: Individual and team scores for 187 students were evaluated for accuracy (101 Pharm.D and 86 PA). A statistically significant difference ($p < 0.001$) was found when comparing the average individual score to the average team score. A 21% absolute increase in optimal interventions occurred when students collaborated as a team.

CONCLUSION: Patient care optimization improved when students collaborated as an interprofessional team. Our research shows that Pharm.D and PA students can learn from, with, and about one another to optimize patient care.

105E. A Novel Instrument for Transparent Annual Goals Resulting in Annual Performance Evaluation Reviews with Impact *Ronald Reed, BS Pharm, Pharm.D., FCCP, FAES*; Department of Pharmacy Practice, Husson University School of Pharmacy, Bangor, ME

Presented at 2016 American Association of Colleges of Pharmacy Annual Meeting, Anaheim, California, July 23rd–July 27th, 2016.

106. Utility of a one-day cultural competency workshop as an end-of-curriculum assessment activity *Anna Dushenkov, BS Pharm, Pharm.D, BCPS*, Lilian Rozaklis, Ph.D., Julie Kalabalik, Pharm.D, BCPS, BCCCP, Anastasia Rivkin, BS, Pharm.D, BCPS; Division of Pharmacy Practice, FDU School of Pharmacy and Health Sciences, Florham Park, NJ

INTRODUCTION: Patient's acceptance of a care plan is reflective of his/her cultural beliefs, recognition of which is core to providing individualized care. The ACCP "White Paper on Cultural Competency" proposed a model curriculum to prepare learners to deliver culturally sensitive patient-centered healthcare. However, the document does not provide guidance on end-of-curriculum, summative activities evaluating students' knowledge and perception of cultural issues in healthcare.

RESEARCH QUESTION OR HYPOTHESIS: To evaluate utility of a one-day cultural competency workshop embedded in Capstone course as an end-of-curriculum, summative activity assessing students' knowledge and perception of cultural issues in healthcare.

STUDY DESIGN: Prospective one sample case study.

METHODS: The workshop consisted of a pre-workshop survey, interactive didactic lecture followed by small group discussion of two *Worlds Apart* cases, and a post-workshop survey. Learning objectives were mapped to Center for the Advancement of Pharmacy Education (CAPE) Outcome 3.5 (Includer). The survey included four knowledge-based multiple-choice questions (MCQ) collaboratively constructed by participating faculty, and nine perception questions (PQ) validated by Sales et al. (2013). Pre- and post-survey data were analyzed using descriptive and inferential statistics (McNemar's and paired-t tests). Group discussion data are evaluated elsewhere.

RESULTS: Of 79 students (98% response rate), 67% answered ≥ 3 MCQ correctly on pre-survey and 86% on post-survey ($p = 0.007$). Significantly more students correctly answered the MCQ regarding legal justification for pharmacists' cultural competency in the post-survey (61% vs. 91%, $p < 0.001$). One of nine PQs, "I would like to learn about other cultures through training and direct contact with others," showed significant difference in agreement ratings pre- vs. post-workshop ($M = 4.51$ vs. 4.75, $p = 0.001$).

CONCLUSION: A one-day cultural competency workshop embedded in Capstone course is a suitable end-of-curriculum, summative activity. It solidified and enhanced the existing knowledge, and augmented learners' recognition of the importance of cultural aspects in healthcare.

107. Evaluation of a Teaching and Learning Curriculum for Clinician Educators *Erin Raney, Pharm.D., BCPS, BC-ADM*[1], Elizabeth Pogge, Pharm.D., MPH, BCPS-AQ Cardiology, FASCP[1], Jeffrey Barletta, Pharm.D., FCCM[1], Melinda Burnworth, Pharm.D., FASHP, FAzPA, BCPS[1], Lindsay E. Davis, Pharm.D.[1], Shareen El-Ibiary, Pharm.D., FCCP, BCPS[1], Samantha Karr, Pharm.D., FCCP, BCPS, BCACP, BC-ADM[1], Suzanne Larson, Pharm.D.[2], Tara Storjohann, Pharm.D, BCGP, FASCP[3]; [1]Department of Pharmacy Practice, Midwestern University, College of Pharmacy-Glendale, Glendale, AZ [2]Office of Experiential Education, Midwestern University College of Pharmacy, Glendale, AZ [3]Department of Pharmacy Practice, Midwestern University College of Pharmacy, Glendale, AZ

INTRODUCTION: The role of the pharmacist as a clinician educator requires a unique skill set and dedication as a life-long learner. Midwestern University College of Pharmacy-Glendale's Clinician Educators Program (MWU-CPG CEP) is a twelve-month longitudinal teaching and learning curriculum designed to meet this need. It includes a post-graduate education track for pharmacy residents, fellows, and preceptors and an experiential education track for university-affiliated preceptors. The program consists of 26 live seminar hours delivered over four sessions, two mentored teaching experiences, and completion of an electronic teaching portfolio.

RESEARCH QUESTION OR HYPOTHESIS: The MWU-CPG CEP will enhance participants' confidence in their clinical education skills.

STUDY DESIGN: Electronic survey upon program completion.

METHODS: All participants and affiliated residency program directors for the 2015–2016 and 2016–2017 cycles were invited to complete an anonymous survey. The survey measured the value of program components and participants' confidence in their education skills before and after program completion. Confidence was compared using McNemar's test ($p < 0.05$; IBM SPSS Statistics).

RESULTS: The survey response rate was 43% (66/154) for program participants (41 post-graduate track, 25 experiential education track) and 33% (13/39) for residency program directors. Not all respondents answered all survey questions. The number of participants who agreed or strongly agreed that they were confident as a proficient clinician educator significantly improved (49% (32/65) before vs. 100% after; $p < 0.001$). Most respondents

(57%; 43/76) ranked attendance at live seminars as the most valuable program component. The mentored teaching experiences were ranked as most valuable by 40% (30/76) of respondents. Nearly all participants would recommend the CEP to future residents (94%; 58/62) and preceptors (97%; 60/62). All residency program directors (13/13) agreed they would support future resident participation.
CONCLUSION: The MWU-CPG CEP was well received by participants and residency program directors and provides a model for enhancing confidence in clinical education skills.

108. Evaluation of a Pre-Assessment Instructional Activity on Student Confidence and Preparedness for a Graded Journal Club
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INTRODUCTION: Critical analysis of the medical literature is a vital component to understanding and applying evidence-based healthcare in practice. Journal club is one method often used by academic institutions and post-graduate training programs to satisfy accreditation requirements, foster scientific inquiry, and facilitate the provision of evidence-based care. Despite widespread utilization, the journal club process is one which can result in anxiety for clinicians in training due to fears of poor performance and lack of self-confidence in the ability to critically analyze clinical trials data. Previous research has demonstrated the usefulness of journal club activities as a tool for student learning. There has been no published data evaluating the impact of pre-assessment instruction for journal club.
RESEARCH QUESTION OR HYPOTHESIS: A pre-assessment instructional activity for clinical trial analysis will improve students' confidence in completing a written review and oral presentation for a formally graded journal club.
STUDY DESIGN: Electronic quantitative survey pre- and post-instructional activity.
METHODS: During academic years 2013–2015, 32 advance pharmacy practice experiential rotation students were invited to complete an anonymous pre- and post-instructional survey. Surveys were identical and used a 4-point Likert scale asking students to rate confidence on 11-items regarding various aspects of the journal club process including preparing, analyzing and presenting. Non-parametric data were analyzed using the Wilcoxon Signed Rank Test. Descriptive statistics were used for nominal data (IBM SPSS Software version 24)
RESULTS: Twenty-six students provided complete data (81.25% response rate). Fifty-four percent were female, with an overall median age of 27. There was statistically significant improvement across all items between pre- and post-survey responses with p-values ranging from 0.000 – 0.007.
CONCLUSION: Pre-assessment instructional activity improved students' confidence in completing a written review and oral presentation for a formally graded journal club.

109. Culturally competent clinical pharmacists: Training students as the next generation of pharmacy leaders
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INTRODUCTION: A recent trend in pharmacy is the need for more for culturally competent focused care to serve an increasingly diverse, multicultural society. Little guidance is available on how to promote cultural competency in the academic environment.
RESEARCH QUESTION OR HYPOTHESIS: Does a cultural competency panel impact student perceptions of their own cultural competency? Do student demographics impact experiences with the panel?.
STUDY DESIGN: Analysis of pre- and post-surveys and open-ended reflections.
METHODS: Two consecutive years of third year pharmacy students (2016 and 2017) who attended an in-class cultural competency panel were asked to complete pre- and post- surveys measuring student perceptions of cultural competence and helpfulness of the panel. The survey included Likert scale questions and a free-text section for reflections. Descriptive statistics, chi-squared tests, t-tests, and qualitative analysis were conducted.
RESULTS: One hundred thirty seven students completed the survey (93%). Fifty-five percent were female, 60% were ≥26 years old, 32% were Asian, and 29% were Caucasian. Ninety-seven percent of students agreed or strongly agreed that a cultural competency panel is a worthwhile experience, and 96% felt the panel would help them change behaviors. Mean Likert scale scores improved between the pre- and post- surveys for all questions ($p < 0.05$). Ethnicity, age and gender significantly impacted response to these questions ($p < 0.05$). In reflections, students reported learning about effective communication (59%), new resources for diverse patient populations (26%), and addressing barriers to care (20%).
CONCLUSION: The study demonstrated that students found value in a cultural competency panel, and demographics impacted student experiences with the panel. Communication was the major theme of open-ended responses. The ability to provide culturally competent care is especially important for clinical pharmacists to be effective in establishing rapport with patients, and to accurately assess, develop, and implement pharmacy interventions designed to meet patients' needs.

110E. Evaluation of the versatility of a post-graduate year 2 (PGY-2) pharmacy residency trained pharmacist across PGY-2 pharmacy specialties
Ardis Copenhaver, MS, Pharm.D.[1], Ronald Campbell, Pharm.D., BCPS[2], Amy Haver, Pharm.D., BCPS[3], Aaron Pickering, Pharm.D., BCPS[2], Stephen Wilson, M.D., MPH, FAAFP[4], Jennie Jarrett, Pharm.D., BCPS, MMedEd[5]; [1]Department of Medical Education - Family Medicine, UPMC - St. Margaret, Pittsburgh, PA [2]Department of Pharmacy, UPMC - St. Margaret, Pittsburgh, PA [3]UPMC St. Margaret Family Medicine Residency, UPMC - St. Margaret, Pittsburgh, PA [4]Department of Medical Education - Family Medicine, UPMC St. Margaret Family Medicine Residency Program, Pittsburgh, PA [5]College of Pharmacy, University of Illinois - Chicago Campus, Chicago, IL
Presented at STFM Society for the Teachers of Family Medicine Annual Spring Conference, San Diego, CA May 5-9, 2017.

111. Evaluation of mock interviews for fourth-year professional pharmacy students pursuing residency training
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INTRODUCTION: An increasingly qualified residency applicant pool results in a highly competitive Match process. To successfully obtain postgraduate training, pharmacy students must showcase a diverse range of skills and perform well during onsite interviews. Fourth-year professional (P4) students often report that interviews are a source of anxiety and a barrier to obtaining a postgraduate year one (PGY1) residency position.
RESEARCH QUESTION OR HYPOTHESIS: Does a mock interview with clinical pharmacy faculty impact students' ability to obtain a residency position and perceived interview preparedness?.

STUDY DESIGN: Prospective Cohort.
METHODS: All P4 students participating in a residency preparation series were invited to participate in a mock interview session with faculty between December 2016 and January 2017. After 20 minutes of interviewing, students were provided feedback on their responses and communication skills. Subsequently, students were surveyed on interview preparedness immediately prior to the Match. The primary outcome was the difference in the PGY1 residency match rate between those students participating in a mock interview and those who did not participate. Parametric and non-parametric statistical tests were used for data analysis with an a-priori alpha level of 0.05 defined for statistical significance.
RESULTS: A total of 51 students provided informed consent and were included in the study, 21 of whom participated in a mock interview session. Of those participating, 14 (67%) obtained a PGY1 position, compared to 9 (30%) students not participating in the mock interviews ($p = 0.0122$). Additionally, students participating had a median self-reported perceived level of preparedness for interviewing of 7 on a 10-point scale (IQR 7–8.5) compared to 6 (IQR 5–7) for those who did not participate ($p = 0.027$).
CONCLUSION: Participation in a mock interview is associated with greater success in obtaining a PGY1 position and an increased perceived level of interview preparedness. Mock interviews should be considered by clinical pharmacists and faculty members to assist students in obtaining residency positions.

112. Evaluation of a living with diabetes simulation experience to increase pharmacy student empathy Katherine Carey, Pharm.D.[1], *Amanda M. Morrill, Pharm.D.*[2]; [1]Department of Pharmacy Practice, MCPHS University, Worcester, MA [2]Department of Pharmacy Practice, School of Pharmacy-Worcester/Manchester, MCPHS University, Manchester, NH
INTRODUCTION: Demonstration of empathy in communication is a learning objective for the 2013 CAPE outcomes, making it important to assess the efficacy of simulations designed to help students understand patients' perspectives. A "Living with Diabetes" project was developed for an ambulatory care elective to increase first professional year students' empathy for patients.
RESEARCH QUESTION OR HYPOTHESIS: It was hypothesized that participation would increase student empathy.
STUDY DESIGN: In this prospective cohort study with a pre- and post-survey design, all students participated in the simulation as a required component of the course, but only data from those who gave consent and fully completed the surveys were analyzed. During the project, students "lived" as a simulated patient, following the oral medication (candy), insulin (needle-less syringe) and glucose testing regimens. The Kiersma-Chen Empathy Scale (KCES), a validated, 15-item Likert scale, was used to assess empathy at baseline, post-simulation, and the end of the semester.
METHODS: Participants were recruited from students in the elective. The primary endpoint was change in empathy from baseline to the end of the simulation and baseline to the end of the semester. Data were collected anonymously using a participant-generated code and analyzed using Excel (descriptive statistics and paired t-tests).
RESULTS: A total of 20 students' data were analyzed. Mean (+/- standard deviation) empathy scores for baseline, post-simulation, and end of semester were 82.25 (+/- 4.25), 82.15 (+/- 6.88), and 83 (+/- 11.46), respectively. The empathy scores did not change significantly. The change in score range for baseline to post-simulation was – 12 to 10, and change in score range for baseline to end of semester was −37 to 18.
CONCLUSION: Following the simulation, pharmacy students' empathy scores remained consistent. Empathy, as measured by the KCES, may be a trait that remains static over time, or this simulation didn't have the desired effect.

113. Efficacy of personal pharmacogenomic testing as an educational tool in the pharmacy curriculum Marti Larriva, Pharm.D.[1], Patrick Campbell, Pharm.D.[1], David E. Nix, Pharm.D., BCPS[2], Dee Quinn, M.S.[3], Walter Klimecki, DVM, Ph.D.[4], *Jason Karnes, Pharm.D., Ph.D.*[5]; [1]Pharmacy Practice and Science, University of Arizona, Tucson, AZ [2]The University of Arizona College of Pharmacy, Tucson, AZ [3]University of Arizona, Tucson, AZ [4]Pharmacology/Toxicology, University of Arizona, Tucson, AZ [5]Department of Pharmacy Practice and Science, University of Arizona, Tucson, AZ
INTRODUCTION: Pharmacists will likely serve as a resource for interpreting pharmacogenomic (PGX) results in the future. Pharmacy students receive training in PGX, but often feel unprepared to incorporate PGX into practice. Personal genomic educational testing (PGET) may improve student knowledge, comfort, and attitudes regarding PGX. No randomized studies are available which evaluate the benefit of PGET.
RESEARCH QUESTION OR HYPOTHESIS: We evaluated the effect of PGET on student knowledge, comfort, and attitudes regarding PGX following a 3 credit core course in PGX.
STUDY DESIGN: Consenting students were randomized to receive PGX testing or no PGX testing. All students completed a pre-test and post-test survey designed to assess 1)PGX knowledge, 2)comfort with PGX patient education, 3)comfort with PGX clinical skills, and 4)attitudes toward PGX.
METHODS: After pre-test survey, students randomized to PGX testing were tested using a panel for PGX variants affecting cardiovascular and neurologic drugs. Students randomized to no PGX testing were provided with the same PGX panel for a hypothetical patient. Students were encouraged to utilize these PGX test results during in class activities. Instructors were blinded to PGX testing assignment. Following post-test surveys, we compared pre-/post-PGX knowledge questions overall (paired t-tests) and differences between PGX testing groups (t-test). We compared pre-/post- survey data overall (Wilcoxon signed rank) and assessed differences between PGX testing groups (Wilcoxon rank sum).
RESULTS: A total of 32 PGX testing and 30 non-PGX testing students completed the study with no differences in student characteristics between groups. Among all participants, a significant improvement was observed in PGX knowledge, comfort with PGX patient education and clinical skills, and attitudes toward PGX. No differences were observed between PGX and non-PGX testing groups.
CONCLUSION: While PGX knowledge, comfort, and attitudes improved after core coursework, PGX testing had no impact after randomization. Studies with greater power are likely necessary to determine the educational value of PGX testing.

114. Assessment of a student pharmacist-led drug abuse education program for elite high school juniors in New York City *Jenny Seo, Pharm.D. Candidate*[1], Julie Kalabalik, Pharm.D, BCPS, BCCCP[2]; [1]School of Pharmacy and Health Sciences, Fairleigh Dickinson University, Florham Park, NJ [2]Division of Pharmacy Practice, FDU School of Pharmacy and Health Sciences, Florham Park, NJ
INTRODUCTION: Drug abuse has been reported amongst high school students. The ASHP Statement on the Pharmacist's Role in Substance Abuse Prevention, Education, and Assistance recommends pharmacists be actively involved in substance abuse education. Data on the impact of pharmacist drug abuse education are currently lacking.
RESEARCH QUESTION OR HYPOTHESIS: To assess the impact of a student pharmacist-led drug abuse education program (SPDAEP) on student knowledge of commonly abused drugs, the pharmacy profession, and perception of the education program.
STUDY DESIGN: Descriptive statistics were utilized.
METHODS: The SPDAEP was provided to 474 high school juniors enrolled in Stuyvesant High School, a major specialized science high school in New York City. The program included a 45-minute interactive presentation delivered in 10 consecutive

class periods. An anonymous, 22-item post-program survey was distributed. The survey was composed by the program coordinators and consisted of 3 categories based on the program objectives: student perception of the program, knowledge about commonly abused drugs, and knowledge about the pharmacy profession.
RESULTS: The response rate was 72.8% (345/474 students). The majority of student respondents (79.4%) strongly agreed or agreed the information presented was new and useful. The majority of respondents felt more knowledgeable about drugs commonly abused by high school students (68.8%) and about dangers of drug abuse (67.3%) following the presentation. The majority responded correctly to all knowledge-based questions (range 62.1% - 98.2%) about drug dependence, drug effects, and the pharmacy profession. Students recommended the need for more educational programs and incorporating personal accounts of drug abuse for future presentations.
CONCLUSION: This program was well-received, and results demonstrate the effectiveness of a student pharmacist-led drug abuse education program in increasing student knowledge of commonly abused drugs and of the pharmacy profession. Student feedback will be incorporated into future delivery of this program.

115. Survey of student perceptions of self-directed activities with pre-post exams for primary care advanced pharmacy practice experiences (APPEs) Katelin Lisenby, Pharm.D., BCPS[1], Kimberly Garza, Pharm.D., M.B.A., Ph.D.[2], *Miranda Andrus, Pharm.D., BCPS, FCCP*[3]; [1]Department of Pharmacy Practice, Auburn University Harrison School of Pharmacy, Tuscaloosa, AL [2]Health Outcomes Research and Policy, Harrison School of Pharmacy, Auburn University, Auburn, AL [3]Department of Pharmacy Practice, Auburn University Harrison School of Pharmacy, Auburn, AL
INTRODUCTION: Preceptors for primary care (PC) advanced pharmacy practice experiences (APPE) routinely assign required readings and/or conduct topic/case discussions with students. However, it is unknown if students can accomplish knowledge retention of PC topics through self-directed activities instead of requiring direct faculty instruction.
RESEARCH QUESTION OR HYPOTHESIS: Do self-directed activities with pre-post exams for APPEs improve student perception of knowledge of PC topics, and does student perception reflect actual grades?.
STUDY DESIGN: Students completed an anonymous, cross-sectional survey via Qualtrics regarding their perceptions of self-directed activities and PC exams.
METHODS: A total of 17 students on PC APPEs from May 2016 – February 2017 (seven five-week blocks) were surveyed. Students completed a pre-exam on the first day of rotation; weekly self-directed activities including readings, patient cases, and a journal scan; and a post-exam the last week of rotation. Chi square and paired t-tests were used to analyze associations between categorical and continuous data, respectively.
RESULTS: Thirteen (76.5%) students completed the survey. Students rated their knowledge of each topic as higher after completing the self-directed activities ($p < 0.01$). The majority of students (92%) perceived that they made a grade of C (n = 6), D (n = 3), or F (n = 3) on the pre-exam and a grade of A (n = 5) or B (n = 7) on the post-exam. The mean (SD) actual pre-exam score was 65.8% (11.9) with the majority (94.1%) receiving a grade of C (n = 7), D (n = 3) or F (n = 6). The mean (SD) actual post-exam score was 88.5% (8.2) with the majority (88.2%) receiving a grade of A (n = 8) or B (n = 7). There was a significant improvement between actual pre- and post-exam scores ($p < 0.001$) with a mean (SD) change of 22.7% (10.9).
CONCLUSION: Student perceptions support self-directed activities as an effective method to improve knowledge retention and application on a PC APPE and closely reflect actual performance.

116. Interprofessional Simulation and Impact on Self-Assessment of Teamwork Lamis Karaoui, Pharm.D., BCPS[1], Maha Habre, MSN, RN, CEN[2], Rudy Bahri, MBA, DESM, BSN[3], Elias Chahine, Pharm.D., FCCP, BCPS (AQ-ID)[4], Nelly El -Chammas Issa, MBA, DHQM, BSN[3], Nadia Asmar, M.D.[5]; [1]School of Pharmacy - Department of Pharmacy Practice, Lebanese American University, Byblos, Lebanon [2]Alice Ramez Chagoury School of Nursing, Lebanese American University, Byblos, Lebanon [3]Clinical Simulation Center – Gilbert and Rose-Marie Chagoury School of Medicine, Lebanese American University, Byblos, Lebanon [4]Lloyd L. Gregory School of Pharmacy, Palm Beach Atlantic University, West Palm Beach, FL [5]Gilbert and Rose-Marie Chagoury School of Medicine/ Clinical Simulation Center, Lebanese American University, Byblos, Lebanon
INTRODUCTION: The Clinical Simulation Liaison Committee piloted a clinical interprofessional education (IPE) simulation activity endorsed by the University's IPE workgroup.
RESEARCH QUESTION OR HYPOTHESIS: This pilot study aims to report student knowledge and self-assessment of teamwork and communication before and after an IPE healthcare simulation experience. Observer assessment of teamwork and communication during the simulation experience was also captured.
STUDY DESIGN: Healthcare students were invited to participate electronically. Each session consisted of one to two students from medicine year 3 or 4, nursing year 3, pharmacy year 3 or 4, who have completed the first three didactic steps of the IPE program. Two high-fidelity critical care simulation scenarios were run, each preceded by pre-briefing and followed by debriefing.
METHODS: Students filled out pre- and post-overall simulation questionnaires on self-assessment and knowledge of teamwork and communication; and the Teamwork Perceptions Questionnaire at the end of each scenario. Two observers filled out the Facilitator's Observation Tool. Questionnaires were adapted with permission from AHRQ TeamSTEPPS®.
RESULTS: A total of 25 students participated in four simulation sessions. Students' self-assessment of their performance on the three selected subscales of AHRQ Team Perceptions Questionnaire improved between the first and second scenario: 69.94% versus 97.61% (team structure), 70.83% versus 91.4% (situation monitoring) and 58.31% versus 86.29% (communication). Students' rating of their individual ability to apply a series of IPE-related objectives focused on teamwork, communication and conflict resolution slightly improved between the first and second scenario: 84.8% versus 87.2%. On questions reflecting knowledge of teamwork, there were no differences in students' responses between pre- and post-overall simulation. Observers' assessment of team performance improved between the first and second scenario: 62.5% versus 91.4% (team structure), 59.4% versus 89.8% (situation monitoring) and 57.8% versus 85.9% (communication).
CONCLUSION: Although participants' knowledge remained the same pre-and post-simulation, their communication skills and teamwork abilities improved.

117. Characterization of clinical problem-solving assessment tools employed in post-graduate year-one pharmacy resident candidate screening and onsite interviews Sarah Eudaley, Pharm.D., BCPS[1], Alexandra Foster, Pharm.D.[2], Drayton Hammond, Pharm.D., M.B.A., BCPS, BCCCP[3], *Jennifer Austin Szwak, Pharm.D., BCPS*[4], Joseph Swanson, Pharm.D.[5]; [1]College of Pharmacy, University of Tennessee Health Science Center, Knoxville, TN [2]University of Tennessee Medical Center, Knoxville, TN [3]Department of Pharmacy, Rush University Medical Center, Chicago, IL [4]University of Chicago Medicine, Chicago, IL [5]College of Pharmacy, University of Tennessee Health Science Center, Memphis, TN
INTRODUCTION: Attainment of post-graduate year-one (PGY1) residency positions has become increasingly competitive. The selection process includes applicant screening and onsite interviews. Characterization of clinical problem-solving assessment tools used by programs is warranted.

RESEARCH QUESTION OR HYPOTHESIS: How are clinical problem-solving assessment tools used during screening and onsite PGY1 candidate interviews?.
STUDY DESIGN: Nationwide survey of ASHP-accredited PGY1 residency program directors (RPDs).
METHODS:
ONLINE SURVEY OF PGY1 RPDS IN MAY 2017. DATA ANALYSIS USED DESCRIPTIVE STATISTICS. :
RESULTS: Of 157 RPDs, most represented a community hospital (n = 49, 44%) or academic medical center (n = 52, 33%). Prior to onsite interviews, 81.5% (n = 128) evaluated clinical problem-solving skills during the screening process. Commonly used items during the screening process were preceptor PhORCAS comments about clinical problem-solving abilities (n = 124, 96.9%), quality/rigor of clinical rotations (n = 122, 95.3%), and GPA (n = 120, 93.8%). Most respondents reported clinical problem-solving assessments to comprise 10–33% (n = 86, 67%) of the applicant's pre-interview screening. During the onsite interview, 90.4% (n = 142) reported evaluating clinical-problem solving abilities. Programs most commonly asked clinical questions during the interview (n = 98, 69%) that focused on applying drug information for a clinical scenario (n = 81, 82.65%) and general disease state information (n = 66, 67.4%). Development of a SOAP note was also commonly used (n = 60, 42.3%). Most programs allowed no references (n = 27, 45%) or electronic drug databases (n = 17, 28%), and often evaluated applicants' verbal presentation of the note (n = 25, 42%). Of 33 programs that changed the interview format from 2016 to 2017, 85% (n = 28) included more clinical problem-solving assessments, many because they believed additional assessments help identify applicants who will be unable to provide adequate clinical care (n = 19, 42.2%).
CONCLUSION: Most PGY1 programs assess applicant clinical problem-solving ability. Applicants should be aware that GPA, rigorous clinical rotations, and rotation preceptor recommendations are often used by programs. Applicants should be prepared to demonstrate clinical problem-solving skills during the interview.

118. Measuring students' knowledge, skills, and attitudes of the pharmacists' patient care process in an interprofessional setting *Kimberly Elder, Pharm.D.*, Emily Smith, Pharm.D., Sarah Raake, Pharm.D.; Department of Clinical and Administrative Sciences, Sullivan University College of Pharmacy, Louisville, KY
INTRODUCTION: The Pharmacists' Patient Care Process (PPCP) was introduced by the Joint Commission of Pharmacy Practitioners in 2014. Little is known about the effect of participating in interprofessional education (IPE) events on understanding of the PPCP.
RESEARCH QUESTION OR HYPOTHESIS: Does participation in an IPE event affect knowledge, skills, and attitudes toward the PPCP and/or perceptions of interprofessional learning?.
STUDY DESIGN: Observational, prospective, cohort study.
METHODS: Doctor of Pharmacy (Pharm.D.) and Masters in Physician Assistant (PA) students worked on interprofessional teams to collect and assess information and create a plan for a simulated diabetic patient. Pharm.D. Candidates completed survey questions regarding the PPCP, and Pharm.D. and PA students completed a Readiness for Interprofessional Learning Scale (RIPLS) before and after the event. All surveys were anonymous and voluntary. The primary endpoint was change in knowledge, skills, and attitudes regarding the PPCP (Pharm.D.), and the secondary endpoint was change in perceptions of IPE (Pharm.D./PA). Mann Whitney U analyses compared pre- and post- survey responses using Sigma Plot version 11.0 (p-value <0.05 considered statistically significant).
RESULTS: Survey response for the PPCP survey was 73.3% (pre-survey) and 53.3% (post-survey) and 90% (pre-survey) and 66.1% (post-survey) for RIPLS. Students' confidence in knowledge/understanding of the PPCP ($p = 0.02$) and their confidence in skills/abilities to successfully perform the PPCP improved following the activity ($p = 0.01$). Confidence in skills/abilities to successfully assess information, plan, implement, and monitor/follow-up using the PPCP increased ($p = 0.025$, $p = 0.011$, $p = 0.011$, $p = 0.003$, respectively). After the activity, more students felt learning with other students' professions would make them a more effective member of a health care team ($p \leq 0.001$) and shared learning with other health care professionals would help them communicate better with patients and other professionals ($p = 0.013$).
CONCLUSION: IPE positively affected Pharm.D. Candidates' knowledge, skills, and attitudes toward the PPCP and Pharm.D./PA students' perceptions of interprofessional learning. Similar events should be incorporated into the curriculum in the future.

119. Peer Assessment of SOAP Note Writing with Calibrated Peer Review *Michelle Fravel, Pharm.D.*[1], Jae-Eun Russell, Ph.D.[2], Laura Knockel, Pharm.D.[1], Jeffrey Reist, Pharm.D.[3]; [1]Department of Pharmacy Practice and Science, University of Iowa, Iowa City, IA [2]ITS Office of Teaching, Learning and Technology, University of Iowa, Iowa City, IA [3]Pharmacy Practice and Science, University of Iowa, Iowa City, IA
INTRODUCTION: Calibrated Peer Review (CPR)™ is an online platform which allows for anonymous peer evaluation of written work. Within CPR™, students 1) submit written work, 2) practice grading sample essays using a rubric, 3) evaluate written work of peers, and 4) self-evaluate work.
RESEARCH QUESTION OR HYPOTHESIS: The purpose of this study is to investigate student receptiveness and effectiveness of the CPR™ process for development of SOAP (Subjective, Objective, Assessment, Plan) note writing skills.
STUDY DESIGN: In a second-year pharmacy practice course, student pharmacists were introduced to SOAP note writing and wrote four notes. The first two notes were reviewed by three peers with CPR™ and the last two notes were assessed by the course instructor. Students completed pre/post surveys to assess self-reported SOAP note writing competency and perceptions of CPR™ utility.
METHODS: The paired t-test was used to compare mean peer note ratings and deviation among peer scores between two assignments and to compare pre/post self-reported competency scores.
RESULTS: The mean peer rating of the second assignment was significantly higher than the first ($M = 9.39$, 7.75, $p < 0.001$), whereas the mean deviation among peer scores for the same note was significantly lower in the second assignment ($M = 0.37$, 0.57, $p < 0.01$). Self-reported SOAP note writing competency significantly improved (5.42 vs. 6.34 on a 7-point scale, $p < 0.001$) and 58% of students reported that the process of evaluating peer SOAP notes and receiving feedback from multiple peers was more useful than receiving instructor feedback.
CONCLUSION: SOAP note scores increased and deviation among peer scores decreased from the first to second assignment, suggesting that writing and peer review skills improved. Utilization of CPR™ for SOAP note writing was well-received by student pharmacists and was associated with improved self-reported SOAP note writing competency. Calibrated peer review may be considered as a useful tool to teach SOAP note writing skills.

120. Achievement of learning objectives for an innovative patient interview activity in a women's health elective *Kassandra Bartelme, Pharm.D., BCACP*, Anne LaDisa, Pharm.D., BCPS, Jessica Bellone, Pharm.D., BCACP; Concordia University Wisconsin School of Pharmacy, Mequon, WI
INTRODUCTION: Women's Health Issues in Pharmacy Practice is a third-year elective course in which one learning objective is for students to use appropriate communication with a female patient to obtain health information.
RESEARCH QUESTION OR HYPOTHESIS: An innovative interview activity provides students an opportunity to practice

asking women sensitive health-related questions and achieve learning objectives.
STUDY DESIGN: Interviewees evaluated student performance using an anonymous electronic survey. Student reflection papers were thematically analyzed.
METHODS: The interview activity learning objectives were to 1) Identify and practice interview methods tailored towards female patients; and 2) Reflect on your perception of your health and health history and how this may change your approach to interviewing a patient. First, students reflected on personal experiences where a healthcare provider addressed sensitive health related topics. Students used this reflection to prepare for their interview with an adult woman of their choice and wrote a reflection paper describing their interview experience. Analysis of papers explored the impact of students' personal health care experiences on their approach with the interviewee and achievement of learning objectives.
RESULTS: Nineteen interviewees participated in the survey in 2015 and 2016. In response to open-ended questions about student performance, 47% of participants specifically stated the student did a good job helping them feel comfortable, 44% said the student was professional, and 13% stated that students seemed nervous or uncomfortable. All interviewees agreed or strongly agreed students used appropriate communication to obtain health information and asked sensitive questions professionally. In 51 student reflections, analysis revealed students tried to emulate behaviors, attitudes, and skills seen in their own personal encounters with clinicians. Examples of these behaviors included empathy and patient-centered communication.
CONCLUSION: Students achieved the learning objectives. It is felt this unique activity helps students prepare for challenging patient interviews they may encounter in future practice.

121. American college of clinical pharmacy student chapters survey: 2017 update *Sara K. Richter, Pharm.D., BCPS*[1], Thu Nguyen, Pharm.D. Candidate[2], Andrew Smith, Pharm.D., BCPS (AQ-CV)[3], Nancy S. Yunker, Pharm.D., FCCP, BCPS[4]; [1]St. Louis College of Pharmacy, St. Louis, MO [2]Touro College of Pharmacy, New York, NY [3]UMKC School of Pharmacy, Kansas City, MO [4]Virginia Commonwealth University School of Pharmacy, Richmond, VA
INTRODUCTION: There are 82 formally recognized American College of Clinical Pharmacy (ACCP) student chapters that promote and support the mission of ACCP. ACCP continues to support student chapter initiatives and strives to help ensure their success. A survey of informal chapters was conducted in 2013, but an update is needed to determine how best to help formalized chapters.
RESEARCH QUESTION OR HYPOTHESIS: What activities are student chapters participating in, and what are barriers for continued chapter success?.
STUDY DESIGN: Survey.
METHODS: All faculty liaisons were invited to participate in an anonymous, 28-question electronic survey to assess chapter demographics, activities, and barriers to success. One completed survey per chapter was requested. The primary objective of this study was to describe the activities of ACCP student chapters and identify barriers to success. Descriptive statistics were used for data analysis.
RESULTS: Forty-seven faculty liaisons completed the survey. Ninety-one percent of responding liaisons reported performing educational programs within the past 24 months, up from 86% in 2013. There was also an increase seen in service projects (77% vs. 55%), research projects (30% vs. 23%), and lunch and learns (84% vs. 77%). The average number of annual events per chapter was 9.6. Eighty-three percent of chapters reported using Facebook to communicate chapter-related activities, followed by Instagram and Twitter (both at 9%). Barriers to success in 2017 versus 2013 include too many other student organizations on campus (89% vs. 84%) and an increase in reported lack of funds (48% vs. 31%).
CONCLUSION: An ACCP student chapter goal is to familiarize students with clinical pharmacy opportunities including patient care, research, and education. Respondents report performing activities relating to these areas, although research project activity is less than other areas. Despite an increase in activities from 2013, liaisons continue to report barriers for successful chapter development. Additional discussion and support may be necessary to help overcome these barriers.

122. A large-scale on-line interprofessional opioid prescriber training program *Edward Bednarczyk, Pharm.D.*[1], Richard Blondell, M.D.[2], Robert Wahler, Pharm.D.[3], Karl Fiebelkorn, B.S., M.B.A.[3], Romanth Waghmaarae, M.D.[3], Barbara Rogler, Pharm.D., M.S.[4], Terry Dunn, Pharm.D.[4]; [1]School of Pharmacy and Pharmaceutical Sciences, University at Buffalo, Buffalo, NY [2]Jacobs School of Medicine and Biomedical Sciences, University at Buffalo, Buffalo, NY [3]School of Pharmacy & Pharmaceutical Sciences, University at Buffalo, Buffalo, NY [4]Department of Pharmacy Practice, State University of New York at Buffalo, Buffalo, NY
INTRODUCTION: As part of its response to the opioid epidemic, the New York State (NYS) Legislature mandated three hours of training in opioid use for all prescribers of controlled substances (M.D., DDS, NP, PA, DPM). Mandated programming included: NYS and federal requirements for prescribing controlled substances; pain management; appropriate prescribing; managing acute pain; palliative medicine; prevention, screening and signs of addiction; responses to abuse and addiction; and end of life care. Training was required to be completed by June 30, 2017
RESEARCH QUESTION OR HYPOTHESIS: Could a large-scale enduring on-line program be feasible, and would participation result in increased knowledge concerning use of opioids?.
STUDY DESIGN: Observational.
METHODS: An interdisciplinary team from the University at Buffalo was formed to develop a 4-hour accredited (ACMME, ACPE, ADA CERP) enduring training program which launched March 15, 2017. A pre and post-test was included, with 70% required for successful completion of the two modules of the course
RESULTS: As of June 13, a total of 28,034 prescribers have completed this training, with the majority (87.92%) from NYS.

Prescriber Type	Pre-test score Part I (%)	Post-test Part I Score (%)	Pre-test score Part II (%)	Post-test Score Part II (%)
DDS	73.65	89.40	63.15	85.80
M.D.	80.07	92.50	67.92	86.83
M.D. (in training)	77.64	91.53	66.26	86.13
NP	82.51	93.27	66.39	85.37
PA	81.68	92.53	64.77	84.21
Pharmacist	82.50	96.19	48.25	68.42
Other	79.09	92.21	66.75	86.09
All	79.89	92.32	66.96	86.25

CONCLUSION: This demonstrates the feasibility of deploying a rigorous, enduring interprofessional educational program. The program has been well accepted, with demonstration of increased knowledge across disciplines through pre and post-training assessment. The greatest gains in performance were seen in the management of addiction and palliative care. Further study is needed to address the impact of this training on patterns of opioid prescribing.

123. Content delivery models influence class preparation, study habits, and preferences *Jaekyu Shin, Pharm.D.*[1], Tina Brock, BS.Pharm., EdD[2]; [1]University of California San Francisco, San Francisco, CA [2]Faculty of Pharmacy and Pharmaceutical Sciences, Monash University, Melbourne, Australia

INTRODUCTION: Three Therapeutics courses at University of California San Francisco use two different content delivery models – I and III used mostly traditional lecture whereas II used flipped classroom.

RESEARCH QUESTION OR HYPOTHESIS: The content delivery model influences students' class preparation, preferences, study habits, and academic performance as they progress through the Therapeutics courses.

STUDY DESIGN: Time-series design with traditional lecture as repetitive exposure.

METHODS: After the end of each course, we surveyed students to assess the frequency of pre-class preparation, participation in in-class activities, and preference for class activities focusing on application and problem-solving. The second and third surveys additionally evaluated study habits. We assessed a correlation between survey variables and written examinations scores by calculating Spearman's coefficient.

RESULTS: Ninety-two students completed all three surveys (response rate: 80.7%). The proportion of students who responded to completing pre-class preparation and participation in in-class activities was significantly higher in Therapeutics II compared to Therapeutics I and Therapeutics III. The proportion of students who preferred class activities focusing on application and problem-solving was significantly higher in Therapeutics II than in Therapeutics I but it was not significantly different between Therapeutics II and Therapeutics III. About 90% felt that the content delivery format in Therapeutics II had made a positive influence on their study habits whereas only 29.5% did in Therapeutics III. The level of class preparation was not significantly correlated with the exam score.

CONCLUSION: The content delivery model used within a course may be associated with reported level of preparation, study habits, and preferences.

124. Integration of a community pharmacy simulation program into a therapeutics course *Jaekyu Shin, Pharm.D.*[1], Daryush Tabatabai, Pharm.D.[1], Christy Boscardin, Ph.D.[1], Marcus Ferrone, Pharm.D.[2], Tina Brock, BS.Pharm., EdD[3]; [1]University of California San Francisco, San Francisco, CA [2]Clinical Pharmacy, University of California, San Francisco, San Francisco, CA [3]Faculty of Pharmacy and Pharmaceutical Sciences, Monash University, Melbourne, Australia

INTRODUCTION: Paper-based patient cases are widely used to help students integrate and apply therapeutics knowledge. However, this approach has many limitations such as not requiring students to gather and summarize the relevant patient information. MyDispense, a computer program simulating community pharmacy practice, does not have these limitations and may help students better integrate and apply their knowledge.

RESEARCH QUESTION OR HYPOTHESIS: Compared with using paper-based cases, using MyDispense-based cases in and outside of Therapeutics class will improve student learning.

STUDY DESIGN: Prospective cohort study with two phases.

METHODS: We conducted a prospective study with an experimental phase and an implementation phase. In the first phase, students were randomized to complete a therapeutics case using MyDispense or traditional paper methods in class. In the second phase, all students completed two therapeutic cases using MyDispense in class with the option to complete four additional outside-of-class cases using MyDispense. Students completed pre- and post-tests in class and three surveys.

RESULTS: In the experimental phase, mean test scores increased from pre- to post-test for both MyDispense and traditional paper groups, but the difference between the groups was not statistically significant. Students in the traditional paper group reported statistically significant gains in confidence compared to the MyDispense group ($p < 0.001$). In the implementation phase, mean test scores again increased, however, student perception of the use of MyDispense for Therapeutics was not positive. Completing the optional outside-of-class cases, however, was positively and significantly correlated with the midterm and final examination scores (Spearman correlation coefficient = 0.30; $p < 0.001$).

CONCLUSION: Compared with using paper-based cases, using MyDispense in Therapeutics class did not improve student learning. However, using outside-of-class MyDispense cases may be associated with students' academic performance. With short-term use and in the absence of assessment methods that also require seeking information from patients, students prefer to learn via paper-based cases.

125. Assessing the implementation fidelity of an immersive early pharmacy practice experience in a Doctor of Pharmacy Curriculum *Laura A. Rhodes, Pharm.D.*, Macary Weck Marciniak, Pharm.D., BCACP, BCPS, FAPhA, Nicole R. Pinelli, Pharm.D., M.S., Carlos R. Melendez, Ph.D., Jacqueline McLaughlin, Ph.D.; UNC Eshelman School of Pharmacy, University of North Carolina at Chapel Hill, Chapel Hill, NC

INTRODUCTION: Experiential education is a significant component of most health professions degree programs. Since the experiential curriculum (also called immersion, clerkships, or rotations) typically occurs at external sites (e.g. clinics, community pharmacies, hospitals), schools are challenged with determining how and what students are learning during this time. Fidelity metrics can provide critical insight into the extent to which experiential programs are implemented as designed by schools and colleges of pharmacy.

RESEARCH QUESTION OR HYPOTHESIS: The objective of this study is to articulate a logic model for an immersion practice experience, to identify critical variables and measures to experience implementation, and to compute and categorize fidelity scores for each practice site.

STUDY DESIGN: This is a retrospective review of data collected from course evaluations, student assignments, and preceptor trainings from a 2-month immersion experience completed by student pharmacists at the conclusion of the first year of the Doctor of Pharmacy degree program.

METHODS: A logic model was defined to articulate inputs, activities, outputs, and outcomes of the practice experience. Collected data points were reviewed for key variables and measures to include in the fidelity model. A fidelity score was generated for each practice site and categorized as poor (0.0–29.4%), fair (29.5–49.4%), intermediate (49.5–69.4%), or good (69.5–100.0%).

RESULTS: Data is available from 147 practice experiences occurring from May-August 2016 at 50 pharmacy practice sites. The mean fidelity score was 59.1% ± 16.4% (range 19.7–88.7%). Practice sites were categorized as poor fidelity (2.0%, n = 1), fair fidelity (30.0%, n = 15), intermediate fidelity (32.0%, n = 16), or good fidelity (36.0%, n = 18).

CONCLUSION: Using a fidelity model has enabled the School to better understand the implementation of the experiential education curriculum and may serve as a criterion-based quality assurance tool for immersion in pharmacy education.

126. An analysis of preventative counseling at patient visits with risk factors for cardiovascular disease in the national ambulatory medical care survey *Mary Gwen Miller, Pharm.D./MS Candidate*[1], Randall Moore, BS Pharm.D./MS Candidate[1], Sierra Timmons, BS, Pharm.D./MS Candidate[1], Michael Jiroutek, DrPH, MS[2], Melissa Holland, Pharm.D., MSCR[3]; [1]College of Pharmacy and Health Sciences, Campbell University, Buies Creek, NC [2]Department of Clinical Research, Campbell University College of Pharmacy & Health Sciences, Buies Creek, NC [3]Department of Clinical Research, Campbell University College of Pharmacy and Health Sciences, Buies Creek, NC

INTRODUCTION: Cardiovascular disease (CVD) is a leading cause of death in the US with over 600,000 deaths annually. Many of the risk factors for CVD can be managed through lifestyle modifications, but studies have shown that counseling rates remain low.
RESEARCH QUESTION OR HYPOTHESIS: For patients with one or more risk factors for CVD, is there evidence of an association between visits with preventative counseling and study years (2006–2014) or other socio-demographic factors of interest?
STUDY DESIGN: Retrospective, cross-sectional, observational, IRB-exempt study.
METHODS: Patient visits for those 18 and older with one or more risk factors for CVD in the National Ambulatory Medical Care Survey were assessed for receipt of preventative counseling, which was defined as health education for any one or more of the following: diet/nutrition, exercise, smoking cessation, or weight reduction. Patient visits with a diagnosis of any type of cardiovascular disease were excluded. Individual chi-square tests and a multivariable logistic regression model were conducted to assess predictors of preventative counseling. Per the complex survey design, data were appropriately weighted and clustered to generate average annual national population estimates.
RESULTS: A total of 144,110 unweighted visits were included representing an extrapolated national estimate of 385,533,713. Adjusting for factors of interest, receiving preventative counseling was significantly more likely for females, black race, Hispanics, tobacco users, when seen by internal medicine specialists, and those with hyperlipidemia or diabetes. Receiving preventative counseling was significantly less likely across study years as well as for those in a non-metropolitan area, age ≥60 and 40–59 years, with Medicare, in the census regions West, South, and Midwest, and for non-primary care visits.
CONCLUSION: Preventative counseling remains low and was found to significantly decrease across study years for those with CVD risk factors. Opportunities for pharmacists to provide education and counseling to help manage CVD risk factors remain.

127. Perspectives of new practitioners concerning post-graduate residency application experiences *Jonathan Cho, Pharm.D., BCPS*[1], Jonathan Girnys, Pharm.D., BCPS[2]; [1]College of Pharmacy, The University of Texas at Tyler, Tyler, TX [2]Department of Pharmacy, Florida Hospital - Orlando, Orlando, FL
INTRODUCTION: The need for specialized pharmacists in patient care has been well documented. Both the American Society for Health-System Pharmacists (ASHP) and American College of Clinical Pharmacy (ACCP) recommend that pharmacists who are involved in direct patient care activities be residency trained by 2020. With the growing need for residency trained pharmacists, obtaining a post-graduate year 1 (PGY1) residency has become more competitive. Literature related to residency directors and preceptors' perspectives on obtaining a PGY1 residency exists but perspectives from current residents and residency-trained new practitioners are not as vast.
RESEARCH QUESTION OR HYPOTHESIS: This study documented the perspectives of new practitioners in order to capture the tools and experiences that new practitioners found essential when applying for PGY1 residency programs.
STUDY DESIGN: A cross-sectional, single-centered electronic survey, was distributed to new practitioners via ASHP connect and piloted amongst current residents at the Florida Hospital – Orlando Pharmacy Residency Program.
METHODS: Survey questionnaire was conducted between March 16, 2017 and April 6, 2017 on ASHP's New Practitioner's Connect Forum. Data collected included gender, type of PGY1 residency program, institution acuity, respondent's residency application period and perceived benefit of various experiences used when applying for PGY1 residency programs.
RESULTS: Of the 214 respondents, most pursued an acute care residency (69.2%) and were in academic institutions (45.8%). Leadership experiences, mentorship, advanced clinical rotational and CV workshops were perceived as the top residency preparedness tools to be of importance. Several respondents were not able to take a residency preparedness course (50.5%) or have hospital work experience (33.6%). Of note, participation in ASHP's PPS was of minimal perceived importance.
CONCLUSION: This study highlights the need for residency preparedness programs. New practitioners found residency preparedness programs to be extremely important and wish they had more guidance on how to prepare for residencies during their doctor of pharmacy program.

128. Interviewer perceptions during the implementation of the multiple mini-interview model at a school of pharmacy *Julie Murphy, Pharm.D., FASHP, FCCP, BCPS*, Anthony Pattin, Pharm.D., Jeffrey Sarver, Ph.D., Michelle Seegert, Pharm.D., BCACP, BCADM, Ethan Blashford, Pharm.D., Sean Mertz, Pharm.D. Candidate 2018; College of Pharmacy and Pharmaceutical Sciences, University of Toledo, Toledo, OH
INTRODUCTION: The 2016 Accreditation Council for Pharmacy Education Standards state standardized interviews should be part of the admissions process for Doctor of Pharmacy programs. The Multiple Mini-Interview (MMI) consists of 6–12 interview stations that focus on noncognitive attributes using case-based scenarios. Studies revealed positive interviewer perceptions upon completion of the MMI process; however, no previous studies have evaluated the change in interviewer perceptions throughout MMI implementation. One school of pharmacy implemented the MMI model for prospective student pharmacists in March 2017.
RESEARCH QUESTION OR HYPOTHESIS: How do interviewer perceptions of the MMI model change during its implementation?
STUDY DESIGN: Prospective cohort.
METHODS: Interviewers (faculty volunteers, preceptors, and student pharmacists in the last year of training) were eligible for inclusion. Individuals who provided consent completed a *pre-MMI training survey* regarding their perceptions of MMI. Interviewers then participated in a 90-min training program consisting of a PowerPoint presentation and review of videos demonstrating MMI practices, followed by administration of a *post-MMI training survey*. After interviews, an additional *post-interview survey* was administered. Six Likert-scale MMI perception questions were independently analyzed for changes in the rank response across the three survey time points. Overall significance of changes in interviewer perceptions was evaluated using a Friedman's nonparametric repeated-measures analysis. Criteria for significance was $\alpha = 0.05$ for each perception question prior to Bonferroni correction for multiple comparisons.
RESULTS: Thirty-two interviewers participated including 20 faculty, five preceptors, and seven students. From the pre-MMI training survey to the post-interview survey, interviewers gained confidence in their ability to explain the rationale behind the MMI process, were more likely to agree that six minutes was enough time to adequately assess an applicant, and believed MMI provides a fair assessment of an applicant's noncognitive attributes for the pharmacy profession ($p < 0.001$ for each question).
CONCLUSION: After interviewers received training and gained experience with MMI, perceptions of the model improved.

129. Impact of electronic health record (EHR) use in a capstone course on students' confidence during Advanced Pharmacy Practice Experiences (APPE) *Joel Marrs, Pharm.D.*[1], Sarah Anderson, Pharm.D.[1], Sunny Linnebur, Pharm.D.[2], Scott Mueller, Pharm.D.[2], Joseph Saseen, Pharm.D.[2]; [1]Department of Clinical Pharmacy, University of Colorado Skaggs School of Pharmacy & Pharmaceutical Sciences, Aurora, CO [2]Department of Clinical Pharmacy, University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO

INTRODUCTION: This was a study to evaluate the impact of EHR exposure during a capstone course within a pharmacy curriculum and its impact on students' confidence and perceptions of EHRs during APPEs.

RESEARCH QUESTION OR HYPOTHESIS: Graduating students' confidence with and perceptions of using an EHR in APPEs following exposure in a capstone course (2016 graduates) will be higher than that of students unexposed to EHRs in their capstone course (2015 graduates).

STUDY DESIGN: An IRB-exempt email-based survey assessed student demographics, confidence level in use of EHRs, and perceptions of EHR use in classroom-based coursework.

METHODS: Confidence with EHR use and student perception data were analyzed using the chi square test and descriptive statistics, respectively.

RESULTS: 47/160 and 55/145 students responded to the 2015 (unexposed to EHRs) and 2016 (exposed to EHRs) surveys, respectively. 80.0% of students exposed to EHRs in their capstone course felt prepared to use EHRs prior to starting APPEs versus 42.6% of students not exposed ($p < 0.0001$). 78.2% of students exposed to EHRs in their capstone course felt confident in the use EHRs on APPEs versus 57.5% of students not exposed ($p = 0.025$). Students both exposed and not exposed to EHRs during their capstone course felt their confidence with using EHRs would increase by being exposed to EHRs early in their pharmacy curriculum (67.3% and 74.5% agreement, respectively ($p = 0.427$)). 74.5% of 2015 graduates had exposure to EHRs outside of the curriculum vs. 61.8% of 2016 graduates ($p = 0.173$). 83.0% of 2015 graduates vs. 98.2% of 2016 graduates felt confident in their use of EHRs at the time of graduation for pharmacy school ($p = 0.007$).

CONCLUSION: Inclusion of EHR use within a capstone course increases student confidence with the use of EHRs in APPEs. Students perceive that earlier EHR exposure in the curriculum would further improve their confidence with EHR use.

130. A case-based pharmacotherapy recitation course to improve students' ability to evaluate and apply primary literature in the delivery of evidence-based medicine *Adenike Atanda, Pharm.D.*, Annesha White, Pharm D, MS, Ph.D.; Pharmacotherapy, University of North Texas System College of Pharmacy, Fort Worth, TX

INTRODUCTION: Over the years, pharmacy practice has focused more on the importance of primary literature evaluation. The Center for the Advancement of Pharmacy Education (CAPE) highlights the practice of evidence based medicine as a key outcome for pharmacy students.

RESEARCH QUESTION OR HYPOTHESIS: Implementation of primary literature assignments into a case-based course would improve students' ability to evaluate primary literature.

STUDY DESIGN: An IRB approved, prospective quasi-experimental pilot study using pre- and post-surveys to assess pharmacy students' primary literature evaluation skills

METHODS: A 12 item pre and post survey comprised of multiple choice and 10-point likert scale perception questions was administered to students on the first and last day of the course. The course included 4 team-based primary literature assignments. Three assignments involved evaluating and applying primary literature in the formulation of one pharmacotherapy recommendation provided during case based activities. The students utilized an evaluation form adapted from the Texas Consortium of Experiential Programs to evaluate primary literature articles. The final assignment involved completing a journal club activity. Descriptive and T test statistical analyses were performed using SPSS. A p value <0.05 was statistically significant.

RESULTS: Ninety-six percent (75/78) and 94% (73/78) of students completed the pre and post surveys, respectively. Students' multiple choice assessment scores (66.7% and 79.6%, $p = .001$) and mean perceived ability to evaluate primary literature (6.3 and 6.9, $p = .021$) improved in the pre and post surveys. Students reported an increase in the frequency of their evaluation of primary literature articles from monthly to weekly ($p = .001$) and also suggested increasing the number of primary literature assignments offered in the post course review.

CONCLUSION: Incorporation of primary literature activities into a third year recitation course improved students' ability to evaluate primary literature. Curricular changes will be made to increase the number of primary literature assignments in the course.

131E. Improved treatment engagement among patients receiving insulin glargine 300 Units/ML who enrolled and received live support through the coach patient support program *Jennifer Goldman, Pharm.D., CDE, BC-ADM, FCCP*[1], Jasvinder Gill, M.D.[2], Tony Horn, MS[3], Timothy Reid, M.D.[4], Jodi Strong, APNP, CDE, BC-ADM, CPT[5], William Polonsky, Ph.D., CDE[6]; [1]Pharmacy Practice, MCPHS University, Boston, MA [2]Sanofi US, Inc., Bridgewater, NJ [3]SYMPHONY HEALTH SOLUTIONS LLC, PHOENIX, AZ [4]Mercy Diabetes Center, Janesville, WI [5]Ministry Medical Group, Stevens Point, WI [6]Behavioral Diabetes Institute, San Diego, CA

Presented at the 26th Annual Scientific & Clinical Congress of the American Association of Clinical Endocrinologists (AACE), Austin, TX, May 3-7, 2017.

132. Reliability of a virtual patient simulation as an assessment tool *Ryan D'Angelo, B.S., Pharm.D.*, Jennifer Smith, Pharm.D., Justin Delic, Pharm.D., Jean Scholtz, Pharm.D.; Department of Pharmacy Practice and Administration, University of the Sciences - Philadelphia College of Pharmacy, Philadelphia, PA

INTRODUCTION: Novel educational technologies, such as virtual patient simulations (VPS), are being used more frequently in the pharmacy curriculum as a learning tool to simulate clinical pharmacy practice. Despite proven benefits as a learning tool, VPS have not been evaluated or described as an assessment tool within pharmacy education.

RESEARCH QUESTION OR HYPOTHESIS: How reliable are VPS as an assessment tool for drug and disease state knowledge for pharmacy students?

STUDY DESIGN: An observational study was conducted in May 2017, to determine the quantitative reliability of a VPS instrument for 3rd year pharmacy students.

METHODS: A VPS was created to evaluate student ability to apply principles of the Pharmacist Patient Care Process and evaluate student drug and disease state knowledge. Students were provided access to a simulated electronic patient case prior to the VPS. The VPS consisted of a series of branching questions specific to the patient case. Questions encountered by all students within the VPS were analyzed for correct response on the first attempt and the primary outcome of reliability was calculated by Kuder-Richardson 20 (KR-20). Student performance was analyzed with descriptive statistics. Secondary outcomes included evaluation of student perceptions of the assessment.

RESULTS: Of the 172 students who consented to the study, mean assessment score was 75.9% $\pm$ 12.4 (SD), and a 95% confidence interval of the mean of 1.86. For questions encountered by all students, the KR-20 was 0.61. There was a 79% student

survey response rate. Students reported that the VPS tool allowed them to apply their knowledge (median, 4; IQR, 4–5), identify areas of weakness (4, 4–5), and prepare them for APPEs (4, 4–5).
CONCLUSION: Overall, the VPS was generally a reliable assessment tool and students had a favorable perception of the VPS. Based on the results of this study, criterion validity of the VPS assessment will be evaluated with student APPE performance.

133. Impact of a problem-based acute care pharmacy elective course on student performance *Thaddeus McGiness, Pharm.D.*[1], Laura Waite, Pharm.D.[2], Michael Smith, Pharm.D.[3]; [1]Department of Pharmacy Practice and Administration, Philadelphia College of Pharmacy, University of the Sciences, Philadelphia, PA [2]University of the Sciences, Philadelphia, PA [3]University of Michigan, Ann Arbor, MI
INTRODUCTION: With changing accreditation standards and higher expectations for pharmacy graduates, colleges of pharmacy across the country are searching for innovative teaching methods to enhance critical thinking skills. Problem-based learning (PBL) is an educational method that emphasizes student problem solving through self-directed learning, with facilitator guidance.
RESEARCH QUESTION OR HYPOTHESIS: Does participation in PBL impact performance in courses requiring advanced clinical reasoning.
STUDY DESIGN: Observational study of PBL student verse non-PBL student performance in advanced therapeutics courses.
METHODS: A progressive, 2-credit PBL acute care elective course was developed for the third professional year fall semester. Students were simultaneously enrolled in the third of four courses in the pharmacotherapeutics and case studies/laboratory sequences, with the expectation of completing both sequences in the spring. During the PBL course, students worked through three-part patient cases, either in groups or individually, that included complex disease states not previously included in the curriculum. At the conclusion of each case, students submitted a written assessment and plan for faculty feedback and in-class discussion. The course concluded with a capstone online decision simulation activity.
RESULTS: Nineteen students completed the PBL course, while 173 students were enrolled in the pharmacotherapeutics and case/lab course sequence. Baseline, and simultaneous pharmacotherapeutic course performance was similar between groups ($p = 0.1691$ and 0.1256, respectively); however, PBL students had higher final grades in the concluding pharmacotherapeutic courses ($p = 0.0448$). There were no differences in performance for the case/lab course for baseline, simultaneous, and concluding courses ($p = 0.5805$, 5858 , and 0.2342, respectively.
CONCLUSION: These results concur with previous literature that supports the use of a PBL model in healthcare education. Our results focused on how the PBL process helped students translate those PBL skills into other courses in the professional curriculum which require advanced levels of clinical reasoning. Research on the impact of this course on student success in advanced pharmacy practice rotations (APPE) is necessary.

134. Prospective evaluation of a formalized residency preparation program with individualized mentoring assignments for fourth professional year pharmacy students *Andrew J. Crannage, Pharm.D., BCPS*, Sara K. Richter, Pharm.D., BCPS, Rebecca L. Bragg, Pharm.D., BCPS, Matthew Pitlick, Pharm.D., BCPS, Anahit R. Simonyan, Pharm.D. Candidate, Zachary A. Stacy, Pharm.D., FCCP, BCPS, Joseph S. Van Tuyl, Pharm.D., BCPS, John M. Burke, Pharm.D., FCCP, FASHP, BCPS; St. Louis College of Pharmacy, St. Louis, MO
INTRODUCTION: Postgraduate training is becoming increasingly important to prepare pharmacy school graduates to manage complex diseases and improve patient outcomes. As the number of pharmacy graduates rises, obtaining a residency position has become increasingly more competitive. A residency preparation series consisting of six informational sessions, workbooks, and assigned mentors was developed to improve the level of preparedness of students pursuing residency training.
RESEARCH QUESTION OR HYPOTHESIS: Does a formalized residency preparation program impact fourth professional year (P4) pharmacy students' ability to obtain a residency position and overall perceived level of preparedness in pursuit of residency?
STUDY DESIGN: Prospective Cohort.
METHODS: This prospective study enrolled P4 students from July 2016 to February 2017. The primary outcome was the correlation between obtaining a postgraduate year one (PGY1) residency position and the number of residency preparation sessions attended. Additionally, students were surveyed about perceived preparedness immediately prior to the Match. Parametric and non-parametric statistical tests were used for data analysis with an alpha of 0.05 determined a-priori for statistical significance.
RESULTS: A total of 52 students enrolled in the residency preparation program, attended at least one session, and completed the necessary survey questions for inclusion. Of those 52 students, 37 attended four or more program sessions. Twenty-one of the 37 (56.8%) students participating in four or more sessions matched with a PGY1 program compared to 3 out of 15 (20%) students participating in less than four sessions ($p = 0.0299$). Students attending four or more sessions self-reported a median perceived level of preparedness of 7 (IQR 7–8.75) on a 10-point scale compared to 6.5 (IQR 4–7) for those attending less than four sessions ($p = 0.006$).
CONCLUSION: Obtaining a residency position is a highly competitive process. Successful obtainment of PGY1 training is associated with participation in a preparation program. Attendance and participation at >50% of the sessions positively impacts successful position attainment and perceived level of preparedness.

Emergency Medicine

135. Staff education reduces prophylactic ondansetron use with opiates in the ED *Hussain Bakhsh, Pharm.D.*[1], Stephen Perona, Pharm.D.[2]; [1]Department of Clinical Pharmacy at the Faculty of Pharmacy, King Abdulaziz University, King Abdulaziz University, Jeddah, Saudi Arabia [2]Pharmacy Department, Northwest Medical Center, Tucson, AZ
INTRODUCTION: Routine administration of anti-emetics with opiates is not recommended. Despite published data that show no benefit for this approach, the use of anti-emetics prophylactically with intravenous (IV) opiates for acute pain is a common practice.
RESEARCH QUESTION OR HYPOTHESIS: To evaluate the effect of an educational intervention on ondansetron prescribing patterns for patients receiving IV opiates for acute pain in the emergency department (ED)
STUDY DESIGN: Pre- and post-educational intervention undertaken in a single community ED.
METHODS: Over a two-month period, pharmacists provided education targeting physicians and nurses. The multifaceted educational initiative comprised a link to an animated video, posters at strategic locations in the department, email reminders, brief presentations during shift change, and one-on-one discussion. The primary outcome was the change in the proportion of prophylactic ondansetron prescription with IV opiates for acute pain in the ED. All patients who received IV morphine or hydromorphone during the month before and immediately following the educational intervention were identified. The charts of 150 patients from each period were randomly selected for retrospective chart review.

RESULTS: The proportion of patients administered prophylactic ondansetron decreased from 41% in the pre-intervention to 26% in the post-intervention period (difference 15% [95% CI 9.3–20.7], $P < 0.005$). Therapeutic use for documented nausea and vomiting upon presentation decreased marginally from 44% to 35% (difference 9% [95% CI 4.4– 13.6], $P = 0.13$). This lead to an overall decrease in ondansetron prescription from 85% to 61% (difference 24% [95% CI 17.2– 30.8], $P < 0.001$) with no requirement of other anti-emetic administration.
CONCLUSION: Pharmacist provided education yielded a significant reduction in the use of prophylactic ondansetron for patients receiving intravenous opiates in the ED.

136E. Impact of electronic physician order-set on antibiotic ordering time in septic patients in the emergency department *Emily Fargo, Pharm.D.*[1], Ronald Campbell, Pharm.D., BCPS[2], Kathy Fowler, MSN, RN, CMSRN[1], Aaron Pickering, Pharm.D.[1], Frank D'Amico, Ph.D.[3], Megan Kloet, Pharm.D., BCPS[1]; [1]UPMC St. Margaret, Pittsburgh, PA [2]Department of Pharmacy, UPMC - St. Margaret, Pittsburgh, PA [3]Department of Biostatistics, UPMC St. Margaret, Pittsburgh, PA
Presented at the Society of Teachers of Family Medicine Annual Meeting, San Diego, CA, May 5-9, 2017.

137. Impact of an emergency department discharge protocol for low-risk venous thromboembolism *David Yang, Pharm.D.*[1], Steven Nerenberg, Pharm.D.[2]; [1]Department of Pharmacy, St. Joseph's Regional Medical Center, Paterson, NJ [2]Department of Pharmacy Practice and Administration, Ernest Mario School of Pharmacy, Rutgers, The State University of New Jersey, Piscataway, NJ
INTRODUCTION: Clinical trials demonstrate outpatient management of low-risk deep vein thrombosis (DVT) and pulmonary embolism (PE) is safe, effective and cost-saving. Non-vitamin K antagonist oral anticoagulants (NOACs) provide an anticoagulation option to facilitate direct discharge from the emergency department for outpatient management. A guideline was created to identify which venous thromboembolism (VTE) patients are considered low-risk.
RESEARCH QUESTION OR HYPOTHESIS: What is the potential impact of implementing a low-risk VTE discharge guideline in the emergency department?
STUDY DESIGN: Single-center, retrospective chart review.
METHODS: A report was generated for adult emergency department patients with a primary diagnosis of "embolism" or "thrombosis" from March 19, 2016 to March 18, 2017. Patients with radiologically confirmed VTE were included. Medical records were reviewed for pre-specified risk factors that would exclude patients from low-risk classification. The primary outcome was avoidable admissions, defined as patients meeting eligibility criteria that were instead admitted. Secondary outcomes included avoidable healthcare expenditure, admission-related adverse events and medical insurance status.
RESULTS: A total of 169 patients were included in the study, divided into 83 PE and 86 DVT. There were 54 (32%) patients identified that would have qualified as low-risk based on the guideline, of which 43 (80%) were admitted. Among PE patients, 16 (19%) qualified, all of whom were admitted. Among DVT patients, 38 (44%) qualified, and 27 (80%) were admitted. These admissions led to the accumulation of 233 hospital days (average 5.4, range 2–11). The avoidable hospitalization expenditure was estimated as $466,000. One qualifying admitted patient had a clinically significant bleed and eight qualifying patients did not have medical insurance.
CONCLUSION: Implementation of a low-risk VTE discharge guideline can effectively and safely reduce admissions. Because not all patients had medical insurance, this guideline may not facilitate discharge in every social circumstance.

138. Pharmacist impact on time and selection of antibiotics for trauma patients with open fractures *Mark Culver, Pharm.D., BCPS*; Department of Pharmacy, Banner University Medical Center Phoenix, Phoenix, AZ

INTRODUCTION: Limited evidence exists evaluating the pharmacist role during trauma resuscitation and none examining open fractures. These patients require appropriate antibiotics due to infection risk up to 55%. National trauma service reviewers examine appropriateness and timing of antibiotics for open fractures and recommend intravenous antimicrobials within 60 min of presentation. Gustilo type I and II open fractures should receive a first-generation cephalosporin, gram-negative organism coverage is recommended for type III fractures, and additional anaerobic coverage for severe contamination or impaired vascularity.
RESEARCH QUESTION OR HYPOTHESIS: What impact does a pharmacist have on timing and appropriate selection of antibiotics in trauma patients with open fractures?
STUDY DESIGN: This was a single center retrospective study.
METHODS: Adults presenting to the trauma bay directly from the scene of injury with open fracture(s) requiring antibiotics in 2016 were included and grouped based on pharmacist participation. Patient demographics, antibiotic administration, and antibiotic selection were evaluated. Appropriate antibiotic selection was determined by Gustilo classification and current guidelines for pathogen coverage.
RESULTS: Forty-four patients met criteria. In the pharmacist group, 94.4% of patients received antibiotics within 60 min versus 60.0% without pharmacist ($p = 0.01$). Appropriate antibiotics within 60 min were given to 89.0% of patients with a pharmacist versus 36.0% without a pharmacist ($p = 0.01$). Time to initial antibiotic was 23.6 min with a pharmacist and 60.8 min without ($p = 0.04$). Appropriate antibiotics within 30 min occurred in 72.2% of patients in pharmacist group and 28% without pharmacy services ($p = 0.004$). Appropriate antibiotic selection required 24.3 min with a pharmacist and 113.9 min without ($p = 0.01$) after excluding patients that never received appropriate antibiotic therapy. Twenty percent of patients did not receive guideline-appropriate antibiotics when a pharmacist was unavailable. There was no difference in demographic data.
CONCLUSION: Pharmacist integration during trauma resuscitation demonstrated a decrease in antibiotic administration timing and improved appropriate antibiotic selection for patients with open fractures.

139. Addition of a pharmcist in the collaborative care of septic patients in the emergency department *Michael Olmos, Pharm.D., BCPS*, Sameer Afghani, Pharm.D., Patricia Newcomb, Ph.D., RN CPNP, Dave Spear, M.D.; Texas Health Harris Methodist Hospital Fort Worth, Fort Worth, TX
INTRODUCTION: Sepsis is a life threatening condition that accounts for greater than 215,000 deaths per year and has a financial impact that exceeds $20 billion of total hospital expenditures. The Surviving Sepsis Guidelines recommend timely administration of appropriate antibiotics. Despite this recommendation, compliance with giving appropriate and timely antibiotics in septic patients in the ED remains low.
RESEARCH QUESTION OR HYPOTHESIS: Does the addition of the pharmacist in the care of septic patients in the ED effect time until antibiotics are given, length of stay and mortality?
STUDY DESIGN: Non randomized cohort study analyzing patients diagnosed with sepsis and septic shock treated in the emergency room from May 1, 2016 through April 30, 2017.
METHODS: Protocol was developed for the ED pharmacist to help identify potential septic patients in the ED. If a patient was identified and no antibiotic(s) ordered then the ED physician was contacted. If deemed appropriate antibiotics were ordered and the pharmacist assisted the ED nurse by pulling the antibiotic(s) from the Pyxis and ensuring no barriers to administration.

Primary outcome measured was to determine if the addition of a pharmacist in the care of septic patients in the ED would reduce time to antibiotic from admission and order. Secondary outcomes measured were in-hospital mortality and length of stay. Student t-test and Chi-square used for analysis of appropriate data.
RESULTS: Time to antibiotic from admission (73.9 min vs. 140.4 min; p =< 0.001), mortality (8.1% vs. 18.8%; p = 0.023), length of stay (11.1 vs. 8 days; p =< 0.001).
CONCLUSION: Patients with sepsis remain a significant challenge for the entire team in any ED. For this reason, collaborative care is of utmost importance in order to potentially improve patient outcomes. The results of this study show collaborative care with the addition of a pharmacist may reduce time until appropriate antibiotics and in-hospital mortality.

140. Evaluation of intravenous alteplase in elderly patients with acute ischemic stroke: a retrospective safety analysis *Judah Brown, Pharm.D.*[1], Christopher Adams, Pharm.D.[1], Fatema Dhanaliwala, BSPharm[2], Luigi Brunetti, Pharm.D., MPH[2]; [1]Ernest Mario School of Pharmacy, Rutgers, The State University of New Jersey, Piscataway, NJ [2]Department of Pharmacy, Robert Wood Johnson University Hospital Somerset, Somerville, NJ
INTRODUCTION: Intravenous alteplase (rtPA), is used to improve functional outcomes for patients experiencing acute ischemic stroke. Although alteplase has been shown to improve functioning, its FDA indication is restricted to younger patients (<80 years old)
RESEARCH QUESTION OR HYPOTHESIS: There is an increased risk of mortality in ischemic stroke patients ≥80 years old after alteplase administration compared to younger patients or those who do not receive alteplase.
STUDY DESIGN: Retrospective cohort study conducted at a Primary Stroke Center.
METHODS: Patients ≥18 years old with a primary diagnosis of ischemic stroke between the dates of 1/1/12 and 1/1/16 were included. Patients were excluded from the study if they did not receive radiographic imaging 24 h after rtPA administration at our institution. The primary outcome measure explored in-hospital mortality within 7 days of admission to the emergency department for the management of ischemic stroke. The secondary outcome measure assessed the composite of hemorrhagic conversion or major bleeding within 7 days of admission to the emergency department for the management of acute ischemic stroke.
RESULTS: 287 patients were included in the study. 4 of 33 patients ≥80 years old expired compared to 0 of 48 patients <80 years old (12.1% vs. 0%, p = 0.01336). Of patients ≥80 years old, 4 of the 33 patients expired in the rtPA-group compared to 1 of 61 patients in the control-group (12.1% vs. 1.6%, p = 0.03066). When comparing the incidence of hemorrhagic conversion, 8 of 33 patients ≥80 years old bled compared to 1 of 48 patients <80 years old (24.2% vs. 2.1%, p = 0.005405). Comparing patients ≥80 years old, 8 of 33 patients in the rtPA-group bled compared to 1 of 61 control-group patients (24.2% vs. 1.6%, p < 0.001).
CONCLUSION: The use of intravenous alteplase in ischemic stroke patients ≥80 years old was associated with a significant increase in the rate of in-hospital mortality and hemorrhagic conversion or major bleeding.

141. Evaluation of outcomes in patients with ICH receiving 4F-PCC: a comparison of patients with and without trial ICH exclusion criteria *Maryam Zaeem, Pharm.D.*, Blake Porter, Pharm.D., Samantha Delibert, Pharm.D., Courtney Jones, Ph.D., Nicole M. Acquisto, Pharm.D.; University of Rochester Medical Center, Rochester, NY
INTRODUCTION: The landmark 4-factor prothrombin complex concentrate (4F-PCC) trial (Sarode et. al., Circulation 2013) had additional intracranial hemorrhage (ICH) specific exclusion criteria aimed at futility that have not been incorporated into clinical practice. Also, little is know about the incremental predictive ability of numerous exclusion criteria and outcomes.
RESEARCH QUESTION OR HYPOTHESIS: The purpose of this study was to compare clinical outcomes of patients with trial ICH exclusion criteria to those without to optimize institutional use of 4F-PCC.
STUDY DESIGN: Retrospective review at an 850-bed academic medical center.
METHODS: Adult ICH patients were included if they received 4F-PCC for anticoagulant reversal between September 2013 and February 2017. Patient demographics, ICH exclusion criteria, in-hospital mortality, disability, and disposition were collected. The primary outcome was the composite of in-hospital mortality and disability [Modified Rankin Scale (mRS) score 5 and 6]. Secondary outcomes were the number of ICH exclusion criteria associated with the composite endpoint, disability, and disposition. Data were analyzed using chi-squared test of association and logistic regression to calculate receiver operating characteristic curves.
RESULTS: Data from 167 patients were analyzed; 103 (61.7%) met at least one ICH exclusion criteria and 64 (38.3%) met none. The composite outcome was more frequent in patients meeting at least one ICH exclusion criteria (74.8% vs. 39%, p < 0.0001). The presence of two or more ICH exclusion criteria was significantly associated with higher odds of the composite outcome, higher mRS and disposition to a long-term care facility (p < 0.0001).
CONCLUSION: Patients meeting at least one trial ICH exclusion criteria had greater death and disability compared to those that did not. Having more ICH exclusion criteria was associated with higher rates of death, disability, and worse disposition at discharge.

142. Effect of vitamin K route and dose on complete warfarin reversal *Nick Polito, Bacholor of Science*[1], Nicole M. Acquisto, Pharm.D.[2], Eric Kanouse, Pharm D[2], Molly McCann, MS[2], Courtney Jones, Ph.D.[2], Majed Refaai, M.D.[2]; [1]Department of Pharmacy, University of Rochester Medical Center, Rochester, NY [2]University of Rochester Medical Center, Rochester, NY
INTRODUCTION: Previous studies report baseline INR, vitamin K route of administration, and doses affect rate of INR reduction. It is unknown how these variables correlate with time to complete reversal.
RESEARCH QUESTION OR HYPOTHESIS: What are the vitamin K and patient variables associated with complete reversal following monotherapy?
STUDY DESIGN: Retrospective chart review.
METHODS: Adult patients, between January and December 2014, receiving vitamin K as monotherapy for warfarin reversal were included. Baseline INR and one repeat INR within 48 h of vitamin K administration had to be available. Exclusion criteria were liver dysfunction, coagulopathy unrelated to warfarin use, or life threatening bleeding. Primary outcome was achievement of complete reversal (INR < 1.5) and the relationship of dose, route, and weight on achieving this goal. Univariate descriptors were used to characterize sample population. To account for non-uniform collection of post-vitamin K INR times, a count processing time series regression model was used to estimate the time to reversal while adjusting for relevant confounders.
RESULTS: A total of 235 patients met inclusion criteria (mean baseline INR 4.7 ± 2.2; mean time to first INR after vitamin K 10.5 ± 4.2 h; 469 total INR values). At 48 h, 42% achieved complete reversal (mean 28 ± 10.3 h). Intravenous vitamin K (n = 120) or 10 mg dose (n = 59) were associated with an increased hazard of complete reversal compared to oral (odds ratio 1.8 [1.3–2.6]) and lower doses (odds ratio 2.4 [1.4–4.2]), respectively. Patient weight did not confound the association of INR reversal.

CONCLUSION: Intravenous route of vitamin K and higher dose were associated with an increased incidence of complete reversal, whereas patient weight was not.

143. Comparison of drug administration logistics between Prothrombin Complex Concentrates and Fresh Frozen Plasma in patients with emergency bleeding *Sumaiah Alarfaj, Pharm.D.*[1], Daniel Jarrell, Pharm.D.[2], Asad E. Patanwala, Pharm.D.[3]; [1]University of Arizona- College of Pharmacy, Tucson, AZ [2]Department of Pharmacy, Banner University Medical Center Tucson, Tucson, AZ [3]university of Arizona-College of Pharmacy, Tucson, AZ

INTRODUCTION: Prothrombin complex concentrates (PCCs) are used as an alternative to Fresh Frozen Plasma (FFP) for emergency bleeding. Since FFP use requires an extra step of thawing, it has been hypothesized that PCCs are faster to administer than FFP. Moreover, due to its smaller volume and faster infusion rate, it is possible that 3-Factor PCCS (PCC3) are easier to prepare and faster to administer than 4-Factor PCCS (PCC4).

RESEARCH QUESTION OR HYPOTHESIS: Compare the time from initial order to start of administration between PCC3, PCC4, and FFP. Evaluate the effect of emergency department (ED) pharmacist involvement on time of administration of PCCs.

STUDY DESIGN: This was a single center three-arm retrospective cohort study.

METHODS: Adult patients admitted to the ED with emergency bleeding were included. Categorical data were analyzed using the Fisher's exact and continuous data were compared between groups using the Kruskal-Wallis test with values expressed as median and interquartile ranges. The primary outcome measure was time from order to drug or FFP administration.

RESULTS: A total of 90 patients were included (30 in each of the three groups – PCC3, PCC4, FFP). The median time from order to start of medication administration was similar between PCC3 (36 min; IQR 20–58), and PCC4 (34 min; IQR 18–48) groups but significantly lower than FFP group (99 min; IQR 64–146) ($p < 0.001$). When an ED pharmacist was involved in ordering the PCCs, median time from order to administration of PCCs was significantly lower (42 min; IQR 32–59, versus 24 min; IQR 15–35); $p = 0.002$). There was no significant difference in length of stay, survival, and thromboembolic complications during hospitalization between the three groups.

CONCLUSION: PCC's are faster to acquire and infuse to patients with emergency bleeding than FFP. ED pharmacist involvement may decrease the time from order to administration of PCC.

145. Emergency department discharge prescription evaluation at an academic medical center *Elizabeth Rozycki, Pharm.D.*, Emily Griffin, Pharm.D., Andrew North, Pharm.D., MBA, BCPS, BCCCP; Department of Pharmacy, Ohio State University Wexner Medical Center, Columbus, OH

INTRODUCTION: The potential impact of pharmacist review of Emergency Department (ED) discharge prescriptions prior to ED discharge have not been fully explored.

RESEARCH QUESTION OR HYPOTHESIS: What is the potential for pharmacist intervention on targeted ED discharge prescriptions?

STUDY DESIGN: Retrospective chart review of ED discharge prescriptions.

METHODS: All ED discharge prescriptions between April 1st and June 30th, 2016 were identified through an electronic medical record query. From the prescriptions identified, select medication classes were excluded based on suspected low intervention yield as determined a priori by the study team, including antihistamines, antiemetics and opioid-analgesics. A random sample of 500 prescriptions was selected for assessment. Prescriptions were assessed in a standardized manner according to pre-specified criteria. Potential interventions were categorized based on intervention type. A single pharmacist completed the evaluation and a second reviewer audited 20% of prescriptions. Any disagreements between reviewers were adjudicated by study team discussion.

RESULTS: During the study period, 13,242 discharge prescriptions were written; 7,598 prescriptions remained after low intervention yield classes were excluded. In the sample of 500 prescriptions, 68 (13.6%) required intervention. Eleven prescriptions warranted more than one intervention. Antimicrobial prescriptions accounted for 50 of the 79 total interventions (63.3%). Cephalosporins and fluoroquinolones had the most opportunities for intervention. NSAIDs had a low yield for intervention with 3/107 prescriptions warranting intervention. Nineteen significant drug-drug interactions were identified. Opportunities for patient education on high-risk medications, including anticoagulants, were also identified in three prescriptions.

CONCLUSION: In our review, 13.6% of discharge prescriptions had the potential for pharmacist intervention. Antimicrobials had both high rates of prescribing and high yield for intervention. Anti-inflammatory and non-opioid analgesic agents had a high rate of prescribing with low yield for intervention. Development of a tool to facilitate discharge prescription review based on frequency of prescribing, high rates of interventions, as well as high-risk medications and populations should be investigated.

146. Evaluation of the level of sedation and monitoring of intubated patients in the emergency department *Daniel Fischer, Pharm.D.*, Gabrielle Jacknin, Pharm.D., Nicole Paavola, Pharm.D.; University of Colorado Hospital, Aurora, CO

INTRODUCTION: Sedatives and analgesics are commonly administered in the emergency department (ED) and intensive care unit (ICU) to treat pain and agitation in intubated patients. Guidelines recommend light sedation and early achievement of light sedation, has been associated with improved outcomes; however, data are limited regarding monitoring sedation in the ED population.

RESEARCH QUESTION OR HYPOTHESIS: How appropriately are intubated ED patients being sedated in accordance with guideline recommendations?

STUDY DESIGN: Retrospective chart review of patients intubated at the University of Colorado ED between August 1st, 2015 and August 1st, 2016.

METHODS: Intubated patients receiving sedation with a Glasgow Coma Scale (GCS) of ≥ 8 prior to intubation were included. Patients were excluded if they were intubated secondary to burns, stroke, or head injury, receiving continuous neuromuscular blockade or therapeutic hypothermia, or were admitted to the operating room. The primary outcome was level of sedation as documented by first ICU Richmond Agitation and Sedation Scale (RASS). Secondary outcomes included time from intubation to first documented RASS and RASS documentation in the ED.

RESULTS: Seventy-one patients were included (mean age 50; median GCS 12, IQR 9–14). Upon ICU admission, median first RASS was -2 (IQR -4 to -2). Level of sedation based on first ICU RASS was light (RASS 0 to -2), moderate (RASS -3), deep (RASS -4 to -5) and under-sedated (RASS 1–4) in 22 (31%), 15 (21%), 20 (28%), 14 (20%) patients respectively. A RASS was documented in the ED in 9 patients (13%) with the median first RASS documented in the ED was -4 (IQR -4 to -3).

CONCLUSION: Level of sedation upon ICU admission was outside recommended RASS goals in over half of the patients reviewed. RASS documentation in the ED was infrequent and increased utilization of RASS to titrate and monitor sedation in ED patients may help to achieve early light sedation goals.

147. Assessing pharmacists' influence in ensuring appropriate transitions of care with anticoagulation management: A focus on emergency department discharges *Candace Bryant, Pharm.D.*[1], Bliss McMichael, Pharm.D.[1], Jennifer W. Baker, Pharm.D., BCACP, BCPS[1], Bishoy Ragheb, Pharm.D., BCACP, CDE, CACP, CTTS[1], Jessica Wallace, Pharm.D., BCPS[2]; [1]Veterans Affairs Tennessee Valley Healthcare System, Murfreesboro, TN [2]Department of Pharmacy Services, VA Tennessee Valley Healthcare System, Nashville, TN

INTRODUCTION: Transitions of care between different healthcare settings can increase the risk of medication errors, possibly resulting in adverse drug events, increased length of hospital stays, and hospital readmissions. Patients receiving high-risk anticoagulation medications are especially prone to adverse outcomes secondary to ineffective transitions of care, especially in the emergency department (ED). The purpose of this study was to evaluate the impact of clinical pharmacists' on the management of anticoagulants during transitions of care through ED discharges.

RESEARCH QUESTION OR HYPOTHESIS: There will be an increase or decrease in the percentage of patients with appropriate anticoagulation at discharge from Nashville ED after the integration of a pharmacist.

STUDY DESIGN: Single-center, retrospective, observational analysis of veterans at the VA Tennessee Valley Healthcare System from July 1, 2013 to June 30, 2016.

METHODS: The primary outcome measured was the percentage of patients who received appropriate anticoagulation at time of discharge before and after the integration of a clinical pharmacist. Secondary endpoints included assessing the number of patients with a pharmacist intervention, whether patient education was provided prior to discharge, and time to outpatient follow-up. Manual chart review was used to determine appropriate anticoagulation based on dosing, indication, renal function, weight, and the presence of major drug-drug interactions.

RESULTS: 220 patients were enrolled in the study with 110 in each group. Patient characteristics, other than warfarin prescriptions, were similar between the two groups. There was a significant improvement in appropriate anticoagulation at discharge after an ED pharmacist was integrated (87.3% vs. 96.4%, $P = 0.02$). 45.8% of patients had an intervention made by a pharmacist and 45.8% of patients received education at discharge after a pharmacist was integrated.

CONCLUSION: Pharmacists' unique knowledge of pharmacology, pharmacokinetics, and drug interactions makes them well-suited to ensure the appropriateness of anticoagulation at discharge from an ED.

Endocrinology

148. Conversion from insulin glargine U-100 to insulin glargine U-300 or insulin degludec and the impact on dosage requirements *Scott Pearson, Pharm.D.*, Jennifer Trujillo, Pharm.D.; Skaggs School of Pharmacy and Pharmaceutical Sciences, University of Colorado, Aurora, CO

INTRODUCTION: Clinical trials showed that in order to achieve similar glycemic control, patients taking insulin glargine U-300 (Gla-300) required 12–18% higher doses and patients taking insulin degludec required 11–12% lower doses compared to those taking insulin glargine U-100 (Gla-100). Despite this, prescribing information recommends 1:1 dose conversion.

RESEARCH QUESTION OR HYPOTHESIS: Do basal insulin requirements change when patients transition from Gla-100 to Gla-300 or insulin degludec?.

STUDY DESIGN: Retrospective chart review.

METHODS: This study involved patients in the University of Colorado Health Endocrine Clinic who were transitioned from Gla-100 to either Gla-300 ($n = 95$) or insulin degludec ($n = 39$). The primary outcome was difference between baseline Gla-100 dose and dose of Gla-300 or degludec prescribed after first follow-up visit within 1–12 months. Secondary outcomes included changes in glycemic control and empiric dose conversion from Gla-100 to Gla-300 or degludec on the day of transition. Wilcoxon matched pairs tests evaluated changes in insulin doses, and paired t-tests assessed changes in glycemic control using GraphPad statistical software.

RESULTS: Daily basal insulin dose increased for patients transitioned from Gla-100 to Gla-300 from 42.8±33.5 units at baseline to 45.9±35.1 units after follow-up ($p = 0.01$). In the degludec group, the basal insulin dose decreased from 66±47.6 units at baseline to 61.8±51.4 units after follow-up, but this was not statistically significant ($p = 0.56$). Changes in A1C, blood glucose measurements and rates of hypoglycemia were not significantly different between baseline and follow-up visits in either the Gla-300 or degludec groups. At the time of transition, the prescribed dose of Gla-300 or degludec did not significantly differ from the previous dose of Gla-100 ($p = 0.73$ and 0.28 respectively), indicating that empiric dose adjustments were not routinely prescribed.

CONCLUSION: Patients who transitioned from Gla-100 to Gla-300 had increased basal insulin requirements between visits, while basal insulin requirements for those transitioned from Gla-100 to insulin degludec were not significantly different.

149. Evaluating the impact of pharmacist intervention in osteoporosis management Brandi Bowers, Pharm.D.[1], Shefali Barot, Pharm.D.[2], *Amy Drew, Pharm.D., BCPS*[3]; [1]Mercy Hospital St. Louis, St. Louis, MO [2]St. Louis College of Pharmacy, St. Louis, MO [3]Mercy Clinic Family Medicine, St. Louis, MO

INTRODUCTION: Despite significant clinical and economic consequences, the American Association for Clinical Endocrinologists reports only one in seven women who should receive osteoporosis therapy is treated. The long-term effects of pharmacist-led osteoporosis management on treatment rates have not been evaluated.

RESEARCH QUESTION OR HYPOTHESIS: Pharmacist intervention in osteoporosis management in a family medicine clinic improves antifracture therapy treatment rates in high-risk patients.

STUDY DESIGN: Retrospective cohort study.

METHODS: All women over the age of 65 with a dual-energy X-ray absorptiometry (DXA) scan ordered by a Mercy Clinic Family Medicine physician between June 1, 2008 and June 1, 2016 were identified by electronic medical record reporting and included in analysis. High-risk patients had T-scores ≤ -2.5 at the lumbar spine, femoral neck, or 33% radius or FRAX 10-year risk scores ≥ 20 for major osteoporosis-related fracture or ≥ 3 for hip fracture. The primary outcome was initiation or continuation of prescription antifracture therapy in high-risk patients managed by either physician or pharmacist. Secondary outcomes included recommendation rates for antifracture therapy and calcium and vitamin D (Ca/VitD) in all DXAs and the high-risk subgroup. Chi-square or Fisher's Exact tests for categorical data and Student's t-tests for continuous data were performed within SPSS software.

RESULTS: There were 549 (237 high-risk) physician-managed and 466 (311 high-risk) pharmacist-managed DXA scans. Most patients were white and average 74.2 years; pharmacist-managed patients were older and more likely high-risk. The primary outcome was significant (34% vs. 66%, $p < 0.001$), with high-risk pharmacy-managed patients more likely to initiate therapy. Recommendation rates for antifracture therapy (32% vs. 87%, $p < 0.001$) in high-risk patients and Ca/VitD in all patients (46% vs. 96%, $p < 0.001$) and high-risk patients (45% vs. 97%, $p < 0.001$) were also significantly higher in pharmacist-managed DXAs.

CONCLUSION: Pharmacist intervention in osteoporosis management is associated with higher rates of antifracture therapy recommendation and initiation in a primary care clinic, increasing compliance with clinical guidelines.

150. Cost-utility of empagliflozin in patients with type 2 diabetes mellitus at high cardiovascular risk *Erin Weeda, Pharm.D., BCPS*[1], Elaine Nguyen, Pharm.D., MPH, BCPS[2], Craig Coleman, Pharm.D.[3], Suresh Nair, Ph.D.[4]; [1]College of Pharmacy, Medical University of South Carolina College of Pharmacy, Charleston, SC [2]School of Pharmacy, Idaho State University, Meridian, ID [3]School of Pharmacy, University of Connecticut, Storrs, CT [4]University of Connecticut School of Business, Storrs, CT

INTRODUCTION: In the Empagliflozin, Cardiovascular Outcomes, and Mortality in Type 2 Diabetes (EMPA-REG) trial, empagliflozin reduced heart failure hospitalizations and cardiovascular and all-cause mortality in patients with type 2 diabetes mellitus (T2DM) at high cardiovascular risk due to a history of coronary or peripheral artery disease or stroke. According to the American Association of Clinical Endocrinologists/American College of Endocrinology T2DM guidelines, sodium glucose cotransporter-2 inhibitors (like empagliflozin) can be used alone or in combination with other glucose-lowering agents, depending on patients' baseline glycated hemoglobin.

RESEARCH QUESTION OR HYPOTHESIS: Empagliflozin is a cost-effective strategy compared to standard treatment for the prevention of cardiovascular morbidity and mortality in patients with T2DM at high cardiovascular risk.

STUDY DESIGN: Markov model based cost-utility analysis.

METHODS: We developed a Markov model to assess the cost-effectiveness of empagliflozin (as compared to standard treatment) for the prevention of cardiovascular morbidity and mortality in patients with T2DM using a 3-month cycle length and a lifetime horizon. Data sources included the EMPA-REG randomized clinical trial and other published studies. Outcomes included treatment costs (in 2016 US$), quality-adjusted life-years (QALYs) and incremental cost-effectiveness ratios (ICERs). One-way and probabilistic sensitivity analyses (PSA) were performed to test the robustness of conclusions.

RESULTS: Empagliflozin use resulted in higher total treatment costs ($371,450 vs. $272,966) but yielded greater QALYs (10.712 vs. 9.419) compared to standard treatment. This corresponded to an ICER of $76,167 per QALY gained. Our model appeared most sensitive to changes in the cost of empagliflozin, 3-month event costs for major stroke and control rates of death and end stage renal disease. PSA suggested empagliflozin would be cost-effective in 96% of 10,000 iterations assuming a willingness-to-pay threshold of $100,000 per QALY gained.

CONCLUSION: Empagliflozin may be cost-effective compared to standard therapy in the treatment of T2DM patients at high cardiovascular risk.

151. Trends in prevalence, cardiovascular risk factors, and lifestyle counseling for patients aged ≥20 years with diabetes mellitus, prediabetes, and/or obesity: analysis of U.S. physician office visits *Samantha Karr, Pharm.D., FCCP, BCPS, BCACP, BC-ADM*, Rebekah M. Jackowski, Pharm.D., Kelsey Buckley, Pharm.D., BCACP, Kathleen A. Fairman, MA, David A. Sclar, B.Pharm., Ph.D.; Department of Pharmacy Practice, Midwestern University, College of Pharmacy-Glendale, Glendale, AZ

INTRODUCTION: Diabetes mellitus (DM) and obesity—body mass index (BMI) ≥30 kg per squared meter body surface area (kg/m^2) —are known risk factors for cardiovascular disease (CVD) and related comorbidities. A previous study of office-based care provided for concomitant diabetes/obesity in 2005 found high rates of CVD-related comorbidities, with counseling on diet/nutrition and exercise, respectively, provided to 58.8% and 44.6% of patients.

RESEARCH QUESTION OR HYPOTHESIS: To evaluate trends in prevalence of DM and obesity; assess rates of comorbidities; and provide updated estimates of improvements/declines in lifestyle counseling in U.S. physician office visits.

STUDY DESIGN: Retrospective analysis of data derived from the National Ambulatory Medical Care Survey (NAMCS), a cross-sectional, nationally representative survey of U.S. office-based care conducted annually by the National Center for Health Statistics; time period 2010–2014.

METHODS: The sample included patients aged ≥20 years who were diagnosed with diabetes mellitus (International Classification of Diseases [ICD] codes of 250.xx); obesity (ICD codes for obesity or BMI ≥ 30 kg/m^2) and/or prediabetes (hemoglobin A1C of 5.5%-6.4%). Prevalence, expressed as counts of diagnoses per 1,000 office visits, and comorbidities, based on chronic conditions reported to the NAMCS, were measured.

RESULTS: From 2010–2014, monotonic increases were observed in the prevalence of obesity (from 163,35 to 233,52 per 1,000); prevalence of concomitant obesity/diabetes (from 19.75 to 29.88 per 1,000); and percentage of DM visits with concomitant obesity (from 31.0% to 43.8%). Among patients with concomitant diabetes/obesity in 2014, 62.3% had hyperlipidemia and 76.9% had hypertension; rates were slightly lower for those with prediabetes/obesity (59.0% and 71.1%, respectively). For the same patient populations, rates of counseling on diet/nutrition and exercise were 28%-30% and 22%-23%, respectively.

CONCLUSION: Despite marked increases in prevalence of concomitant DM/obesity and prediabetes/obesity, accompanied by high CVD-related comorbidity rates, provision of lifestyle counseling in U.S. physician office visits has declined sharply since 2005.

153E. Improved glycemic control and lower hypoglycemia risk with reduced prior oral antidiabetes drug (OAD) therapy in patients (pts) with T2D treated with insulin glargine 300 U/mL (Gla-300) *George Dailey, M.D.*[1], Timothy Reid, M.D.[2], John White, Pharm.D.[3], Jason Chao, MS[4], Fang Liz Zhou, M.D.[5], Sachin Paranjape, M.D.[5], Paulos Berhanu, M.D.[5]; [1]Scripps Whittier Diabetes Institute, San Diego, CA [2]Mercy Diabetes Center, Janesville, WI [3]Washington State University School of Pharmacy, Washington, WA [4]Xinyi, Inc., Bridgewater, NJ [5]Sanofi US, Inc., Bridgewater, NJ

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154E. Shorter time to glycemic control with fixed-ratio combination of insulin glargine and lixisenatide compared with insulin glargine treatment ALONE *Juan Pablo Frias, M.D.*[1], Manuel Puig Domingo, M.D., Ph.D.[2], Luigi Meneghini, M.D.[3], Raffaele Napoli, M.D.[4], Minzhi Liu, Ph.D.[5], Erika Soltes Rak, Ph.D.[6], Vanita Aroda, M.D. Ph.D.[7]; [1]National Research Institute, Los Angeles, CA [2]Service of Endocrinology, Hospital Germans Trias i Pujol, UAB, Barcelona, Spain [3]UT Southwestern Medical Center, Dallas, TX [4]Federico II University School of Medicine, Naples, Italy [5]BDM Consulting, Inc., Somerset, NJ [6]ProUnlimited, Inc., Boca Raton, FL [7]Medstar Health Research Institute, Hyattsville, M.D.

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155E. Impact of lixisenatide (LIXI) dose range on glycemic outcomes with fixed-ratio combination (FRC) iGlarLixi in patients (pts) with T2D *Juan Pablo Frias, M.D.*[1], William Hurst, Ph.D.[2], John Newton, M.D.[2], Martin Lorenz, Ph.D.[3], Michelle Roberts, M.D.[2], Terry Dex, Pharm.D.[2], Wolfgang Schmider, Ph.D.[3], Neil Skolnik, M.D.[4]; [1]National Research Institute, Los Angeles, CA [2]Sanofi US, Inc., Bridgewater, NJ [3]Sanofi Germany, Frankfurt, Germany [4]Abington Family Medicine, Jenkintown, PA

Presented at the American Diabetes Association 77th Scientific Sessions, San Diego, CA, June 9-13, 2017.

157E. Characteristics and glycemic outcomes of T2D patients (Pts) titrated to 60 U/day with insulin glargine/lixisenatide fixed-ratio combination (iGlarLixi) vs. insulin in the LixiLan-L Trial
Lawrence Blonde, M.D., FACP, MACE[1], Timothy Bailey, M.D.[2], Jason Chao, MS[3], Terry Dex, Pharm.D.[4], Juan Pablo Frias, M.D., FACE[5], Luigi Meneghini, M.D.[6], Michelle Roberts, M.D.[4], Vanita Aroda, M.D. Ph.D.[7]; [1]Department of Endocrinology, Ochsner Diabetes Clinical Research Unit, Ochsner Medical Center, New Orleans, LA [2]AMCR Clinic, Escondido, CA [3]Xinyi, Inc., Bridgewater, NJ [4]Sanofi US, Inc., Bridgewater, NJ [5]National Research Institute, Los Angeles, CA [6]UT Southwestern Medical Center, Dallas, TX [7]Medstar Health Research Institute, Hyattsville, MD
Presented at the American Diabetes Association 77th Scientific Sessions, San Diego, CA, June 9-13, 2017.

158E. Achievement of HbA1c targets in the diabetes unmet need with basal insulin evaluation (DUNE) real-world study
Luigi Meneghini, M.D.[1], Didac Mauricio, M.D.[2], Emanuela Orsi, M.D.[3], Nebojsa Lalic, M.D., Ph.D., FRCP[4], Anna Cali, M.D., MSc[5], Jukka Westerbacka, M.D.[5], Peter Stella, M.D.[5], Christophe Candelas, M.D.[5], Valerie Pilorget, M.D.[5], Riccardo Perfetti, M.D., Ph.D.[5], Kamlesh Khunti, FRCGP, FRCP, M.D., Ph.D.[6]; [1]UT Southwestern Medical Center, Dallas, TX [2]Hospital Universitari Germans Trias i Pujol, Barcelona, Spain [3]Endocrine and Metabolic Diseases Unit, Fondazione Ca' Granda IRCCS, Milan, Italy [4]Clinic for Endocrinology, CCS Faculty of Medicine,University of Belgrade, Belgrade, Serbia [5]Sanofi, Paris, France [6]Diabetes Research Centre, University of Leicester, Leicester, United Kingdom
Presented at the American Diabetes Association 77th Scientific Sessions, San Diego, CA, June 9-13, 2017.

159. Usability and acceptability of a ready-to-use glucagon autoinjector in a simulated severe hypoglycemia rescue situation
Brett Newswanger, BS, MBA[1], Steven Prestrelski, Ph.D., MBA[2], Anthony Andre, Ph.D.[3], Mark Garibaldi, BS[3]; [1]Xeris Pharmaceuticals, Chicago, IL [2]Xeris Pharmaceuticals, Austin, TX [3]Interface Analysis Associates, Saratoga, CA
INTRODUCTION: Currently approved glucagon emergency kits (GEKs) for severe hypoglycemia (SH) rescue are based on lyophilized formulations that require manual reconstitution with a vial and syringe at time of use, thus are difficult to administer. An investigational ready-to-use autoinjector is in clinical development for SH rescue. In a previous study, 88% (14/16) of participants successfully administered a simulated rescue injection using this glucagon auto-injector (GAI) compared to 31% (5/16) using the GEK.
RESEARCH QUESTION OR HYPOTHESIS: This study was designed to validate whether the GAI and associated instructional materials could be correctly, safely, and effectively used by intended user populations.
STUDY DESIGN: During the first session participants were either trained on the device and procedure, or given time to read the IFU and familiarize themselves with the device. Participants returned a week later to perform an unaided rescue attempt simulating a SH emergency.
METHODS: This study was conducted with 75 volunteers comprising four subgroups: 15 first responders experienced with GEKs, 15 experienced adult caregivers of diabetic patients, 30 naïve adult caregivers of diabetic patients, and 15 naïve adolescent caregivers. Neither the experienced adult caregivers (15) nor half of the naïve adult caregivers (15) received formal training.
RESULTS: All but one participant (74/75, 98.7%), an untrained, naïve adult caregiver, successfully administered the rescue injection. All participants 1) successfully removed the device from the pouch, 2) removed the cap from the device, 3) selected an appropriate injection site, 4) exposed the skin of the manikin, and 5) activated the injection by pressing the device against the skin. All participants (75/75, 100%) stated that had no difficulty with any aspect of the process and no concerns about their ability to safely and effectively use the GAI for SH rescue.
CONCLUSION: The current study validated that GAI and associated instructional materials can be correctly, safely, and effectively used by the intended user populations.

160E. Low incidence of gastrointestinal adverse events over time with a fixed-ratio combination of insulin glargine and lixisenatide vs. lixisenatide alone
Jennifer Trujillo, Pharm.D.[1], Michelle Roberts, M.D.[2], Terry Dex, Pharm.D.[2], John White, Pharm.D.[3], James LaSalle, M.D.[4]; [1]Skaggs School of Pharmacy and Pharmaceutical Sciences, University of Colorado, Aurora, CO [2]Sanofi US, Inc., Bridgewater, NJ [3]Washington State University School of Pharmacy, Washington, WA [4]Excelsior Springs Clinic, Excelsior Springs, MO
Presented at the 2017 AACE Annual Scientific & Clinical Congress, Austin, TX, May 3-7, 2017.

Family Medicine

161. Impact of clinical pharmacist feedback presentations on family medicine residents' patient care and prescribing behaviors at hospital discharge
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INTRODUCTION: Clinical pharmacists play a key role in care transitions by ensuring patients adhere to the treatment plans post discharge. During these encounters, pharmacists identify medication and patient issues such as lack of understanding of treatment plan and medication non-adherence which are then shared with the inpatient team to enhance patient care and minimize future occurrences.
RESEARCH QUESTION OR HYPOTHESIS: To determine the impact of the clinical pharmacist feedback presentations on residents' patient care and prescribing behaviors at hospital discharge.
STUDY DESIGN: A voluntary and anonymous survey administered to family medicine residents.
METHODS: After obtaining IRB approval, the clinical pharmacist collected medication and patient care issues in patients discharged from the family medicine inpatient service at post-discharge phone and clinic encounters. The findings were presented bi-monthly over eight months in a 15-min presentation during the weekly morning report teaching session. The residents were then surveyed on their impression of the presentations' impact on their patient care and prescribing behaviors and comments on the presentations itself.
RESULTS: Sixteen out of eighteen residents (89%) participated in the online survey. Most respondents agreed that the learning experience modified their approach to overall patient care (88%), when reconciling patients' medication regimens (94%), when initiating, discontinuing or modifying patients' medications (94%), and when providing discharge education/instructions to patients (100%). Fourteen (88%) residents agreed that the presentations assisted them in effectively assessing the need to refer patients for follow up with the clinical pharmacist. General comments about the presentations provided by seven respondents (44%) were uniformly positive with suggestions to continue the presentations and encourage the attendance of the primary care providers.
CONCLUSION: Family medicine residents felt that the pharmacist feedback presentations on transitions of care issues, was a positive learning experience and that it helped them to improve patient care and prescribing behaviors.

162. Healthcare provider perceptions of vaccinations in a Patient-Centered Medical Home and academic family medicine clinic *Emily Christenberry, Pharm.D.*[1], Margie Padilla, Pharm.D.[1], Gabriel Frietze, MA[2], Agathe Franck, M.D.[3], Amanda Loya, Pharm.D.[1]; [1]School of Pharmacy, The University of Texas at El Paso, El Paso, TX [2]Department of Psychology, The University of Texas at El Paso College of Liberal Arts, El Paso, TX [3]Department of Family and Community Medicine, Texas Tech University Health Sciences Center El Paso Paul L. Foster School of Medicine, El Paso, TX

INTRODUCTION: Adult vaccination rates are significantly below recommended thresholds. Previous literature has suggested patients are more likely to receive indicated vaccines if recommended by their healthcare provider (HCP). Subsequently, HCPs' attitudes and beliefs regarding immunizations can affect patient care.

RESEARCH QUESTION OR HYPOTHESIS: What are the attitudes and beliefs of family medicine HCPs regarding adult immunizations?

STUDY DESIGN: This was an observational study that utilized an adapted survey to capture HCP knowledge, attitudes, and perceptions regarding vaccinations. It was approved by the institutional review board.

METHODS: Physicians and nursing staff were recruited from a family medicine clinic. Participants rated their level of agreement with statements using a 5-point Likert scale (1 = Strongly Disagree; 5 = Strongly Agree). Descriptive statistics were utilized to describe the sample, including vaccine: knowledge, perceived barriers, role in patient education, and impact of vaccine-preventable diseases. An independent sample t-test was used to compare results between the physician and nursing groups. Data was analyzed using SPSS.

RESULTS: Twenty-three physicians and eleven nursing staff members participated in the survey. The majority reported agreement with the importance of adult vaccination ($M = 4.59$, $SD = 0.59$ & $M = 4.82$, $SD = 0.41$; respectively). HCPs did not report time barriers for vaccine administration ($M = 2.36$, $SD = 1.26$ & $M = 2.27$, $SD = 1.19$; respectively) or difficulty keeping track of adult patients' vaccine status ($M = 3.18$, $SD = 1.33$ & $M = 3.45$, $SD = 1.13$; respectively). No significant differences were reported between results in the two groups.

CONCLUSION: HCPs held positive knowledge, attitudes, and perceptions regarding adult immunizations. Results were limited by a small convenience sample and potential reporting bias. The results will be used to inform and improve vaccination practices in clinic. Future study will include an educational intervention for HCPs and re-administration of the survey post-intervention.

163. Development of a clinic-specific antibiogram for urinary pathogens in an outpatient Family Medicine Clinic Sarah Eudaley, Pharm.D., BCPS[1], Corey Medler, Pharm.D. Candidate (2018)[1], Julie Jeter, M.D.[2]; [1]College of Pharmacy, University of Tennessee Health Science Center, Knoxville, TN [2]Department of Family Medicine, University of Tennessee Graduate School of Medicine, Knoxville, TN

INTRODUCTION: As resistance patterns for uropathogens differ among geographic regions, the 2011 IDSA guidelines for treatment of uncomplicated UTI recommend using local resistance rates to drive empiric prescribing. Furthermore, the guidelines recommend avoiding empiric use of fluoroquinolones (FQ) and trimethoprim/sulfamethoxazole (TMP/SMX) when local resistance exceeds 10% and 20%, respectively.

RESEARCH QUESTION OR HYPOTHESIS: Determine clinic-specific antimicrobial susceptibilities for urinary pathogens.

STUDY DESIGN: This study was a retrospective chart review of positive urine cultures from patients with uncomplicated UTI in an outpatient Family Medicine clinic. Descriptive statistics were used to analyze data.

METHODS: Urine cultures eligible for inclusion were those with an antimicrobial susceptibility profile obtained from non-pregnant female patients (≥ 18 years of age) without an indwelling catheter or genitourinary abnormalities between January 1, 2015 and December 31, 2015. Cultures were excluded if obtained within 14 days of hospitalization and if >2 organisms isolated. Positive cultures were those with growth of $>10^2$ cfu/mL of a single pathogen. For patients with multiple positive urine cultures during the study period, only the first isolate was included.

RESULTS: Of the 349 urine cultures obtained, 110 were included. *Escherichia coli* was identified most commonly (n = 70) and was the only organism with >30 isolates. Susceptibility rates were as follows: FQ 88.5% (n = 62), TMP/SMX 77.1% (n = 54), nitrofurantoin 90% (n = 63), ceftriaxone 100% (n = 69), amoxicillin/clavulanate 91.4% (n = 64). Of note, FQ or TMP/SMX was prescribed empirically for 41.8% (n = 46) and 23.6% (n = 26) of infections, respectively. For 8% (n = 9) of infections, the organism isolated was resistant to the empiric agent selected (FQ n = 4, TMP/SMX n = 4, doxycycline n = 1).

CONCLUSION: Clinic-specific resistance rates to FQ and TMP/SMX exceed the rate for which guidelines recommend avoiding use for empiric therapy; however, these agents were the most commonly prescribed in our clinic. Determining the local susceptibility patterns and evaluating empiric antibiotic selection will allow targeted clinic-specific interventions to drive prescribing of empiric therapy.

Gastroenterology

164E. Turning off the drip: a single center evidence-based cost savings model for high risk upper gastrointestinal bleeding *Mark Culver, Pharm.D., BCPS*[1], Tyler Aasen, DO[2]; [1]Department of Pharmacy, Banner University Medical Center Phoenix, Phoenix, AZ [2]Division of Gastroenterology, East Tennessee State University Quillen College of Medicine, Johnson City, TN

Presented at Digestive Disease Week 2017, Chicago, IL, May 6-9, 2017.

165. Examination of the association between MELD-Na and clinical outcomes for hospitalized patients with cirrhosis and spontaneous bacterial peritonitis *Mary Kimmel, Pharm.D. Candidate*, Courtney Olesky, Pharm.D. Candidate, Jordan R. Covvey, Pharm.D., Ph.D., BCPS, Branden Nemecek, Pharm.D., BCPS; Duquesne University School of Pharmacy, Pittsburgh, PA

INTRODUCTION: Spontaneous bacterial peritonitis (SBP) commonly occurs in patients with cirrhosis, associated with downstream complications and high mortality. The Model for End-Stage Liver Disease (MELD) is a validated scoring system that provides a severity/prognostic index informing on short-term mortality in patients with cirrhosis; the score was updated in 2016 to include serum sodium (MELD-Na). Limited studies are available associating MELD-Na with outcomes, or in comparison to the previous MELD score.

RESEARCH QUESTION OR HYPOTHESIS: The objective was to evaluate clinical outcomes (length of stay [LOS], ICU admission and mortality) in patients with cirrhosis with SBP during hospitalization, stratified by MELD/MELD-Na.

STUDY DESIGN: Health system-wide retrospective cohort.

METHODS: Patients treated inpatient for SBP between 2009–2014 were identified using ICD-9 CM coding for cirrhosis (571.2,5,6) and SBP (567.23). Data extracted included demographics, laboratory/clinical markers, treatment and clinical outcomes. SBP diagnoses were considered confirmed (PMN count ≥250 cells/mm^3 or bacteria in the ascitic fluid) or suspected

(receipt of empiric treatment during admission). Both MELD and MELD-Na scores were calculated to assess disease severity, stratified and correlated with clinical outcomes. The study was approved by university/health system institutional review boards.
RESULTS: A total of 468 predominantly Caucasian males with alcoholic and/or hepatitis C-associated cirrhosis were evaluated; 309 (66.0%) had confirmed SBP and 159 (34.0%) had suspected SBP. In-hospital mortality was 9.8%, with a mean hospital LOS of 10.8 days and a mean ICU LOS of 6.2 days. Clinical outcomes correlated linearly with both MELD/MELD-Na. Mortality ranged 2.7%, 9.7%, 20.3% and 44.4% for MELD <10, 10–19, 20–29, 30–39 and 40+, respectively. Similarly, mortality ranged 2.6%, 5.3%, 19.4% and 44.4% for the same MELD-Na categories. Comparable trends were present for ICU admission and broadly for hospital and ICU LOS.
CONCLUSION: MELD-Na approximates traditional MELD scoring for short-term clinical outcomes in patients with cirrhosis hospitalized with SBP.

166. Hemodynamic changes after administration of neostigmine in adult patients with acute colonic pseudo-obstructions *Brian Spoelhof, Pharm.D.*, Jennifer Viveiros, Pharm.D., Lina Shoukry, Pharm.D.; Department of Pharmacy, Lahey Hospital and Medical Center, Burlington, MA
INTRODUCTION: Acute colonic pseudo-obstruction (ACPO), is a non-mechanical obstruction characterized by colonic dilation in adults with a variety of medical and surgical conditions. Intravenous neostigmine has been evaluated in several small trials. A potential adverse effect of neostigmine therapy is significant and potentially fatal bradycardia. Low-dose (0.5 mg), subcutaneous neostigmine has been proposed to be potentially safer by limiting peak concentrations. However, tThis regimen has only been evaluated in pediatric oncology patients; no data exists with the adult population.
RESEARCH QUESTION OR HYPOTHESIS: What are the hemodynamic effects of low-dose subcutaneous in an adult population with ACPO?
STUDY DESIGN: This is a retrospective observational study evaluating hemodynamic parameters before and after neostigmine administration.
METHODS: Patients who received subcutaneous neostigmine between January, 2014 and April, 2017 for ACPO were included. Heart rate (HR), systolic blood pressure (SBP), and diastolic blood pressure (DBP) were collected 6 h before and after each administration of neostigmine. The parameters before administration and lowest post-administration HR were compared. Administrations without pre- and post-vitals were excluded. SPSS© version 23 was used for statistical analysis. Wilcoxon signed rank was used to compare paired vital signs.
RESULTS: A total of 17 patients were identified who received a combined 178 administrations of subcutaneous neostigmine, and 150 of which were included. Patients were given a median of 7 doses (range: 2–38 doses). Median HR significantly differed between pre- and post- administration 83 (65–117 bpm) and 74 (46–105 bpm), $p < 0.001$, respectively. SBP and DBP, however, did not differ (SBP: 137 vs. 138 mmHg, $p = 0.312$; DBP: 70 vs. 69 bpm, $p = 0.193$). A decrease in heart rate was observed in 86 (57%) administrations and lead to any heart rate of less than 60 bpm.
CONCLUSION: Administration of low-dose subcutaneous neostigmine for ACPO led to decreased but clinically safe heart rate.

167. Evaluation of vitamin K administration for elevated international normalized ratio in chronic liver disease *Erin K. Hennessey, Pharm.D., BCPS*[1], Carmen B. Smith, Pharm.D, BCPS[2]; [1]St. Louis College of Pharmacy/Mercy Hospital St. Louis, St. Louis, MO [2]St. Louis College of Pharmacy, St. Louis, MO
INTRODUCTION: Patients with chronic liver disease (CLD) often have an elevated international normalized ratio (INR) due to disease associated coagulopathy. Vitamin K is frequently administered in an attempt to lower INR in these patients, however evidence to support this practice is lacking.
RESEARCH QUESTION OR HYPOTHESIS: Does vitamin K administration affect INR in patients with chronic liver disease?
STUDY DESIGN: Retrospective cohort.
METHODS: Hospitalized patients ≥18 years admitted between January 1, 2015 and December 31, 2106 with a diagnosis of CLD and receipt of at least one dose of vitamin K were included. Patients with acute liver failure, full dose anticoagulation, or administration of fresh frozen plasma (FFP) surrounding time of INR monitoring were excluded. The primary outcome was absolute change in INR from baseline to first follow-up INR after vitamin K administration. Total change in INR over the course of the hospitalization was also evaluated.
RESULTS: A total of 79 patients were included. Patient population consisted mainly of white males, predominately Child-Pugh class C (83.5%) with an average age of 54.1 years. The most common etiology of CLD was alcohol (72.2%). Absolute change in INR from baseline to first follow-up INR was +0.4 (baseline INR 2.4, first follow-up INR 2.8) with a median follow-up time of 21 h. Median change in INR over the course of hospitalization was 0.0 (no change). Median vitamin K administration during the course of hospitalization was 2 doses or 20 mg. Routes of administration included oral (62%), intravenous (34.4%) and intramuscular or subcutaneous (3.6%).
CONCLUSION: The administration of vitamin K does not appear to affect INR during hospitalization. Given the side effect profile and cost implications of vitamin K use in the hospital, further research regarding use in this patient population is warranted.

Geriatrics

168. The perceived utility of deprescribing in the nursing home setting *Jennifer Pruskowski, Pharm.D., BCPS, CGP, CPE*[1], Steven Handler, M.D., Ph.D., CM.D.[2]; [1]Department of Pharmacy and Therapeutics, University of Pittsburgh School of Pharmacy, Pittsburgh, PA [2]Department of Medicine,
Division of Geriatric Medicine, and Department of Biomedical Informatics, UPMC Senior Communities, Pittsburgh, PA
INTRODUCTION: Deprescribing is defined as the systematic process of identifying and discontinuing drugs in instances in which existing or potential harms outweigh existing or potential benefits within the context of an individual patient's care goals, current level of functioning, life expectancy, values, and preferences. This is a process that can be led by clinical pharmacists. Perhaps the most crucial and obvious population to deprescribe are nursing home (NH) residents, however little information exists on how to develop and implement the process of deprescribing in American NHs.
RESEARCH QUESTION OR HYPOTHESIS: What is the perceived utility of deprescribing by NH providers?
STUDY DESIGN: This was a survey-based qualitative study. The survey aimed to gather information regarding perceptions and desired attributes of a deprescribing initiative in the NH. It included 45 questions, most including a 5 point Likert scale (1: strongly agree, 5: strongly disagree), and took approximately 10-min to complete. This study was approved by the University of Pittsburgh IRB.
METHODS: Potentially eligible participants included the attendees of the 2017 Society for Post-Acute and Long-Term Care Medicine Annual Conference. Survey responses were summarized using appropriate summary statistics, such as means, standard deviations, frequencies and percentages.

RESULTS: A total of 638 surveys (44% of conference attendees) were completed. Respondents exhibited the strongest agreement with statements relating to the process of deprescribing reducing potentially inappropriate medications, resident transfer to the ED and hospital, cost to the resident, and nursing administration time and burden. Respondents expressed strongest disagreement with statements referring to deprescribing being depersonalizing and hindering provider relationships. The attributes that were deemed most important by respondents were conversations with the resident, family, interdisciplinary team, and other providers.
CONCLUSION: Deprescribing is recognized as a valuable process for NH providers. Information regarding perceptions and desired attributes can be valuable to clinical pharmacists to lead such initiatives.

169. Analysis of potentially inappropriate medication (PIM) use in the older adult population at an academic medical center Niketa Patel, Pharm.D.[1], *Julie Murphy, Pharm.D., FASHP, FCCP, BCPS*[2], Rachel E. Rarus, Pharm.D., BCPS[3], Ethan Blashford, Pharm.D.[2], Corissa Piatka, Pharm.D. Candidate 2018[2], Shivani Bhakta, Pharm.D. Candidate 2019[2], Christina Brown, Pharm.D. Candidate 2019[2], Xin Shu, Pharm.D. Candidate 2019[2]; [1]Department of Pharmacy, University of Toledo Medical Center, Toledo, OH [2]College of Pharmacy and Pharmaceutical Sciences, University of Toledo, Toledo, OH [3]University of Toledo Medical Center, Toledo, OH
INTRODUCTION: The American Geriatrics Society 2015 Updated Beers Criteria introduce two new categories of potentially inappropriate medications (PIMs): 1) potentially clinically important non-anti-infective drug-drug interactions that should be avoided in the elderly, and 2) non-anti-infective medications that require dose adjustments in elderly patients with varying degrees of kidney impairment. No published studies that apply the Updated Beers Criteria to hospitalized patients were identified.
RESEARCH QUESTION OR HYPOTHESIS: What is the prevalence of the new categories of PIMs, and likelihood of related adverse events (AEs), in the elderly population at an academic medical center?
STUDY DESIGN: Non-interventional, retrospective, single-center study.
METHODS: Patients 65 years of age and older admitted to a non-intensive care unit from December 1, 2015 through December 31, 2016 were included. Drug-drug interaction and renal dose adjustment PIMs were defined according to the Updated Beers Criteria. Medical records of patients with an identified PIM were further evaluated for the presence of possible AEs. AEs, negative outcomes possibly related to a PIM, were predefined using standard clinical references, such as package inserts or guidelines, as appropriate. Probability of AE causation by PIMs was assessed using the Drug Interaction Probability Scale (DIPS) and the Naranjo scale as applicable. Data was analyzed using chi-square test, the Wilcoxon rank-sum test and the independent student's t-test as appropriate. Outcomes were considered statistically significant when p-value < 0.05.
RESULTS: Based on review of 2172 patient charts, a PIM was identified for 676 patients (31.1%). Of these patients, 483 (71.4%) had a drug-drug interaction PIM, 147 (21.7%) had a renal dose adjustment PIM, and 46 (6.8%) had both a drug-drug interaction and renal dose adjustment PIM. Fifty-three patients (7.8%) experienced an AE. The median score for both DIPS and Naranjo was four (possible).
CONCLUSION: PIMs related to drug-drug interactions are more prevalent than renal dose adjustments. The likelihood of a PIM causing an adverse event was possible.

170E. Benzodiazepine use in older adults: a comparison of prescriber factors over time *Megan Carr, Pharm.D.*[1], Frank D'Amico, Ph.D.[2], Megan A. Kloet, Pharm.D.[3], Elizabeth Mohan, M.D.[1], Sydney Springer, Pharm.D., BCPS[1], Jennie Jarrett, Pharm.D., BCPS, MMedEd[4]; [1]UPMC St. Margaret, Pittsburgh, PA [2]Department of Biostatistics, UPMC St. Margaret, Pittsburgh, PA [3]University of Pittsburgh Medical Center, Pittsburgh, PA [4]College of Pharmacy, University of Illinois - Chicago Campus, Chicago, IL
Presented at Society of Teachers of Family Medicine Annual Spring Conference, San Diego, CA, May 5-9, 2017.

171. Impact of immunization education led by a pharmacy resident among hospitalized older adults Alan Zhao, Pharm.D.[1], Irving Gomolin, M.D.[2], *Sum Lam, Pharm.D.*[3]; [1]Department of Pharmacy, South Nassau Communities Hospital, Oceanside, NY [2]Division of Geriatric Medicine and Clinical Pharmacology, Winthrop University Hospital, Mineola, NY [3]College of Pharmacy and Health Sciences, St. John's University, Queens, NY
INTRODUCTION: Poor vaccine adherence is a prevalent health care issue, particularly in the elderly. The national vaccination rates for older adults (≥65 years of age) were 66.2% for influenza, 59.7% for pneumococcal polysaccharide (PPSV23) and 24.2% for herpes zoster.
RESEARCH QUESTION OR HYPOTHESIS: Can pharmacy-resident-driven immunization education among hospitalized older adults increase post-discharge vaccination rates?
STUDY DESIGN: A prospective, one-tailed study.
METHODS: A sample size of 55 was determined based on an 80% power, a one-sided significance level of 0.05, and an anticipated dropout rate of 40%. Clinical databases were used for patient enrollment during February to April, 2015. Patients were included if aged 60 years or older at admission, had never received the herpes zoster vaccine, were communicative, and had no documented contraindications for the vaccine. Interventions include face-to-face individualized immunization education on herpes zoster, and if applicable, Tdap, influenza, PPSV23, and/or pneumococcal conjugate (PCV13) vaccines. Patients were contacted at least two months after hospital discharge. The primary endpoint was the post-discharge herpes zoster vaccination rate compared to the national data using a one-sample binomial proportion test (SAS 9.3®). The secondary endpoints were the post-discharge vaccination rates for Tdap, influenza, and PPSV23 and/or PCV13, compared to those of pre-discharge using the McNemar test (SAS 9.3®).
RESULTS: A total of 55 patients (42% male; 31% aged ≥ 75) received interventions. Among 45 patients (82%) who completed the study, post-discharge herpes zoster vaccination rate was 44.4% (20/45), compared to the national rate of 24.2%. Increased vaccination rates (pre vs. post) were observed for Tdap (8.9% vs. 26.7%, $p = 0.008$), PPSV23 (53.3% vs. 68.9%, $p = 0.016$) and PCV13 (15.6% vs. 43.8%, $p = 0.004$). No difference was noted for influenza vaccines.
CONCLUSION: Pharmacy-resident-driven immunization education among hospitalized older adults increased post-discharge vaccination rates for herpes zoster, Tdap, PCV13, and PPSV23.

172. Intravenous opiate dosing in the geriatric population in the emergency department at a community hospital *John Noviasky, Pharm.D.*[1], Christa Candela, Pharm.D. Candidate[2], Deena Barbagallo, Pharm.D.[3], Sharon Brangman, M.D.[4], James Ciaccio, M.D.[3], Kelly Braham, Pharm.D.[3]; [1]Department of Pharmacy, Upstate University Hospital Community Campus, Syracuse, NY [2]Albany College of Pharmacy, Albany, NY [3]Upstate University Hospital Community Campus, Syracuse, NY [4]Upstate University Hospital, Syracuse, NY
INTRODUCTION: Despite increased risk of adverse effects from opioid analgesics in the elderly, there is little dosing guidance of intravenous (IV) opiates in the geriatric patient with acute pain seen in the emergency department (ED).

RESEARCH QUESTION OR HYPOTHESIS: The goal of this review was to determine usual dosing of IV opiates in our emergency department which has a specialty "Geriatric Emergency Medicine (GEM)" unit.
STUDY DESIGN: Retrospective Chart Review.
METHODS: A 4-month retrospective review was conducted to assess dosing of IV fentanyl and IV morphine in patients >65 years of age. The data collected included patient age, weight, gender, opiate naivety, and complaint/diagnosis.
RESULTS: A total of 53 patients were administered 74 doses of IV fentanyl or IV morphine. Most of the patients (74%) were female with age of 75+7.72 years old and weighed about 78 kg. The average morphine equivalent dose administered to females and males was similar at 3.4 + 1.3 mg and 3.3+1.3 mg, $p = 0.7$, respectively. With respect to age groups of 65–80, 81–90, and >91, the average dose of Fentanyl administered according to age was 39.4mcg, 27.5mcg, and 12.5mcg respectively ($R^2 = 0.99559$). In contrast, the morphine dose for those same age groups was 3.7 mg, 2.5 mg, and 3 mg respectively ($R^2 = 0.33$). A marginal correlation with morphine dose to patient weight was seen as patients weighing 40–50 kg, 51–60 kg, 61–70 kg, 71–80 kg, 81–90 kg, and >90 kg had dose of 1.7 mg, 1 mg, 3.4 mg, 3.7 mg, 3.1 mg, and 3.6 mg respectively ($R^2 = 0.59$). Finally, if a patient was opioid naïve ($n = 62$), they received 3.4+1.3 mg vs. 3.25+1.4 mg if patient was on opiate prior ($n = 12$) to ED visit ($p = 0.78$).
CONCLUSION: There is potential for improved dosing of IV opiates in the ED focusing on several patient variables such as age, patient weight, and opioid exposure. A dosing nomogram is in development for dosing guidance.

Health Services Research

173. Integrating student pharmacists into health-services research: primary care (PC) workflow mapping *Kathryn Steckowych, Pharm.D.*[1], Marie Smith, Pharm.D.[2]; [1]Pharmacy Practice, The University of Connecticut School of Pharmacy, Storrs, CT [2]Department of Pharmacy Practice, University of Connecticut, Storrs, CT
INTRODUCTION: Pharm.D. curricula largely focus on teaching students to become successful pharmacist clinicians; there is little emphasis on the role of pharmacists in transforming healthcare through health services research (HSR). Student immersion into faculty scholarship endeavors is one way to educate students on real-world implications of practice-based HSR. This project was part of an ambulatory care research methods elective for 5 APPE students.
RESEARCH QUESTION OR HYPOTHESIS: Observation and mapping of medication workflows in a PC office is one method to educate students on the inter-relationship between HSR and clinical pharmacy practice transformation.
STUDY DESIGN: Four common medication-related activities (MRAs) were directly observed for a total of 100 h over 6 weeks within a PC practice, including:

1 Medication reconciliation
2 Medication refills
3 Medication communications (incoming and outgoing telephone calls relating to medication issues)
4 Medication management (warfarin/INR, vaccinations)

METHODS: Months 1 and 2 of the project focused on: 1) literature assessment to propose recommendations for project design/methodology, 2) development/revision original data collection forms for each MRA, and 3) observational data collection. Month 3 focused on data analysis and development/implementation of process improvement initiatives to enhance practice workflow efficiency and reduce patient/medication safety events.
RESULTS: Students were directly integrated into the following project working steps:

1 Development of "ideal-state" workflow maps for each MRA based on "best practice standards."
2 Analysis of observational findings to identify workflow gaps/deviations.
3 Development of "observed" workflow maps for each MRA based on observational findings.
4 Interpretation of findings to develop actionable recommendations for practice transformation efforts (e.g. creation of a warfarin outpatient management algorithm, creation/facilitation of a "lunch n' learn" discussion on warfarin management for office staff/providers).

CONCLUSION: Students learned how practice-based research shapes practice transformation through: 1) innovative PC workflow redesign for team-based, medication management activities, 2) medication-related quality, safety, and efficiency improvement, and 3) clinical pharmacist collaboration/integration with PC teams.

174. A physician/Patient integrated approach to increasing annual wellness visits *Nicholas Carris, Pharm.D.*[1], Chad Eichel, MBA, MHA[2], Julie Martinez, MSN[2], Chandresh Saraiya, M.D.[2]; [1]College of Pharmacy, University of South Florida, Tampa, FL [2]Florida Medical Clinic, PA, Zephyrhills, FL
INTRODUCTION: Annual Wellness Visits (AWV) encourage preventive care, are performed by physician and non-physician practitioners, and are underused nationally (15.6%). Strategies to increase AWVs are limited, though physician recommendation increases patient participation.
RESEARCH QUESTION OR HYPOTHESIS: Tying a portion of physician reimbursement to documenting key Medicare quality-measures increases scheduled/completed AWVs.
STUDY DESIGN: Florida Medical Clinic, PA (FMC), a private physician-network, operates a Medicare Accountable Care Organization (ACO) through "centers" (primary-care physician groups). FMC tied physician reimbursement to documenting key ACO quality-measures in Q4 2015 (Nov. 2015 – Jan. 2016). FMC educated physicians on quality-measures, how AWVs document required quality-measures, and implementing AWVs. In any month, centers were able to request an AWV report of patients with completed/scheduled AWV vs. total accountable patients. The current study retrospectively assessed center AWV reports over the 3 quarters pre- and post-implementation.
METHODS: Patients with future-scheduled or past-completed AWVs were counted together (per-year) for AWVs. The primary outcome was the proportion of center-quarters with at least 5% absolute before-to-after increase in AWVs. Data were assessed per-quarter due to Medicare's quarterly patient reallocation between centers. Center-quarters with a ±5% or greater change in accountable patients, over the quarter, were excluded (denominator change). Centers with no before-and-after quarter-reports were excluded.
RESULTS: Eighteen of 20 centers had at least one-quarter with before-and-after AWV reports. Center-quarters with before-and-after reports increased post-implementation (pre-implementation 39% vs. post-implementation 63%, $P = 0.02$). Three center-quarters pre-implementation, and 10 center-quarters post-implementation were excluded (denominator change). One center-quarter pre-implementation increased ≥5% compared to four post-implementation (6% vs. 17%, $P = 0.37$). Of all end-of-quarter reports, 71% of center-quarters were greater than the national proportion and 47% were at least twofold greater.
CONCLUSION: Most FMC centers completed more AWVs than the national average. Tying physician reimbursement to documenting key ACO quality-measures increased data reporting regarding AWVs and trended toward increasing completion or scheduling of AWVs.

Hematology/Anticoagulation

176. Evaluation of SAMe-TT2R2 score on predicting anticoagulation control with extended-interval warfarin monitoring *Andrew Hwang, Pharm.D.*[1], Steven M. Smith, Pharm.D., MPH[1], Eric Dietrich, Pharm.D.[1], Nicholas Carris, Pharm.D.[2], John Gums, Pharm.D.[1]; [1]Department of Pharmacotherapy & Translational Research, College of Pharmacy, University of Florida, Gainesville, FL [2]Pharmacotherapeutics & Clinical Family Medicine, University of South Florida, Tampa, FL

INTRODUCTION: Extended-interval warfarin monitoring (every ≤12 weeks) can be considered in stable patients, but predictors of success with this strategy are unknown. The validated SAMe-TT_2R_2 (sex, age, medical history, treatment, tobacco, race) score predicts anticoagulation control during standard follow-up, with low scores associated with greater time-in-therapeutic range.

RESEARCH QUESTION OR HYPOTHESIS: We hypothesized that SAMe-TT_2R_2 score also predicts success with extended-interval warfarin follow-up in patients with previously stable INRs.

STUDY DESIGN: Post-hoc analysis of a single-arm feasibility study of extended-interval warfarin follow-up in patients with stable/therapeutic INRs.

METHODS: Baseline SAMe-TT_2R_2 scores were calculated for patients with ≥1 follow-up visit. Patients had INR monitoring at intervals up to 12 weeks, and ended study participation at 64 weeks or when they were no longer candidates for extended-interval follow-up, primarily because of unstable INRs. The primary outcome was achieved duration of follow-up with extended-interval monitoring, comparing strata of baseline SAMe-TT_2R_2 score.

RESULTS: Forty-seven patients (mean age, 67 years; 53% women; 75% white) receiving chronic anticoagulation completed a median (IQR) of 36 (13–52) weeks of extended-interval follow-up. Baseline SAMe-TT_2R_2 scores ranged from 0–5 (median, 1 [IQR, 1–3]). Lower SAMe-TT_2R_2 scores were associated with greater duration of extended-interval follow-up achieved (Table), although the differences between strata were not statistically significant ($p = 0.48$). Likewise, SAMe-TT_2R_2 scores were not correlated with extended-interval follow-up duration ($\rho = -0.07$; $p = 0.66$).

SAMe-TT_2R_2 Score	n (%)	Weeks of Follow-up Completed, Median (IQR)
0	8 (17.0)	44 (19–56)
1	16 (34.1)	37.5 (10–57.5)
2	11 (23.4)	34 (14–50)
3	5 (10.6)	26 (12–52)
4	6 (12.8)	12 (10–44)
5	1 (2.1)	63

CONCLUSION: Lower SAMe-TT_2R_2 scores seemed to predict greater weeks of extended-interval follow-up completed, though our findings may have been limited by the small sample size particularly for higher scores. Further research is needed to confirm these findings and establish predictors of successful extended-interval warfarin follow-up.

177. Management of warfarin drug interactions in a pharmacist managed anticoagulation clinic: evaluation of frequency of inr monitoring and pre-emptive dose adjustment Amr Fahmi, MSc Clinical Pharmacy[1], Adham Mohamed, Pharm.D.[2], *Hazem Elewa, Ph.D., R.Ph., BCPS*[3], Mohamed Saad, Pharm.D., BCPS[4]; [1]Al Wakra Hospital, Hamad Medical Corporation, Wakra, Qatar [2]Hamad Medical Corporation, Doha, Qatar [3]Qatar University, Doha, Qatar [4]Pharmacy Department, Al-Wakra Hospital, Hamad Medical Corporation, Doha, Qatar

INTRODUCTION: Patients on warfarin are advised to avoid medications that have interactions with warfarin. Despite clinicians attempt to prescribe alternative medications, interactions with warfarin is inevitable. To avoid major impact on warfarin therapeutic level, one of two strategies (or both) are implemented:- increasing frequency of INR monitoring and/or preemptive dose adjustment.

RESEARCH QUESTION OR HYPOTHESIS: Are patients having warfarin drug interactions frequently monitored? and is preemptive dose adjustment used as a strategy to manage warfarin drug interactions?

STUDY DESIGN: Retrospective cohort.

METHODS: Warfarin patients followed at the anticoagulation clinic, Al-Wakra Hospital, Qatar and having warfarin drug interactions from May 2013 to May, 2016 were included. In addition to baseline demographics and warfarin indication, INR values, warfarin dose, interacting medications and frequency of visits were collected. Frequency of warfarin INR monitoring prior to and during the interaction period were compared as well as the extreme out of range INR in patients with and without pre-emptive dose adjustments.

RESULTS: Among 340 patients screened, 50 patients met the inclusion criteria. The mean age was 57.9±14 years. Patients experiencing a drug interaction with warfarin had significant decrease in the number of days between visits when compared to baseline before interaction (7 ± 5.3 days vs. 21 ±11.6 days $p < 0.0001$). Patients having their warfarin dose pre-emptively adjusted had less supratherapeutic INR, although this difference was not statistically significant [2 (18.18%) vs. 11 (28.95%), $P = 0.5$]

CONCLUSION: Frequency of INR monitoring appears to be the most adopted method used by the anticoagulation clinic for the management of warfarin drug interactions. Pre-emptive warfarin dose adjustment may be a useful tool although its effectiveness needs further evaluation.

178. Evaluation of potential drug-drug interactions with direct oral anticoagulants in a large urban hospital *Yoonsun Mo, Pharm.D.*[1], Ayse Karakas-Torgut, Pharm.D.[2], Antony Pham, Pharm.D.[1]; [1]Arnold & Marie Schwartz College of Pharmacy and Health Sciences, Long Island University Pharmacy, Brooklyn, NY [2]Department of Pharmacy, Brookdale Hospital and Medical Center, Brooklyn, NY

INTRODUCTION: Direct oral anticoagulants (DOACs) are subject to a number of drug–drug interactions (DDIs) as their plasma levels may be altered in the presence of concomitant drugs that induce or inhibit P-glycoprotein and/or Cytochrome 3A4 enzyme systems. Given that available data on DOAC interactions are primarily derived from pharmacokinetic studies in healthy volunteers, the clinical significance of DDIs with DOACs remains uncertain.

RESEARCH QUESTION OR HYPOTHESIS: To identify potential DDIs in patients on DOACs who are admitted to the hospital and assess whether appropriate dosage adjustments were made based on currently available evidence.

STUDY DESIGN: Single-center, retrospective study.

METHODS: All adult patients admitted to Brookdale Hospital Medical Center who were treated with dabigatran, rivaroxaban, or apixaban for at least 3 days from January 1, 2014 to November 30, 2016 were identified. Those who received selected interacting medications at any time during the course of DOAC therapy were included in this study. Recommended interventions for the potential DDIs were categorized into four subgroups based on various evidence-based guidelines and drug manufacturers' recommendations: (1) avoidance due to increased bleeding risk; (2) avoidance due to the decreased DOAC effect; (3) dose reduction; and (4) therapy modification.

RESULTS: A total of 165 patients (including 38 patients readmitted) ranging from 36 to 94 years old (72.7 ± 12.3 [mean ± SD])

with 233 encounters met the inclusion criteria. The most commonly used concomitant medication was aspirin (72 %), followed by amiodarone (20 %) and clopidogrel (14 %). The combined use of dual antiplatelet therapy and a DOAC was identified in 18 cases (8 %). One-fourth of the cases (n = 68) encountered were classified as the "avoidance" category.
CONCLUSION: Despite computerized DDI alerts, potentially significant DDIs with DOACs occur. While the present study provides insight into the current patterns of DDIs, further studies are needed to evaluate clinical outcomes of the potential DDIs with DOACs in practice.

179. Impact of a pharmacist-directed heparin-induced thrombocytopenia service on the appropriateness of treatment and drug costs *Kayla Torppey, Pharm.D., BCPS*, Sheetal Patel, Pharm.D., BCPS, Leena Kansagra, Pharm.D., BCPS; Department of Pharmacy, Newark Beth Israel Medical Center, Newark, NJ
INTRODUCTION: Heparin-induced thrombocytopenia (HIT) is a rare but serious, immune-mediated syndrome. A study was conducted at our institution in 2014 which showed <4% of patients were indicated to receive treatment for HIT with argatroban therapy, resulting in >500,000 dollars in drug wastage. Following the study, a 24/7 on-call clinical pharmacy service was implemented which alerts the pharmacist to argatroban requests. Orders are assessed for appropriateness, approved or denied, and necessary laboratory tests are ordered with follow-through until argatroban discontinuation.
RESEARCH QUESTION OR HYPOTHESIS: The objective was to evaluate the impact of a clinical pharmacy service on appropriateness of patients treated for suspected HIT and decrease in argatroban wastage compared to the pre-intervention period.
STUDY DESIGN: This was an IRB-approved retrospective review of clinical data.
METHODS: Data was collected on all adult patients admitted to our institution who were treated for suspected HIT between January 5, 2015 and May 5, 2017. When argatroban was requested, the pharmacist approved or rejected the request using evidence-based criteria. If argatroban was approved, the patient was followed throughout the duration of therapy. Appropriateness of therapy compared to the pre-intervention period was analyzed using the Fisher's exact test. The impact of the clinical pharmacy service on quality measurements and cost savings were evaluated using descriptive analyses.
RESULTS: A total of 76 patients were evaluated for treatment for suspected HIT, in which 80% received treatment (95% with argatroban vs. 5% with fondaparinux). After implementation of the pharmacist-directed HIT service, the number of patients treated with argatroban decreased from 112 to 58 and those indicated to receive argatroban based on evidence-based criteria increased from 3.57% to 94.8% ($p < 0.0001$). Compared to the pre-intervention period, the total cost of drug wasted went from $507,527 to $2,038.
CONCLUSION: The impact of a pharmacist-directed HIT service has dramatically lowered costs and increased appropriate treatment of suspected HIT.

180. The effect of obesity on the rate and detection of heparin induced thrombocytopenia *Carrie Oliphant, Pharm.D., FCCP, BCPS-AQ Cardiology, AACC*[1], Jacob Marler, Pharm.D., BCCCP[1], Morgan Jones, Pharm.D.[1], Abdulrahman Alshaya, Pharm.D.[2], Jonathan Hartmann, Pharm.D.[3]; [1]Department of Pharmacy, Methodist University Hospital, Memphis, TN [2]Department of Pharmacy, Brigham and Womens Hospital, Boston, MA [3]Ochsner Medical Center, New Orleans, LA
INTRODUCTION: Heparin-induced thrombocytopenia (HIT) diagnosis includes both the 4-T score and laboratory assays. The 4-T score is a scoring system used to determine the probability of HIT prior to laboratory testing. Obesity has been associated with the development of HIT, and has been proposed as another potential risk factor. The goal of this study was to determine the impact of obesity on the development of HIT and to evaluate if it predicts HIT diagnosis.
RESEARCH QUESTION OR HYPOTHESIS: Does obesity predict the development of HIT?
STUDY DESIGN: Multisite, retrospective cohort study.
METHODS: All adult patients in a four hospital system with heparin exposure and both an enzyme linked immunosorbent assay (ELISA) and serotonin release assay (SRA) result were included. Obese patients (body mass index [BMI] > 30) were compared to non-obese patients (BMI < 30) for the primary outcome of HIT, defined as a positive SRA result. Multivariable logistic regression analysis was performed to determine if obesity independently predicted HIT diagnosis. Additionally, a "5-T score" including obesity as the fifth variable was developed to assess the predictive value of HIT identification.
RESULTS: A total of 124 patients in the obese and 148 in the non-obese group were identified. The incidence of HIT was higher in the obese compared to the non-obese group (22.6% vs. 12.1%, $p = 0.02$), as was the optical density (OD) value (0.94 vs. 0.78, $p = 0.04$). The logistic regression analysis did not identify obesity alone as an independent predictor of HIT. While the "5-T" score was found to be independently associated with HIT development (OR 1.6), there was no additional predictive value above the 4-T score (OR 1.7).
CONCLUSION: Obesity was found to be a risk factor for HIT, but did not predict the development of HIT. Predicting HIT remains challenging and novel markers are needed to improve the current scoring system.

181. Clinical severity of venous thromboembolism patients presenting to a community hospital: a retrospective review *Jeff Kyle, Pharm. D.*[1], Amy Clark, Pharm.D.[2], Zachary Burns, Pharm.D.[1]; [1]Department of Pharmacy Practice, Samford University McWhorter School of Pharmacy, Birmingham, AL [2]Cardiovascular Medical Affairs, Janssen Scientific Affairs, LLC, Titusville, NJ
INTRODUCTION: VTE related hospitalizations have increased over the past decade contributing to a rise in financial burden for patients and the healthcare system. The 2016 American College of Chest Physicians (ACCP) Guideline recommends outpatient management or early discharge in patients with a pulmonary embolism (PE) who are considered low-risk (sPESI score 0), hemodynamically stable, and whose home circumstances are adequate. The Simplified Pulmonary Embolism Severity Index (sPESI) is a validated risk assessment to assist clinicians in identifying candidates for outpatient therapy. For a leg DVT, the 2012 ACCP Guideline recommends outpatient management if home circumstances are adequate and no contraindications.
RESEARCH QUESTION OR HYPOTHESIS: To describe the severity and treatment methods of VTE patients who present to the emergency department at a community hospital.
STUDY DESIGN: Retrospective cohort.
METHODS: A retrospective cohort was conducted of patients presenting to the emergency department aged ≥ 21 years with a primary diagnosis of a DVT or PE between October 2015 – May 2016. Those with both DVT and PE were excluded. Patient demographics, diagnosis, PMH, recent surgery (within 7 days), vitals, platelet count, INR, SCr, length of stay (LOS), and VTE regimen were collected. Descriptive statistics along with calculated sPESI scores were used to describe the severity and therapies. IRB approval was obtained.
RESULTS: A total of 76 charts were reviewed, 70 (PTE n = 25; DVT n = 35) met the inclusion criteria. Sixteen (45.7%) PE patients had a sPESI score of 0; thirteen (81.3%) were hospitalized with a mean LOS 2.75 days. Eleven (31%) DVT patients

were hospitalized with a mean LOS 5.2 days. Four (11%) had contraindications to outpatient therapy. Heparin was the most common inpatient therapy, while rivaroxaban was the most common outpatient therapy.
CONCLUSION: Early identification of low-risk VTE patients may prevent an unnecessary admission and have financial benefits for the patient and healthcare system.

182. Evaluation of venous thromboembolism prophylaxis in patients status post total joint arthroplasty at University of Illinois Health Danielle Tompkins, Pharm.D., *Nina Huynh, Pharm.D., BCPS*, Julie Jun, Pharm.D., BCPS, Margaret Choye, Pharm.D., BCPS; Department of Pharmacy Practice, University of Illinois College of Pharmacy, Chicago, IL
INTRODUCTION: At the University of Illinois Health (UIH), patients undergoing total knee arthroplasty (TKA) or total hip arthroplasty (THA) have historically been treated with warfarin, aspirin, or fondaparinux. The decision on which method of venous thromboembolism (VTE) prophylaxis to use is based upon the type of procedure, patient-specific factors, and is ultimately up to the discretion of the physician. Despite utilization of guideline recommended pharmacologic agents for prophylaxis post-operatively, VTE rates remain high at UIH.
RESEARCH QUESTION OR HYPOTHESIS: Which areas of improvement may be made at UIH to reduce VTE events in total joint arthroplasty (TJA) patients?
STUDY DESIGN: Single center retrospective chart review of patients who underwent a total knee or hip replacement or revisions of either of these procedures during 2013 to 2015.
METHODS: The primary objective of this study is to evaluate the appropriateness of post-operative VTE prophylaxis in TJA patients based on type, time to initiation, and intended duration of prophylaxis. Secondary objectives included evaluation of clinical outcomes based on VTE events and safety based on bleeding events.
RESULTS: Patients were most commonly treated with warfarin as prophylaxis (37.7%), followed by aspirin (29.7%). Time to initiation of prophylaxis was 14.3 ± 9.37 h. Intended duration of prophylaxis was 24.1 ± 6.03 days post-TKA and 28.6 ± 10.34 days post-THA. Overall, 26 out of 300 patients (8.7%) experienced VTE events. Aspirin use was associated with a statistically significant increase in VTE events when compared with use of other pharmacologic agents [16.9% versus 5.2%, $p = 0.001$]. Differences in bleeding rates were not statistically significant between groups.
CONCLUSION: The primary area of improvement identified was the need for the development of an orthopedic protocol in order to encourage standardized time to initiation and duration of prophylaxis, as well as aiding physicians in identifying patients at high risk of VTE.

183. Sickle cell disease is associated with delayed anticoagulation in patients with newly diagnosed venous thromboembolism Edith A. Nutescu, Pharm.D., MS, FCCP[1], *Jifang Zhou, M.D., MPH*[2], Jin Han, Pharm.D., Ph.D.[3], Gregory Calip, Pharm.D., Ph.D., MPH[2]; [1]Department of Pharmacy Systems, Outcomes and Policy, Center for Pharmacoepidemiology and Pharmacoeconomic Research, University of Illinois at Chicago, College of Pharmacy, Chicago, IL [2]Department of Pharmacy Systems Outcomes and Policy, College of Pharmacy, University of Illinois at Chicago, Chicago, IL [3]Department of Pharmacy Practice, College of Pharmacy, University of Illinois at Chicago, Chicago, IL
INTRODUCTION: Timing of anticoagulation initiation is critical in patients with newly diagnosed venous thromboembolism (VTE), however, limited data exist to evaluate the appropriateness of such practice patterns among sickle cell disease (SCD) patients.
RESEARCH QUESTION OR HYPOTHESIS: To evaluate the impact of SCD status on timely anticoagulant initiation in patients with newly diagnosed VTE.
STUDY DESIGN: Retrospective matched cohort study.
METHODS: SCD patients with newly diagnosed VTE for the first time (cases) were identified from the Truven Health MarketScan® Databases between 2009 and 2015. A cohort of non-SCD patients with newly diagnosed VTE (controls), were matched to cases in a 5:1 ratio. The index date was the date of VTE diagnosis. Multivariate logistic regression analysis was performed to identify the association between SCD status (exposure) and timely anticoagulant treatment initiation (primary outcome, defined as anticoagulant initiation ≤24 h of index date), while controlling for pertinent covariates.
RESULTS: We identified a total of 434 cases and 2170 controls. The median age was 45 years and 63.4% were female. Timely anticoagulation treatment initiated was significantly lower in the SCD cases compared to their matched controls (32.7% vs. 50.8%, $p < 0.001$). Compared to matched non-SCD controls, SCD patients had greater length of stay for the index VTE event (mean, days: 4.67 ± 6.06 vs. 3.07 ± 3.78, $p < 0.001$), a higher rate of central catheter use (13.6% vs. 5.6%, $p < 0.001$), and more comorbidity as measured by Deyo-adapted Charlson comorbidity index (2.90 ± 3.18 vs. 2.52 ± 2.96, $p = 0.015$). In adjusted multivariate models, the effect of SCD status remained significant (OR 0.48, 95%CI 0.36–0.63).
CONCLUSION: Timely anticoagulation initiation is low in patients with newly diagnosed VTE; and patients with SCD are at even greater risk of delayed anticoagulation compared to patients without SCD. Additional work elucidating the impact of delayed anticoagulant treatment on VTE recurrence in SCD patients is needed.

184E. Analysis of patient characteristics as covariates potentially affecting pharmacokinetics, efficacy, or safety of betrixaban in the apex study *Janet M. Leeds, Ph.D.*[1], Russell Wada, Ph.D.[2], Olga Bandman, M.D.[1], Alex Gold, M.D.[1], C. Michael Gibson, M.D., FRCP, FAHA, FSCAI, FACC[3], Alexander T. Cohen, M.D., FRACP[4], John T. Curnutte, M.D., Ph.D.[1], Pamela B. Conley, Ph.D.[1]; [1]Portola Pharmaceuticals, Inc., South San Francisco, CA [2]Quantitative Solutions, Menlo Park, CA [3]Harvard Medical School, Boston, MA [4]Guy's and St. Thomas' Hospitals, King's College London, London, United Kingdom
Presented at the Annual Congress of the European Society of Cardiology (ESC), Barcelona, Spain, August 26-30, 2017.

185E. Pharmacokinetic and pharmacodynamic modeling of Andexanet alfa dose to reverse the anticoagulant activity of FXa inhibitors in patients with acute major bleeding *Janet M. Leeds, Ph.D.*[1], Jaap W. Mandema, Ph.D.[2], Genmin Lu, Ph.D.[1], John T. Curnutte, M.D., Ph.D.[1], Truman J. Milling, M.D., FACEP[3], Mark Crowther, M.D., M.Sc., FRCPC[4], Stuart J. Connolly, M.D., FRCPC[4], Pamela B. Conley, Ph.D.[1]; [1]Portola Pharmaceuticals, Inc., South San Francisco, CA [2]Certara, Menlo Park, CA [3]Seton Dell Medical School Stroke Institute, Austin, TX [4]McMaster University, Hamilton, ON, Canada
Presented at the Biennial Congress and Annual Scientific and Standardization Committee Meeting of the International society on Thrombosis and Haemostasis (ISTH); July 8-13, 2017; Berlin, Germany. Abstract OC 76.4.

186E. Reversal of betrixaban-induced anticoagulation in healthy volunteers by andexanet alfa Mark Crowther, M.D., MSc, FRCPC[1], Genmin Lu, Ph.D.[2], Janet M. Leeds, Ph.D.[2], Joyce Lin, MS[2], *Pamela B. Conley, Ph.D.*[2], Alex Gold, M.D.[2], Stuart J. Connolly, M.D., FRCPC[1], John T. Curnutte, M.D., Ph.D.[2]; [1]McMaster University, Hamilton, ON, Canada [2]Portola Pharmaceuticals, Inc., South San Francisco, CA
Presented at the American Society of Hematology (ASH) Annual Meeting, San Diego, CA, December 3-6, 2016.

187. Direct oral anticoagulants for the treatment of venous thromboembolism in cancer patients *Kimberly Sorensen, Pharm.D.*, Leila Mohassel, Pharm.D., BCPS, BCOP, Jenny Kim, Pharm.D., BCPS; Department of Pharmacy, Inova Fairfax Hospital, Falls Church, VA

INTRODUCTION: Cancer patients are more likely to develop venous thromboembolism (VTE) compared to non-cancer patients. The recommended treatment for cancer-associated thrombosis is low molecular weight heparin (LMWH) therapy. However, the high cost associated with this treatment and the need for daily injections are major barriers to its use in clinical practice. A meta-analysis suggests that direct oral anticoagulants (DOACs) are as effective as vitamin K antagonists in cancer patients. Although these findings are encouraging, further assessment in patients with active cancer is warranted.

RESEARCH QUESTION OR HYPOTHESIS: Are DOACs safe and effective for the treatment of VTE in cancer patients?

STUDY DESIGN: This study was a single-center, retrospective analysis from November 2012 to July 2016.

METHODS: Adult cancer patients with active disease receiving DOAC therapy were identified using an electronic medical record system. Patients initiated on DOAC therapy for VTE treatment more than six months prior to cancer diagnosis or once in remission were excluded. The primary outcome was rate of recurrent VTE by diagnostic imaging. Secondary outcomes included the incidence and severity of bleeding, time to bleed, and time to recurrent VTE.

RESULTS: Eighty-six cancer patients that experienced a pulmonary embolism (34.9%), deep vein thrombosis (51.2%), or both (14.0%) were included. Of these patients 75.6% received rivaroxaban, 23.3% received apixaban, and 1.2% received dabigatran. The rate of recurrent VTE was 7.0% with a median (IQR) time to recurrence of 1.0 (0.3–3.2) month. Thirteen patients (15.1%) experienced a bleeding event with a median (IQR) time to bleed of 4.2 (1.3–14.9) months. Five patients (5.8%) experienced major bleeding.

CONCLUSION: Overall rates of recurrent VTE and bleeding events for DOACs appear to be similar to that of LMWH in cancer-associated thrombosis. Larger, randomized controlled studies are needed to validate our findings.

188. Management of bleeding complications in patients on oral anticoagulants: a national survey of pharmacists Tessa Wiley, Pharm.D.[1], *Paul Dobesh, Pharm.D., FCCP, BCPS*[2], Brian Trevarrow, Pharm.D., BCPS[3]; [1]Department of Pharmacy, Nebraska Medicine, Omaha, NE [2]College of Pharmacy, University of Nebraska Medical Center, Omaha, NE [3]The Nebraska Medical Center, Omaha, NE

INTRODUCTION: The management of major and life threatening bleeds in patients on oral anticoagulation remains complex. With the increasing use of direct oral anticoagulants and evolving bleeding management strategies, we sought to evaluate the pharmacist perspective on this issue.

RESEARCH QUESTION OR HYPOTHESIS: What are the current institutional practices for the management of anticoagulant-induced major life-threatening bleeding?

STUDY DESIGN: Observational; survey.

METHODS: An electronic survey was sent to members of the Practice Research Networks (PRNs) for Adult Medicine, Cardiology, Critical Care, Emergency Medicine, and Perioperative Care. These PRNs were ones in which pharmacist would be involved in management of anticoagulant-induced major bleeding. Questions involved reversal choices for warfarin, Xa inhibitors, and dabigatran in three clinical scenarios. Demographics on institution size and type were also collected.

RESULTS: There were 266 responses to the survey. There were 45% from institutions >500 beds; 41% from 250 to 500 beds, and 14% from <250 beds; 49% from academic and 51% from non-academic institutions. Bleeding management protocols were in 89% of institutions. A 4 factor PCC was the most common reversal agent, regardless of bleed scenario, for warfarin (68%-93%) and Xa inhibitors (70%-81%). Idarucizumab was the most common reversal agent for dabigatran regardless of bleeding scenario (86%-97%) If andexanet alfa was approved, it was selected more often for Xa inhibitors for all bleeding scenarios (76%-87%). Pharmacists from institutions with a protocol for bleeding management, and those from larger institutions (>500 beds), were more likely to use more aggressive approaches than those without a protocol, or those from smaller institutions (<250 beds). There were no differences found in management of bleeding between pharmacists from academic versus non-academic institutions.

CONCLUSION: In general, pharmacists recommend appropriate strategies for management of anticoagulant-induced bleeding. Pharmacist from larger institutions and those with protocols recommend more aggressive approaches to bleeding management.

189. Evaluation of simplified risk-stratified twice daily aspirin protocol for venous thromboembolism prophylaxis after total joint replacement *Candy Ng, Pharm.D., BCPS*[1], Sarah Zavala, Pharm.D., BCPS, BCCCP[1], Michael S. Pinzur, M.D.[2]; [1]Department of Pharmacy, Loyola University Medical Center, Maywood, IL [2]Department of Orthopaedic Surgery and Rehabilitation, Loyola University Medical Center, Maywood, IL

INTRODUCTION: The American Academy of Orthopaedic Surgeons Guidelines on Venous Thromboembolism (VTE) supports the use of aspirin for prophylaxis for patients undergoing total joint replacement (TJR). This conflicts with the American College of Clinical Pharmacy Guidelines which only gives aspirin a Grade 2C recommendation. Studies investigating aspirin 325 mg twice daily versus warfarin in risk-stratified patients are limited, show mixed results, or used complex risk stratification criteria.

RESEARCH QUESTION OR HYPOTHESIS: Is aspirin 325 mg twice daily as safe and effective as warfarin using a simplified risk-stratified protocol in patients undergoing TJR?

STUDY DESIGN: Single-center, retrospective cohort study at a large academic medical center in patients undergoing TJR.

METHODS: The aspirin protocol was implemented on January 1, 2015. Patients deemed high thrombotic risk or intolerant to aspirin received warfarin (goal international ratio 2–2.5). The pre-implementation (control) group was comprised of patients using warfarin for VTE prophylaxis from July 4, 2014 to December 31, 2014. The post-implementation group included patients from February 1, 2015 to July 31, 2015, who used aspirin or warfarin.

RESULTS: This study included 449 patients with similar baseline characteristics. No difference was found in rates of thirty-day post-operative bleeding, VTE, death, and composite endpoint of VTE and death between the pre-implementation and post-implementation groups (all $p > 0.05$). Thirty-day post-operative surgical site infections (SSI) (5.8% vs. 1.2%, $p = 0.02$) and return to operative room (OR) (3.9% vs. 0.4%, $p = 0.03$) were less frequent in the post-implementation group. There was no difference in other post-operative complications and length of stay (all $p > 0.05$) between groups. In a subgroup analysis of patients at high and low risk of VTE, no differences were found in the aforementioned outcomes (all $p > 0.05$).

CONCLUSION: A simplified risk-stratified twice daily aspirin protocol is safe and effective in patients undergoing TJR, and SSI and return to OR rates may be lower when compared to warfarin.

HIV/AIDS

190. Optimization of antiretroviral use by pharmacist intervention *Ellen Dowers, B.S. Pharm*, Francis Zamora, Pharm.D.; Pharmacy, Yale-New Haven Hospital, New Haven, CT

INTRODUCTION: Due to the complexity of antiretroviral therapy, hospitalized patients with HIV/AIDS are at high risk for

medication-related errors. This study corroborates the importance of pharmacist interventions in identifying, preventing and resolving medications errors in patients diagnosed with HIV/AIDs on antiretroviral therapy.
RESEARCH QUESTION OR HYPOTHESIS: Will pharmacist pharmacotherapy review of antiretroviral medications identify and resolve medication errors in hospitalized patients with HIV/AIDS.
STUDY DESIGN: Cohort Prospective.
METHODS: Clinical pharmacist daily review of antiretroviral use in adult patients was performed. The primary outcome of this review was to identify and resolve drug interactions, inaccuracies in medication reconciliation and incorrect dosing of antiretrovirals. Secondary outcomes included determination of error rate by drug category and type and severity of drug interactions.
RESULTS: A total number of 1,008 medication evaluations were performed during the study period for 155 patients. Eighty-one patients required intervention. Number of interventions totaled 111. Interventions involved drug interactions (50%), dosing errors (29%) and incorrect regimen (21%). Of the drug interactions, 30% were considered major, 22% moderate and 3% contraindicated. Drug interactions most commonly involved chelating agents (42%) and acid suppressors (25%). Additional drug interactions included the use of non-recommended benzodiazepines (16%) and incorrect statin doses (11%). Most common dosing errors involved incorrect doses based on renal function (68%) and incorrect frequency of antiretrovirals (28%). The majority of incorrect regimens involved omissions (43%) and identification of sub-optimal therapy (35%).
CONCLUSION: Pharmacotherapy review by a dedicated pharmacist identify and resolve medication errors in hospitalized patients with HIV/AIDS. Limitations of the study included complete verification of medication reconciliation. In addition, the severity scale used and identification of interactions is not universally established and subject to interpretation. On-going stewardship with dedicated pharmacists are essential to detect and prevent errors in patients hospitalized with HIV/AIDS.

191. Comparison of adherence rates to various combined antiretroviral therapy regimens *Melody Berg, Pharm.D., MPH*[1], Eric Farmer, Pharm.D.[2], Lisa Fletch, Pharm.D.[3], Michael Murray, Pharm.D., MPH[4]; [1]Clinical Drug Information, Wolters Kluwer, Indianapolis, IN [2]IUH LifeCare Clinic, Indiana University Health, Indianapolis, IN [3]UNC Healthcare, Chapel Hill, NC [4]College of Pharmacy, Purdue University and Regenstrief Institute, Indianapolis, IN
INTRODUCTION: Adherence to combined antiretroviral therapy (cART) is paramount for optimal HIV management. cART regimens are becoming increasingly available in fixed dose combination (FDC) products which are purported to improve adherence rates.
RESEARCH QUESTION OR HYPOTHESIS: Primary objective of this study was to compare adherence rates of patients prescribed cART regimens given as FDC tablets versus those given as non-FDC tablets. Secondary objectives were to compare proportion of patients obtaining viral load (VL) suppression, discontinuation rates, reasons for discontinuation, and reported side effects.
STUDY DESIGN: A retrospective cohort study was conducted to compare adherence and persistence amongst patients prescribed one of 7 study cART regimens at a large academic health center during the study period August 1, 2009 to July 31, 2014.
METHODS: Ahderence rates and rates of viral load suppression were compared among three primary study groups: those receiving a once daily FDC cART regimen, once daily non-FDC cART regimen, and a twice daily non-FDC cART regimen. All primary and secondary objectives were also compared amongst patients receiving one of the 7 individual cART regimens. Adherence was defined as proportion of days covered (PDC) calculated using prescription claims data.
RESULTS: One hundred twelve patients met enrollment criteria: 57 in the FDC group, 40 in the once daily non-FDC cART, 15 in a twice daily non-FDC cART group. PDCs were 0.64 (SD 0.30), 0.61 (SD 0.28), and 0.59 (SD 0.29) ($p = 0.798$). Proportion of subjects obtaining VL suppression were 52.63%, 47.5%, and 53.33% for the FDC group, once daily non-FDC group, and twice daily non-FDC group, respectively ($p = 0.866$).
CONCLUSION: This study suggests drug-related factors likely have a small impact on overall adherence to cART regimens.

192. Virologic outcomes in HIV infected patients following bariatric surgery *Neha Sheth Pandit, Pharm.D., AAHIVP, BCPS*[1], Emily Heil, Pharm.D., BCPS AQ-ID[2]; [1]Depart of Pharmacy Practice and Science, University of Maryland School of Pharmacy, Baltimore, M.D. [2]University of Maryland School of Pharmacy, Baltimore, MD
INTRODUCTION: Previous studies have demonstrated decreased overall AUC, solubility, and bioavailability of certain medications after gastric bypass, which could significantly impact patient outcomes. However, little is known about the effect of bariatric surgery on the absorption of antiretroviral (ARV) agents and associated treatment outcomes.
RESEARCH QUESTION OR HYPOTHESIS: The purpose of this evaluation was to characterize HIV-related virologic and immunologic outcomes in patients who have undergone bariatric surgery at an urban HIV clinic.
STUDY DESIGN: This was a retrospective, observational study that was approved by the University of Maryland Baltimore IRB.
METHODS: Patients included in this study were those receiving HIV care at the University of Maryland Medical Center who had undergone gastric bypass surgery between 2007 and 2016. Patients were excluded if they were <18 years of age, diagnosed with HIV after their gastric bypass surgery, or had no post-bypass HIV-RNA levels. Antiretroviral regimens and 3 CD4 cell counts and HIV-RNA values were collected prior to and post bypass.
RESULTS: Eleven patients were included in the study; all patients had suppressed HIV-RNA levels pre-surgery and were prescribed varying regimens representing all first-line ARV classes. The pre-surgery CD4 cell count ranged from 403 to 1,541 cells/mm^3 and post –surgery ranged from 351 to 1,585. Ten patients remained suppressed during the follow-up period ranging from 5 to 30 months. One patient had a post-surgery HIV-RNA level of 286–21,270 copies/ml which was due to documented medication noncompliance. All patients were continued on the same ARV medications as prior to surgery but were given varying instructions to crush, switch to liquid formulations, or to hold ARVs for 2–6 weeks.
CONCLUSION: In our study, HIV-infected patients who were virally suppressed prior to bariatric surgery maintained viral suppression in the post-operative setting indicating that bariatric surgery did not alter the absorption or metabolism of ARV medications in a clinically significant way.

193. Assessment of professional activities and needed resources of hiv-specialist pharmacists Elizabeth Sherman, Pharm.D.[1], Karl Aagenes, Pharm.D.[2], Susan Chuck, Pharm.D.[3], Taylor Gill, Pharm.D.[4], Mallory Kruckman, Pharm.D.[5], *James Scott, Pharm.D., M.Ed*[6]; [1]Department of Pharmacy Practice, Nova Southeastern University, College of Pharmacy, Fort Lauderdale, FL [2]Federal Medical Center, Rochester, MN [3]Foster City, CA [4]Department of Pharmacy, Via Christi Health, Wichita, KS [5]Louisville, KY [6]Western University of Health Sciences, Pomona, CA
INTRODUCTION: HIV pharmacists (HIVPharms) working in various settings have demonstrated a positive impact on persons living with HIV (PLWH). However, little is known regarding the

expansion of HIVPharm roles to address new challenges in HIV care and prevention and the resources they require.
RESEARCH QUESTION OR HYPOTHESIS: What roles do HIVPharms play in HIV care and what services can the American Academy of HIV Medicine (AAHIVM) provide to them?
STUDY DESIGN: Web-based survey.
METHODS: Pharmacist members of AAHIVM (n = 321) were emailed a voluntary 50-item survey in March 2017. The survey explored demographics, practice/setting characteristics, routine duties, and avenues whereby AAHIVM could better serve its members. Data were analyzed using Microsoft Excel with summary statistics performed.
RESULTS: 126 respondents consented and 124 completed the survey (39% response rate). Respondents were mostly younger (64% <44yo), white (62%) or Asian (17%), and female (57%). The majority completed a Pharm.D. (79%), post-doctoral training (44%), and held AAHIVM's pharmacist credential (AAHIVP) (86%). The most common practice settings were community pharmacies (36%) and outpatient clinics (35%) with other settings including academia, inpatient/hospital, pharmaceutical industry, and government. In addition to expected setting-specific duties for pharmacists (i.e., dispensing and counseling), respondents were also involved in burgeoning roles such as post/pre-exposure prophylaxis (70%), ordering laboratory tests (47%), recommending sexually transmitted infection treatment (30%), and on-site HIV testing (15%). Precepting pharmacy trainees was common across all settings (93%). Respondents appreciated AAHIVM's pharmacist credentialing, continuing education, and publications; requested resources included education on clinical HIV updates, hepatitis co-infection, and primary care in PLWH.
CONCLUSION: The majority of the pharmacist membership of AAHIVM are involved in precepting pharmacist trainees, practice in community pharmacies and outpatient clinics, and are involved in both traditional and evolving clinical functions. AAHIVM offers its members useful resources and aims to expand services based on the results of this survey.

194. Phosphodiesterase Type 5 inhibitor use and drug interactions in HIV-infected US air force members receiving antiretroviral therapy *Jason M. Cota, Pharm.D., M.S.*[1], Michael A. James, Pharm.D. Candidate[1], Julius Li, Pharm.D.[2], Jason F. Okulicz, M.D.[3]; [1]University of the Incarnate Word Feik School of Pharmacy, San Antonio, TX [2]Department of Pharmacy, Ochsner Medical Center, New Orleans, LA [3]Infectious Diseases Service, San Antonio Military Medical Center, San Antonio, TX
INTRODUCTION: The prevalence of phosphodiesterase type 5 (PDE-5) inhibitor use in HIV-infected men and PDE-5 inhibitor-mediated drug interactions with antiretroviral therapy (ART) are unknown.
RESEARCH QUESTION OR HYPOTHESIS: What is the prevalence of PDE-5 inhibitor use in ART recipients? What is the prevalence of clinically-significant drug interactions (CSDIs) between PDE-5 inhibitors and ART? Are CSDIs more likely to occur when non-HIV providers prescribe PDE-5 inhibitors?
STUDY DESIGN: Retrospective review of prescription records for PDE-5 inhibitors and ART in HIV-infected US Air Force personnel from July 2001 to May 2013.
METHODS: Regimens were analyzed for CSDIs using two drug interaction software programs and published ART guidelines. CSDI was defined as a contraindication or requirement for dose adjustment. PDE-5 inhibitor use and CSDI prevalence was described. Odds of CSDI was calculated for the first PDE-5 inhibitor prescription written by a non-HIV provider. CSDIs by HIV versus non-HIV providers were calculated by Fisher exact test.
RESULTS: Overall, 799 PDE-5 prescriptions were filled during the 12-year study period with 573 (71.7%) written by non-HIV providers. Of 516 patients, 64 (12.4%) received a PDE-5 inhibitor prescription and 59 (11.4%) received concomitant ART. Of these, 16 (27.1%) patients had 21 CSDIs documented and 19 (90.4%) occurred when the PDE-5 inhibitor was from a non-HIV provider. CSDIs were more likely to occur in those who received a PDE-5 prescription from a non-HIV versus HIV provider (OR 4.36; 95% CI 1.05–20.02; p = 0.03). Vardenafil was involved in 13 CSDIs (61.9%) and all CSDIs involved protease inhibitors. The median number of PDE-5 inhibitor prescriptions per patient was 3 (IQR 1–5) and median duration of CSDI was 241 days (IQR 30–346).
CONCLUSION: This study highlights a previously undocumented challenge in PDE-5 inhibitor use in ART recipients. CSDIs in HIV-infected patients receiving ART and PDE-5 inhibitors are common and are more likely to occur when PDE-5 inhibitors are prescribed by non-HIV providers.

195E. Utilizing phase 3 clinical trial data to assess adverse event (AE) frequency of a potentially interacting medication (PIM) amlodipine with elvitegravir/cobicistat (EVG/COBI) Daniel Podzamczer, M.D.[1], Karen Tashima, M.D.[2], Eric Daar, M.D.[3], Joseph McGowan, M.D.[4], Thomas Campbell, M.D.[5], Jihad Slim, M.D.[6], Melanie Thompson, M.D.[7], Susan Guo, Ph.D.[8], Peter Borg, BAPharm[9], Richard Haubrich, M.D.[10], Moupali Das, M.D.[11], *Ian McNicholl, Pharm.D.*[10], Scott McCallister, M.D.[12]; [1]Hospital Universitario de Bellvitge, Barcelona, Spain [2]The Miriam Hospital, Providence, RI [3]Los Angeles Biomedical Research Institute at Harbor-UCLA Medical Center, Los Angeles, CA [4]North Shore University Hospital, Manhasset, NY [5]University of Colorado, Denver, CO [6]Saint Michael's Medical Center, Newark, NJ [7]AIDS Research Consortium of Atlanta, Atlanta, GA [8]Giilead Sciences, Foster City, CA [9]Gilead Sciences, Stockley Park, United Kingdom [10]HIV Medical Affairs, Gilead Sciences, Foster City, CA [11]Gilead Sciences, Foster City, CA [12]Clinical Research, Gilead Sciences, Foster City, CA
Presented at HIV Glasgow 2016. Glasgow, Scotland. Oct 23-26, 2016.

196E. Assessing adverse event (AE) Frequency of eight potentially interacting medications (PIM) with Elvitegravir/Cobicistat/Emtricitabine/Tenofovir Alafenamide (E/C/F/TAF) utilizing phase 3 clinical trial data Karen Tashima, M.D.[1], Eric Daar, M.D.[2], Joseph McGowan, M.D.[3], Jihad Slim, M.D.[4], Melanie Thompson, M.D.[5], Susan Guo, Ph.D.[6], Richard Haubrich, M.D.[7], *Ian McNicholl, Pharm.D.*[7], Moupali Das, M.D.[8]; [1]The Miriam Hospital, Providence, RI [2]Los Angeles Biomedical Research Institute at Harbor-UCLA Medical Center, Los Angeles, CA [3]North Shore University Hospital, Manhasset, NY [4]Saint Michael's Medical Center, Newark, NJ [5]AIDS Research Consortium of Atlanta, Atlanta, GA [6]Giilead Sciences, Foster City, CA [7]HIV Medical Affairs, Gilead Sciences, Foster City, CA [8]Gilead Sciences, Foster City, CA
Presented at the 18th International Workshop on Co-morbidities and Adverse Drug Reactions in HIV, New York, NY, September 12-13, 2016.

197E. Week 96 efficacy and safety of tenofovir alafenamide versus tenofovir disoproxil fumarate in older, HIV-infected treatment-naive adults Douglas Ward, M.D.[1], Melanie Thompson, M.D.[2], Deborah Goldstein, M.D.[3], Cynthia Brinson, M.D.[4], Gordon Crofoot, M.D.[5], Clifford Kinder, M.D.[6], Hui Wang, Ph.D.[7], *Julie Ryu, Pharm.D., MBA*[8], Ian McNicholl, Pharm.D.[8], Richard Haubrich, M.D.[8], Amy Weinberg, DNP[9], Scott McCallister, M.D.[10]; [1]Dupont Circle Physicians Group, Washington, DC [2]AIDS Research Consortium of Atlanta, Atlanta, GA [3]Whitman Walker Health, Washington, DC [4]CTCR, Austin, TX [5]Crofoot Research, Houston, TX [6]The Kinder Medical Group, Miami, FL [7]Biostatistics - HIV, Gilead Sciences, Foster City, CA [8]HIV Medical Affairs, Gilead

Sciences, Foster City, CA [9]HIV Medical Sciences, Gilead Sciences, Foster City, CA [10]Clinical Research, Gilead Sciences, Foster City, CA
Presented at International Workshop on HIV & Aging, Washington DC, September 26-27, 2016.

198E. Week 96 efficacy and safety of tenofovir alafenamide versus tenofovir disoproxil fumarate in older, HIV-infected virologically-suppressed adults Deborah Goldstein, M.D.[1], Douglas Ward, M.D.[2], Cynthia Brinson, M.D.[3], Gordon Crofoot, M.D.[4], *Julie Ryu, Pharm.D., MBA*[5], Ian McNicholl, Pharm.D.[5], Richard Haubrich, M.D.[5], Scott McCallister, M.D.[6]; [1]Whitman Walker Health, Washington, DC [2]Dupont Circle Physicians Group, Washington, DC [3]CTCR, Austin, TX [4]Crofoot Research, Houston, TX [5]HIV Medical Affairs, Gilead Sciences, Foster City, CA [6]Clinical Research, Gilead Sciences, Foster City, CA
Presented at International Workshop on HIV & Aging, Washington DC, September 26-27, 2016.

Infectious Diseases

199. Comparison of standard versus extended durations of antimicrobial therapy for hospital-acquired pneumonia *Sarah Petite, Pharm.D., BCPS*[1], Khang Nguyen, Pharm.D.[2]; [1]College of Pharmacy and Pharmaceutical Sciences, University of Toledo, Toledo, OH [2]Department of Pharmacy, University of Toledo Medical Center, Toledo, OH
INTRODUCTION: The Infectious Diseases Society of America recommends a seven-day duration of antimicrobial therapy for hospital-acquired pneumonia (HAP); however, this recommendation is based on low quality evidence. The majority of evidence supporting this recommendation is from ventilator-associated pneumonia clinical trials. Due to the lack of literature regarding length of antimicrobial therapy for HAP, adherence to guideline recommendations is variable in clinical practice.
RESEARCH QUESTION OR HYPOTHESIS: Clinical stability at day 7 is no different between patients treated with standard duration (≤7 days) compared to extended duration (>7 days) antimicrobial therapy.
STUDY DESIGN: Retrospective, cohort, single-center study.
METHODS: Adult patients admitted with a diagnosis of HAP and received at least 72 h of antimicrobial therapy were included. The primary outcome was clinical stability at day 7 in patients treated with standard compared to extended duration antimicrobial therapy. Secondary outcomes included hospital and intensive care unit (ICU) length of stay (LOS), 30-day mortality and 30-day hospital readmission rates. Categorical data were analyzed using Chi-square or Fisher's exact test and continuous data were analyzed using Mann-Whitney U test.
RESULTS: Fifty-three unique patient encounters were identified. Thirty-two patients (60.4%) received standard duration (6 days [5–7]) and 21 patients (39.6%) received extended duration (14 days [11–14]) antimicrobial therapy ($p < 0.001$). There were no statistically significant differences between groups with respect to day 7 clinical stability (62.5% vs. 47.6%; $p = 0.29$), hospital LOS (9 [7–16] days vs. 12 [7.5–24] days; $p = 0.29$), ICU LOS (5 [3.5–9.5] days vs. 5 [3–20] days; $p = 0.62$), 30-day mortality (3.1% vs. 9.5%; $p = 0.56$) or 30-day readmission rates (21.9% vs. 38.1%; $p = 0.2$).
CONCLUSION: No differences were observed in day 7 clinical stability between antimicrobial treatment groups. Guideline recommended durations of antimicrobial therapy can be utilized in patients with HAP.

202. Impact of an antifungal stewardship intervention on optimization of candidemia management Hana Rac, Pharm.D.[1], Jamie L. Wagner, Pharm.D.[2], S. Travis King, Pharm.D., BCPS[3], Katie E. Barber, Pharm.D.[2], *Kayla R. Stover, Pharm.D., BCPS-ID*[2]; [1]Pharmacy, University of Mississippi Medical Center, Jackson, MS [2]Department of Pharmacy Practice, University of Mississippi School of Pharmacy, Jackson, MS [3]School of Pharmacy, University of Mississippi School of Pharmacy, Jackson, MS
INTRODUCTION: Candidemia represents a leading cause of healthcare-associated bloodstream infections with mortality up to 40%. Previous studies have demonstrated comprehensive care bundles improve candidemia outcomes but are time-consuming.
RESEARCH QUESTION OR HYPOTHESIS: What is the impact of a targeted candidemia intervention on time to initiation of adequate therapy compared to standard-of-care?
STUDY DESIGN: Single-center, quasi-experimental, pretest-posttest design.
METHODS: A targeted candidemia intervention involving a single phone call to the primary team providing recommendations for care was implemented. Daily follow-up was provided by the infectious diseases (ID) consult service. Clinical outcomes evaluated in the pre-period (08/01/12–07/31/14) and post-period (10/01/14–09/30/16) included time to adequate therapy, infection-related length of stay (IF-LOS), compliance with quality indicators (composite endpoint: ophthalmology (OPH) consult, repeated cultures, ≥14 days of adequate therapy), ID consultation, and in-hospital mortality. Adequate therapy was defined as documented or expected *in vitro* susceptibility to the pathogen. The primary endpoint was time to adequate antifungal therapy (AAT). Descriptive (median, [IQR]) and inferential (chi-square, fisher's exact, Mann-Whitney U) statistics were performed using SPSS (v. 24). A p-value of <0.05 was considered statistically significant.
RESULTS: 117 patients were included (pre-intervention = 50, post-intervention = 67). Median age was 56 [40–64.5] years with 57.3% male and 58.1% African American. Median Pitt bacteremia score was 2 [1–4]. AAT decreased from 3 h 30 m to 2 h 9 m ($p = 0.026$). There was no difference in IF-LOS ($p = 0.797$), compliance with quality indicators ($p = 0.343$), or in-hospital mortality ($p = 0.761$). Post-intervention, there were more ID and OPH consults ($p < 0.001$).
CONCLUSION: Our one-time candidemia intervention did statistically decrease time to initiation of adequate therapy by 1 h 21 m. No differences were found for other clinical outcomes, except increases in ID and OPH consults. Further studies are needed to examine if a one-time intervention is non-inferior to a more comprehensive bundle.

203. Benchmarking outpatient antibiotic prescribing patterns and adherence to published guidelines in an academic medical clinic *Michael Klepser, Pharm.D.*[1], Heather Rauch, BS[2], Alyssa Woodwyk, MS[3], Ashley Altom, Pharm.D.[1], Mark Schauer, M.D.[4], Colleen MacCallum, MS[3], Donald G. Klepser, Ph.D., M.B.A.[5]; [1]College of Pharmacy, Ferris State University, Kalamazoo, MI [2]Division of Epidemiology and Biostatistics, Western Michigan University Homer Stryker, M.D. School of Medicine, Kalamazoo, MI [3]Division of Epidemiology and Biostatistics, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI [4]Department of Internal Medicine, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI [5]College of Pharmacy, University of Nebraska Medical Center, Omaha, NE
INTRODUCTION: The National Action Plan for Combating Antibiotic-Resistant Bacteria has a goal of reducing inappropriate outpatient antibiotic use by 50% in 2020 over 2010.Methods to effectively assess antibiotic use in the outpatient setting are lacking.
RESEARCH QUESTION OR HYPOTHESIS: Data from an electronic medical record (EMR) can be used to quantify and assess the appropriateness of outpatient antibiotic use.
STUDY DESIGN: Single-center, retrospective, cross-sectional study Methods: Data were collected between January

2012-September 2013 from the Western Michigan Medical Clinics and included antibiotic regimens, allergies, ICD-9 code(s), and provider. For each antibiotic, a Prescribed Therapeutic Regimen (PTR) was calculated (Dose x Frequency x Duration). A Recommended Therapeutic Regimen range (RTR) was similarly calculated for regimens recommended by published guidelines. Choice of agent and PTR were compared to guideline recommendations and RTR ranges to determine appropriateness of use. Antibiotic usage was described as antibiotics per 1,000 patient visits. 95% confidence intervals were used to estimate antibiotic use and logistic regression to assess compliance with recommended regimens using SAS.
RESULTS: 21,468 clinic visits were reviewed and 4,355 episodes resulting in at least one antibiotic prescription were identified. The rate of global antibiotic use was 819 antibiotics per 1,000 patients (95% CI 818, 820), which is higher than the national average of 801 per 1,000. Antibiotic use decreased with age ($p < 0.0001$) and was 1.4 times higher (95% CI 1.34, 1.53; $p < 0.0001$) among females. A non-recommended antibiotic was prescribed 35% (95% CI 31.9, 37.2) of the time and a non-recommended regimen selected 60% (95% CI 56.6, 63.3) of the time. The combined rate of inappropriate antibiotic use, agent and regimen, was 74% (95% CI 71.3, 76.2).
CONCLUSION: Data from an EMR can be used to quantify and assess the appropriateness of outpatient antibiotic use. These data can be used to justify and direct outpatient antimicrobial stewardship initiatives.

204. Incidence and risk factors for healthcare utilization among patients discharged on outpatient parenteral antimicrobial therapy (OPAT) *Wai Yin Leung, Student*[1], David Essi, MA[2], Woojin Park, Student[2], Amy Shaver, Student[2], Gauri G. Rao, Pharm.D.[3], David M. Jacobs, Pharm.D.[2]; [1]University at Buffalo School of Pharmacy and Pharmacuetical Sciences, Buffalo, NY [2]University at Buffalo School of Pharmacy and Pharmaceutical Sciences, Buffalo, NY [3]Eshelman School of Pharmacy, University of North Carolina, Chapel HIll, NC
INTRODUCTION: Outpatient Parenteral Antimicrobial Therapy (OPAT) programs have become a standard modality of care to facilitate hospital discharge. However, patients are still at risk for complications which can lead to increases in utilization of healthcare resources.
RESEARCH QUESTION OR HYPOTHESIS: To identify the incidence of health care utilization (HCU) within 60 days of hospital discharge and risk factors for HCU among OPAT patients.
STUDY DESIGN: This was a single-center, retrospective case-control study of patients discharged on OPAT from January 2011–October 2015.
METHODS: Patients aged ≥18 years with a peripherally inserted central catheter and planned continuation of intravenous antibiotic therapy at time of discharge were included. HCU was defined as emergency department visit or unplanned hospital readmission. Cases and controls were defined as patients in the study cohort that utilized and those that did not utilize the healthcare system within 60 days of discharge, respectively. Cases were matched 1:2 to controls based on year of admission and length of stay. A conditional, multivariable logistic regression model was used to identify independent predictors of HCU.
RESULTS: 189 patients were included in this study with 63 cases matched to 126 controls. The most common diagnoses were wound infection (22%) and cellulitis (14%). The cumulative incidence of HCU following discharge with OPAT was 27% with a disproportionately higher incidence in the first 30 days (21%). The final regression model consisted of number of prior admission in past 12 months (aOR 1.48, 95% CI 1.05–2.10), a diagnosis of septic shock (aOR 4.62, 95% CI 1.23–17.3), and a statin at discharge (aOR 0.23, 95% CI 0.09–0.57). Major reasons for unplanned HCU included non-infection related (38%), worsening of the infection (30%), and mechanical complication (13%).
CONCLUSION: HCU following OPAT discharge remains high. Multiple factors were found to impact the risk for HCU including a strong protective effect in patients discharged on a statin.

205. Antibiotic prescribing and infections in individuals with and without diabetes in the United States *Khine Tun, B.S. Biology*, Ke Ting Liu, B.A. Biology, Grace Lee, Pharm.D.; The University of Texas at Austin College of Pharmacy and University of Texas Health Science Center School of Medicine, San Antonio, TX
INTRODUCTION: Individuals with diabetes mellitus (DM) have been found to have an increased propensity for infectious diseases (IDs) compared to those without DM. However, the magnitude of DM on the risk of developing an infection and receiving antimicrobials remain largely unknown.
RESEARCH QUESTION OR HYPOTHESIS: Antimicrobial prescribing and incidence of common bacterial IDs will be significantly different between diabetic and non-diabetic adults.
STUDY DESIGN: This was a retrospective, cross-sectional analysis of the U.S. adult population in 2014.
METHODS: Using the Medical Expenditure Panel Surveys, DM defined by Clinical Classification Software (CCS) codes, 049 and 050, was used to identify two cohorts >18 years old, with and without diabetes in 2014. We compared antimicrobials prescribed during ambulatory visits (including outpatient and office-based visits) and ID diagnoses as defined by CCS codes using population-based rates (per 10,000 persons) and risk ratios (RR) among DM and non-DM adults. 95% confidence intervals (95% CIs) were calculated to assess statistical differences. All analyses were adjusted for age and sex. Data weights were applied to derive national estimates.
RESULTS: These data represent 24 million adults with DM and 218 million without DM. A total of 17 million antimicrobials were prescribed among diabetics. Overall, diabetics were 1.6× more likely to be prescribed antimicrobials (6,892/10,000 in DM vs. 4,229/10,000 in non-DM). This higher prescribing rate among diabetics was observed across all antimicrobial classes. The most commonly prescribed antimicrobials among diabetics included: macrolides (1,733/10,000), penicillins (1,282/10,000), and quinolones (1,045/10,000). Diabetics were 1.8× and 1.2× more likely to experience urinary tract infections [UTIs] (RR = 1.8, 95% CIs 1.7–1.8) and upper respiratory infections [URIs] (1.3, 1.2–1.3), respectively. Whereas SSTIs were lower among diabetics (0.3, 0.2–0.3) at the ambulatory care setting.
CONCLUSION: Individuals with DM experienced a higher rate of antimicrobial prescribing and infections, particularly UTIs and URIs, but lower risk of SSTIs compared to individuals without DM.

206E. Prediction of sulfamethoxazole/trimethoprim resistance in community-onset urinary tract infections Madeline DeMarsh, Pharm.D., MBA[1], P. Brandon Bookstaver, Pharm.D., FCCP, BCPS, AAHIVP[2], Juanne Lim, Pharm.D. Candidate[3], *Caroline Gordon, Pharm.D. Candidate*[3], Nicole K. Bookstaver, Pharm.D., BCACP[1], Majdi Al-Hasan, M.D.[4]; [1]Department of Pharmacy, Palmetto Health Richland, Columbia, SC [2]Department of Clinical Pharmacy & Outcomes Sciences, University of South Carolina College of Pharmacy, Columbia, SC [3]School of Pharmacy, South Carolina College of Pharmacy, Columbia, SC [4]Department of Medicine, Division of Infection Diseases, University of South Carolina School of Medicine, Columbia, SC
Presented at South Carolina Infectious Diseases Society, Greenville, SC, July 15, 2017.

207. Antimicrobial stewardship education amongst United States colleges and schools of pharmacy *Wesley Kufel, Pharm.D.*[1], Lindsay Daniels, Pharm.D.[1], Ashley Marx, Pharm.D.[1], Dennis Williams, Pharm.D.[2]; [1]University of North Carolina Medical Center, Chapel Hill, NC [2]UNC Eshelman School of Pharmacy, Chapel Hill, NC

INTRODUCTION: Infectious diseases (ID) pharmacists are considered key members of the antimicrobial stewardship (AS) team. Incorporation of AS education in the pharmacy curricula help prepare future pharmacists for AS practice. It is currently unknown if United States (US) colleges and schools of pharmacy incorporate AS into their doctorate of pharmacy (Pharm.D.) curricula.

RESEARCH QUESTION OR HYPOTHESIS: What is the extent, content, and methodology to which AS is incorporated into US colleges and schools of pharmacy curricula?

STUDY DESIGN: Educational research survey.

METHODS: A 27-question online survey was distributed via email to individual ID pharmacy faculty or department chairs of 135 accredited and candidate-status US Pharm.D. programs over a five week period. Demographic information and data regarding the extent, content, and methodology of AS education in the required didactic, elective didactic, and experiential education component of the Pharm.D. curricula were collected.

RESULTS: Of the 81 participating programs (60.0% response rate), AS education was integrated into the required didactic and elective didactic curricula in 55 (67.9%) and 30 (37.0%) US Pharm.D. programs, respectively. Most US Pharm.D. programs offered AS education as part of experiential education (81.5%). Fifty-seven (70.4%) offered advanced pharmacy practice experiences (APPE) and 9 (11.1%) offered both introductory pharmacy practice experiences (IPPE) and APPE. Five (6.2%) participating programs did not offer AS education within their Pharm.D. curricula. Multiple AS-related topics were incorporated into the curricula through a variety of teaching and delivery methods.

CONCLUSION: AS education appears to be integrated into the curricula of most US Pharm.D. programs yet there is great variability amongst programs. While a majority incorporated AS education into the experiential education component, not all students will be exposed or have the opportunity to engage in these experiences. Colleges and schools of pharmacy should attempt to expose all students to AS education within the curricula as more pharmacists are needed to practice in AS.

208. Empiric carbapenems versus cefepime or piperacillin-tazobactam for the treatment of extended spectrum β-lactamase producing *Escherichia Coli* bacteremia in patients with hematologic malignancies *Grace Benanti, Pharm.D.*[1], Anne Rain Tanner Brown, Pharm.D.[1], Terri Lynn Shigle, Pharm.D.[1], Jeffrey Tarrand, M.D.[2], Micah Bhatti, M.D., Ph.D.[2], Patrick McDaneld, Pharm.D.[1], Samuel Shelburne, M.D., Ph.D.[3], Samuel Aitken, Pharm.D.[1]; [1]Division of Pharmacy, The University of Texas M.D. Anderson Cancer Center, Houston, TX [2]Department of Laboratory Medicine, The University of Texas M.D. Anderson Cancer Center, Houston, TX [3]Department of Infectious Diseases, Infection Control, and Employee Health, The University of Texas M.D. Anderson Cancer Center, Houston, TX

INTRODUCTION: Extended-spectrum β-lactamase (ESBL)-producing *Escherichia coli* (ESBL-EC) are common in patients with hematologic malignancies; carbapenems are considered the treatment of choice. Interest in cefepime and piperacillin-tazobactam as carbapenem-sparing alternatives has risen, but prior studies comparing these options largely excluded patients with hematologic malignancies.

RESEARCH QUESTION OR HYPOTHESIS: Patients with hematologic malignancies who received empiric carbapenems for ESBL-EC bacteremia will have reduced mortality compared to those treated empirically with cefepime or piperacillin-tazobactam.

STUDY DESIGN: Single-center retrospective cohort review.

METHODS: Adult inpatients (>18 years old) with leukemia or hematopoietic stem cell transplant (HSCT) recipients with monomicrobial ESBL-EC bacteremia treated empirically with a carbapenem, cefepime, or piperacillin-tazobactam were included. The primary outcome was 14-day mortality. Secondary outcomes were time to defervescence and persistent bacteremia. Fourteen-day mortality was assessed with Cox proportional hazards regression. Time to defervescence was assessed using competing risks regression. Persistent bacteremia was assessed using logistic regression. Multivariable models were constructed using a backward stepwise approach. P-values < 0.05 denoted significance; analyses were performed using Stata.

RESULTS: One hundred and three patients (cefepime n = 40; piperacillin-tazobactam n = 21; meropenem n = 42) were included. Mortality was similar for cefepime versus carbapenems (hazard ratio [HR] 0.57, 95% CI 0.14 – 2.26, p = 0.42). Zero patients who received piperacillin-tazobactam died and multivariable analysis was not performed. Persistent bacteremia was more common with cefepime (OR 9.7, 95% CI 0.87 – 108.04, p = 0.08) and piperacillin-tazobactam (OR 27.06, 95% CI 1.78 – 410.08, $p < 0.01$) compared to carbapenems. Time to defervescence was longer in patients receiving cefepime (HR 0.56, 95% CI 0.4 – 0.77, $p < 0.01$) and piperacillin-tazobactam (HR 0.37, 95% CI 0.22 – 0.64, $p < 0.01$).

CONCLUSION: Despite similar mortality rates, persistent bacteremia and prolonged fever were more common in recipients of cefepime or piperacillin-tazobactam in patients with hematologic malignancies and ESBL-EC bacteremia. The utility of these agents as carbapenem-sparing alternatives appears limited in this population.

209. Characterization of causative pathogens in spontaneous bacterial peritonitis infections: emergence of multi-drug resistant bacteria with the use of fluoroquinolone prophylaxis *Benjamin Albrecht, Pharm.D.*[1], Sarah Todd, Pharm.D., BCPS[2], Amber Cordry, Pharm.D.[3], Ram Subramanian, M.D., FCCM, FCCP, AGAF[4]; [1]Department of Pharmacy, Emory University Hospital, Atlanta, GA [2]Department of Liver Transplantation, Emory University Hospital, Atlanta, GA [3]Mercer College of Pharmacy, Atlanta, GA [4]Emory University Hospital, Atlanta, GA

INTRODUCTION: Although the emergence of multi-drug resistant (M.D.R) pathogens has been of growing concern, minimal data is available on the current trends in causative species of spontaneous bacterial peritonitis (SBP) after a decade of such practices in related patients.

RESEARCH QUESTION OR HYPOTHESIS: Does fluoroquinolone prophylaxis against spontaneous bacterial peritonitis in end-stage-liver disease (ESLD) increase the risk of multi-drug resistant pathogens?

STUDY DESIGN: A retrospective chart review focused on descriptive data in patients diagnosed with SBP who received a liver transplant from 2009 to 2016 at Emory University Hospital.

METHODS: Primary outcomes included the identity and percentage of M.D.R pathogens of spontaneous bacterial peritonitis in patients receiving fluoroquinolone prophylaxis with those not receiving fluoroquinolone prophylaxis within 6 months prior to SBP diagnosis. Secondary outcomes included length of stay, 30-, 90-, 180-day mortality, *Clostridium difficile* infection, and incidence of gastrointestinal bleed. Absolute risk reduction, relative risk, and number needed to harm were calculated for the incidence of resistant pathogens in peritoneal cultures in patients with and without prophylaxis.

RESULTS: A higher incidence of SBP infections in patients on prophylaxis as compared to those not on prophylaxis, at 2/20 (10%) and 4/78 (5%) respectively, grew M.D.R bacteria. An absolute risk reduction of M.D.R growth in peritoneal cultures of 5% (number needed to harm = 20 patients) with a statistically insignificant relative risk of 1.95 (p = 0.42; 95% CI, 0.38 – 9.9) was calculated. Culture data did show a predominance of

Enterococci species and *Staphylococci* species for patients on fluoroquinolone prophylaxis and *Pseudomonas*, *E. coli*, and other gram negative bacilli for patients not on prophylaxis.
CONCLUSION: There is an observable increase in gram positive infections as compared to gram negative infections in patients receiving fluoroquinolone prophylaxis, however the difference in M.D.R growth between patients on prophylaxis and those not on prophylaxis is not statistically significant.

210. Outcomes of rapid identification of multi-drug resistant gram-negative organisms causing bacteremia in combination with antimicrobial stewardship in a community health system *Sarah Ross, Pharm.D.*[1], Eva Sullivan, Pharm.D.[2], Harminder Sikand, Pharm.D., FCSHP, FASHP, FCCP[2], Maggie Box, Pharm.D., BCPS, AQ-ID[3], Jennifer Lee, Pharm.D.[4], Caitlin Richardson, Pharm.D., BCPS, AQ-ID[5], Kristine Ortwine, B.S.[6]; [1]Pharmacy, Scripps Mercy Hospital San Diego, San Diego, CA [2]Department of Pharmacy, Scripps Mercy Hospital, San Diego, CA [3]Pharmacy, Scripps Memorial Hospital, La Jolla, CA [4]Pharmacy, Scripps Mercy Hospital Chula Vista, Chula Vista, CA [5]Pharmacy, Scripps Green Hospital, La Jolla, CA [6]Project Management, Scripps Mercy Hospital San Diego, San Diego, CA
INTRODUCTION: Rapid initiation of effective antibiotic therapy has been strongly associated with a decrease in mortality in gram-negative (GN) bacteremia. In an effort to improve time to effective antibiotic therapy in the treatment of multi-drug resistant (M.D.R) GN bacteremia, we implemented Verigene GN Blood Culture (BC-GN) assay, which can rapidly identify GN bacteria at the genus/species level and specific resistance markers from blood cultures within 2 h of positivity.
RESEARCH QUESTION OR HYPOTHESIS: Does rapid diagnostics with antimicrobial stewardship intervention decrease time to effective antimicrobial therapy for resistant gram-negative bacteremia.
STUDY DESIGN: Multi-center, pre-post quasi-experimental study. Pre-intervention retrospective review phase from 11/1/2015 to 10/31/2016, and a post-intervention prospective review phase from 11/1/2016 to 2/28/2017.
METHODS: The objective of this study was to assess outcomes of Verigene BC-GN in combination with antibiotic stewardship in treatment of M.D.R GN bacteremia. A retrospective chart review was performed one year prior and four months post-implementation of Verigene BC-GN. Patients >18 years old with M.D.R GN bacteremia identified by Verigene BC-GN within 5 days of admission were included. The primary endpoint was time to effective antibiotic therapy for M.D.R GN bacteremia. Secondary outcomes included overall and ICU length of stay (LOS) and 30-day mortality. Education regarding interpretation of resistance markers and selection of optimal antibiotic therapy was provided to pharmacists and physicians prior to implementation.
RESULTS: A total of 110 patients were included, 86 in the pre-intervention group and 24 in the post-intervention group. Mean time to effective antibiotic therapy decreased significantly from 47.6 ± 23.1 h vs. 18.8 ± 9.1 h, respectively ($p < 0.0001$). Median overall LOS was 6.0 vs. 5.5 days ($p = 0.88$), ICU LOS was 3.0 vs. 4.0 days ($p = 0.57$), and 30-day mortality was 4.7% vs. 4.2% ($p = 1$) pre and post-implementation, respectively.
CONCLUSION: Verigene BC-GN, in combination with antibiotic stewardship, successfully improved time to effective antibiotic therapy among M.D.R GN organisms causing bacteremia.

211. Monte Carlo analysis of investigational carbapenem/beta-lactamase inhibitor combinations against Enterobacteriaceae spp *Joshua Knight, BA*[1], Roger White, Pharm.D.[2]; [1]MUSC School of Pharmacy, Medical University of South Carolina, College of Pharmacy, Charleston, SC [2]MUSC Department of Biomedical Science, Charleston, SC
INTRODUCTION: New beta-lactamase inhibitors, relebactam (REL) and vaborbactam (VAB), combined with imipenem (IMI) and meropenem (MER) are currently in Phase 3 (P3) clinical trials.
RESEARCH QUESTION OR HYPOTHESIS: This Monte Carlo analysis (MCA) compared the pharmacodynamics of imipenem-relebactam (IMI-REL) and IMI against wild-type (NPE-WT) and resistant (NPE-R) Non-Proteeae Enterobacteriaceae and meropenem-vaborbactam (MER-VAB) and MER against WT (ENT-WT) and R Enterobacteriaceae (ENT-R).
STUDY DESIGN: MCA (n = 10,000), using PK parameters, recent MICs, and pharmacodynamic (PD) targets from peer-reviewed literature, and an inpatient CrCl distribution (10–120 mL/min) from our institution.
METHODS: MCA was performed for IMI-REL (500 mg/250 mg q6 h for normal CrCl), IMI (500 mg q6 h for normal CrCl), MER (1 g q8 h for normal CrCl), and MER-VAB (1 g/1 g q8 h for normal CrCl), adjusted for CrCl per the product label (PL) and P3 dosing schemes. MCA was performed using volumes of distribution (0.22/0.34 L/Kg for normal/critically ill patients) and infusion times of 0.5 and 3.0 h. Target attainment (TA%) for PD targets of fT>MIC(%) ≥ 20, and ≥40 was assessed.
RESULTS: Inhibitor addition increased activity against resistant populations by 35–50% and 43–57% for IMI and MER, respectively. TA% differences for both volumes and infusions were minimal (≤11% and ≤9%, respectively); these differences occurred at the 20% fT>MIC goal, where increased volume and increased infusion time decreased %TA. Below is TA% for the individual drugs and combinations with normal patient volumes and the following dosing schemes: IMI (PL), IMI-REL (P3), MER (PL), and MER-VAB (P3):

		Target Attainment for % T>MIC ≥	
Organism	Drug	20	40
NPE-R	IMI	74	57
	IMI-REL	100	100
ENT-R	MER	58	37
	MER-VAB	100	100
NPE-WT	IMI	99	99
	IMI-REL	100	100
ENT-WT	MER	99.5	99
	MER-VAB	100	100

CONCLUSION: Target attainment for IMI and MER appear to be viable options for empiric use against typical Enterobacteriaceae populations. However, IMI/REL or MER/VAB may be warranted against resistant Enterobacteriaceae populations.

212. Incidence of acute kidney injury among patients receiving the combination of vancomycin with piperacillin-tazobactam or meropenem *Amy Robertson, Pharm.D.*[1], Chenghui Li, Ph.D.[2], Drayton Hammond, Pharm.D., MBA, BCPS, BCCCP[3], Tiffany Dickey, Pharm.D.[1]; [1]Department of Pharmacy Practice, University of Arkansas for Medical Sciences College of Pharmacy, Fayetteville, AR [2]Department of Pharmacy Practice, Pharmaceutical Evaluation and Policy Division, University of Arkansas for Medical Sciences College of Pharmacy, Little Rock, AR [3]University of Arkansas for Medical Sciences College of Pharmacy, Little Rock, AR
INTRODUCTION: It is well documented that vancomycin is associated with an increased risk of acute kidney injury (AKI). However, there is conflicting evidence regarding the risk of AKI when vancomycin is combined with broad-spectrum beta-lactams, such as piperacillin-tazobactam or meropenem, for empiric treatment of severe infections.

RESEARCH QUESTION OR HYPOTHESIS: What is the comparative incidence of AKI when vancomycin is combined with piperacillin-tazobactam versus meropenem?
STUDY DESIGN: This was a single-center, retrospective cohort study conducted at a 204-bed community hospital from November 1, 2014 to October 31, 2016.
METHODS: Adults that received the combination of vancomycin and piperacillin-tazobactam or meropenem for at least 48 h were included. Critically ill patients and those with baseline renal dysfunction were excluded. The primary outcome was the incidence of AKI during or within 72 h of completing antibiotic therapy defined as an absolute increase in serum creatinine (SCr) of ≥0.5 mg/dL or ≥ 50% increase in SCr from baseline. Secondary outcomes included the time to AKI development, duration of AKI, initiation of hemodialysis, and total length of hospital stay. Continuous variables were assessed using Wilcoxon rank-sum or Student's t-test while categorical variables were assessed using Chi-square or Fisher's exact tests.
RESULTS: A total of 169 patients were included. There was a significantly higher incidence of AKI in the piperacillin-tazobactam group compared to meropenem (16.5% versus 3.6%, p = 0.009). The time to AKI onset was significantly shorter in the piperacillin-tazobactam group compared to meropenem (3.4 days versus 8 days, p = 0.0002). Vancomycin doses >4 g/day and trough levels >20 mcg/mL were associated with an increased risk of developing AKI (OR 8.71; 95% CI 1.04–72.94 and OR 9.01; 95% CI 1.44–56.21, respectively).
CONCLUSION: The combination of vancomycin and piperacillin-tazobactam increases the risk of AKI compared to vancomycin and meropenem in non-critically ill patients.

213. Comparison of nafcillin and cefazolin for the treatment of methicillin-susceptible staphylococcus aureus bacteremia
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INTRODUCTION: *Staphylococcus aureus* is one of the most prevalent bacterial pathogens in the United States and is identified as a leading cause of bloodstream infections (BSI). Although, cefazolin is used for methicillin-susceptible *staphylococcus aureus* (MSSA) infections, it has been constrained by concerns for an inoculum effect. This raises concern of cefazolin use in high bacterial burden infections such as, endocarditis, osteomyelitis, septic arthritis, pneumonia or large abscesses.
RESEARCH QUESTION OR HYPOTHESIS: Are there more treatment failures (TF) in patients with MSSA BSI treated with cefazolin compared to nafcillin?
STUDY DESIGN: Retrospective analysis of patients admitted to Methodist LeBonheur Healthcare adult hospitals between 8/31/2011–8/31/2016.
METHODS: Inclusion criteria: Age ≥18 years, ≥1 positive MSSA blood culture. Exclusion criteria: Positive cultures other than MSSA, initiation of therapies >5 days after MSSA blood culture positivity, concurrent use of other anti-staphylococcal antibiotics for longer or equivalent duration.
RESULTS: For analysis, 176 patients were included (n = 88 nafcillin, n = 88 cefazolin). No difference in the number of TF was observed between the groups (nafcillin 19.3% vs. cefazolin 12.5%; p = 0.30). However, there were more patients in the cefazolin group that experienced clinical cure compared to nafcillin (94.3% vs. 81.8%, respectively; p = 0.02). Microbiological cure (cefazolin 88.2% vs. nafcillin 86.5%; p = 0.82) as well as in-hospital mortality (cefazolin 6.8% vs. nafcillin 12.5%; p = 0.31) was similar between the groups. Compared to cefazolin, patients treated with nafcillin had a higher disease burden (36.3% vs. 52.3%, respectively; p = 0.04). In patients with high disease burden, there were no statistically significant differences in TF between the groups (cefazolin 5.7% vs. nafcillin 12.5%; p = 0.44).
CONCLUSION: Cefazolin was not associated with higher rates of treatment failure and appears to be an effective alternative to nafcillin for treatment of MSSA BSI. More research is needed to optimize MSSA bacteremia treatment outcomes among specific groups of patients, particularly those with high disease burden.

214. The impact of the duration of antibiotic therapy in hospitalized community-onset pneumonia patients on 30-day readmission rates: a retrospective cohort study
Daniel Parshall, Pharm.D.[1], Kelly Conn, Ph.D., MPH[2], *Lisa Avery, Pharm.D. BCPS*[3]; [1]Pharmacy Department, St.Joseph's Health, Syracuse, NY [2]Wegmans School of Pharmacy, St. John Fisher College, Rochester, NY [3]Deparment of Pharmacy Practice, Wegmans School of Pharmacy/St. John Fisher College, Rochester, NY
INTRODUCTION: Pneumonia treatment guidelines are recommending shorter courses of antibiotic therapy based on clinical signs of stability. Despite these guidelines, prescribers often use prolonged antibiotic courses with the justification of decreasing hospital readmission rates.
RESEARCH QUESTION OR HYPOTHESIS: For patients with community-onset pneumonia, there is no difference in all cause 30-day readmission rates for patients treated with antibiotics ≤7 compared to >7 days.
STUDY DESIGN: Single center, retrospective cohort study.
METHODS: Patients ≥18 years with a primary diagnosis of pneumonia during a 6 month period in 2016 were included. Demographics and contributing factors for readmission were collected. Patients were categorized by antibiotic therapy duration of ≤7 or >7 days. Descriptive statistics were used to summarize collected data. The primary outcome of all cause 30-day readmission was analyzed in both bivariate and multivariate models using logistic regression to control for covariates. Secondary outcomes included 30-day readmission rate with a diagnosis of pneumonia and independent risk factors for readmission. Readmissions were compared to days of antibiotic therapy post-hoc via CART analysis.
RESULTS: Among 237 patients included, baseline characteristics were not significantly different between patients treated ≤7 (n = 83) and >7 days (n = 154). All cause 30-day readmission rates were 18.1% and 14.3% for antibiotic treatment ≤7 vs. >7 days, respectively (p = 0.44). Multivariate logistic regression showed no statistically significant association between readmission rates and antibiotic duration. Patients who received antibiotics ≤7 days had similar readmission rates with the diagnosis of pneumonia compared to >7 days (4.8% vs. 3.3%, p = 0.55). Having ≥3 previous admissions within 1 year was associated with increased readmission rates (OR 6.28, 95% CI 1.9–20.7; p = 0.003). Post-hoc CART analyses revealed no other significant breakpoint in number of antibiotic treatment days.
CONCLUSION: There was no statistically significant difference in all cause 30-day readmission rate for patients treated with ≤7 vs. >7 days of antibiotics for pneumonia.

215. Comparison of sustained virologic response rates after hepatitis C virus treatment in patients with advanced fibrosis or cirrhosis at an urban academic medical center
Michelle T. Martin, Pharm.D., BCPS, BCACP[1], Darby Rosenfeld, Pharm.D. Candidate[2], Todd Lee, Pharm.D., Ph.D.[2]; [1]Department of Pharmacy Practice, University of Illinois Hospital and Health Sciences System/University of Illinois at Chicago College of Pharmacy, Chicago, IL [2]University of Illinois at Chicago College of Pharmacy, Chicago, IL
INTRODUCTION: Direct-acting antiviral regimens (DAAs) offer high sustained virologic response (SVR) rates for hepatitis C virus

(HCV) treatment. Patients with cirrhosis (Metavir stage F4) often have lower cure rates than non-cirrhotics. Several Medicaid insurers restrict treatment to F4; some include advanced fibrosis (F3).
RESEARCH QUESTION OR HYPOTHESIS: How do HCV SVR rates differ among F3–F4 patients treated with DAAs at an urban academic medical center?
STUDY DESIGN: A retrospective study comparing SVR among F3–F4 patients.
METHODS: Data were collected from electronic records of F3–F4 patients who started HCV treatment from 1/1/2014–12/1/2016. Data were described with counts/percentages for categorical data and means/standard deviations for continuous data. The primary endpoint was SVR for F3–F4 patients; rates were compared using a chi-square test.
RESULTS: Of the 438 F3–F4 patients, 362 had SVR data available and were 67% male, 54% black, had a mean age of 60.7 (+8.1) years, and BMI of 29 (+6.3) kg/m^2. In addition, 61% had genotype 1a; 21% had F3, 59% had F4 Child-Turcotte-Pugh (CTP) class A, 15% CTP B, and 5% CTP C; 28% were treatment-experienced; 11% post-transplant; 10% had hepatocellular carcinoma (HCC); 28% had diabetes; 40% had Medicaid insurance, and 69% were treated with ledipasvir/sofosbuvir+ribavirin. The overall SVR rate was 89%; it differed by stage (F3 = 97% vs. F4 = 86%, p = 0.006), and by F3 versus F4 CTP A, B, and C (97%, 90%, 74%, and 75%, respectively; p < 0.001). SVR rates were lower in patients with HCC than those without it (73% vs. 90%, p = 0.001). SVR rates did not differ by treatment history, ethnicity, age, obesity, diabetes, or insurance (p > 0.05).
CONCLUSION: Patients with F3 had significantly higher SVR rates than F4 patients in this diverse patient population. HCC typically develops in F4 disease; low SVR rates were seen in HCC patients in this population. These results support HCV treatment prior to progression to F4 to allow for improved SVR rates.

216. Disk diffusion is not a reliable susceptibility testing method for ceftazidime-avibactam against clinically important multidrug-resistant Gram negative organisms *Kevin Meyer, BS*, Tiffany Wu, BS, Eric Wenzler, Pharm.D., BCPS; Department of Pharmacy Practice, University of Illinois at Chicago, College of Pharmacy, Chicago, IL
INTRODUCTION: Reliable antimicrobial susceptibility tests (AST) are essential for optimal antibiotic use in the era of increasing bacterial resistance.
RESEARCH QUESTION OR HYPOTHESIS: Are disk diffusion (DD) and Etest CLSI-equivalent ASTs compared to the reference broth microdilution (BM.D.) method for ceftazidime-avibactam (CAZ-AVI)?
STUDY DESIGN: Design followed the recommendations from the FDA guidance for assessment of AST devices. Essential agreement (EA = minimum inhibitory concentration (MIC) within 1 2-fold dilution), categorical agreement (CA = identical susceptibility interpretation), major errors (ME = false resistance), and very major errors (VME = false susceptibility) were assessed using BM.D. as the reference method. 50 meropenem and ceftazidime non-susceptible *Klebsiella pneumoniae* (MNSKP) clinical isolates and a panel of multidrug-resistant Gram negative organisms (M.D.RO, 50% *Pseudomonas aeruginosa*) with elevated CAZ-AVI MICs obtained from the CDC were used.
METHODS: CAZ-AVI AST were performed via each method in triplicate according to CLSI guidelines. *K. pneumoniae* ATCC 700603 was used as a quality control strain. Modal MICs or zones of inhibition were used to assess agreement. The CLSI threshold for equivalency was a VME+ME rate <3%.
RESULTS: All 50 MNSKP were CAZ-AVI susceptible by BM.D. with MIC_{50}/MIC_{90} of 1/2 mg/L. CA by DD was 96% with 2 ME and 0 VME. The rate of VME+ME was 4%. Etest EA and CA were 80% and 100%, respectively, with no errors. The rate of VME+ME was 0%. 9/26 (35%) M.D.RO were resistant by BM.D. with MIC_{50}/MIC_{90} of 8/32 mg/L. CA by DD was 62% with 10 ME and 0 VME. The rate of VME+ME was 38%. Etest EA and CA were 73% and 77%, respectively, with 6 ME and 0 VME. The rate of VME+ME was 23%.
CONCLUSION: DD was not an equivalent AST method for either MNSKP or M.D.RO with elevated CAZ-AVI MICs. Etest was equivalent for MNSKP but not for the M.D.RO.

217. An antimicrobial stewardship public commitment poster intervention to improve antibiotic prescribing in a University primary care clinic *Scott J. Bergman, Pharm.D., FIDSA, BCPS-AQ ID*[1], Suzanne Williams, MPH[2], Chinyere Alu, MPH[2], Wayne Mathews, MS, PA-C[3]; [1]College of Pharmacy, University of Nebraska Medical Center, Omaha, NE [2]Division of Patient Safety and Quality, Illinois Department of Public Health, Chicago, IL [3]College of Allied Health, University of Nebraska Medical Center, Omaha, NE
INTRODUCTION: More data are needed on ways to improve antibiotic prescribing in outpatient settings. Posters with a personalized prescriber commitment to avoid antibiotics for acute respiratory infections have shown promise. This research describes a low-cost intervention and collaboration with the state health department that pharmacists can advocate.
RESEARCH QUESTION OR HYPOTHESIS: A personalized public commitment poster will increase antibiotic avoidance for acute bronchitis and upper respiratory infections (URI)
STUDY DESIGN: Quasi-experimental study at an academic family medicine clinic.
METHODS: A 9 × 12" poster was designed by the state Department of Public Health with names and photographs of attending physicians and mid-level practitioners at the clinic. The poster included text of a pledge that providers wanted to provide the best care possible and that meant not prescribing antibiotics for certain respiratory infections. Preceded by education from the clinical pharmacist and physician's assistant leading the initiative locally, the poster was hung in all exam rooms of the clinic in Sept 2015. Analysis included all prescriptions entered into the electronic medical record (EMR) for the diagnosis of acute bronchitis or URI, otherwise unspecified (the common cold). The primary outcome was proportion of visits where an antibiotic prescription was avoided. The endpoint was assessed over the 21 months before and 9 months after poster implementation. Statistical significance was set at <0.05 using Fisher's exact test on GraphPad software.
RESULTS: Antibiotic avoidance increased for acute bronchitis from 59% to 71% (P = 0.047) with the poster intervention and remained similar for unspecified URI, 97% vs. 93%. There was a change in visits/month billed for these diagnoses after adoption of ICD-10 and conversion of the EMR.
CONCLUSION: Appropriate antibiotic prescribing improved following the addition of a personalized public commitment poster for antimicrobial stewardship in the clinic exam rooms. Longer follow-up and a change in billing practices may alter these findings.

218. Effect of estimated versus measured free serum concentrations on the probability of target attainment for cefazolin in hospitalized patients S. Christian Cheatham, Pharm.D.[1], Andrea Stock, Pharm.D.[2], Sara Utley, Pharm.D.[3], Dan Healy, Pharm.D.[4], Maureen Campion, Pharm.D.[5], Timothy Murrey, Pharm.D.[6], *Michael B. Kays, Pharm.D.*[7]; [1]Department of Pharmacy, Franciscan St. Francis Health — Indianapolis, Indianapolis, IN [2]Department of Pharmacy, Columbus Regional Health, Columbus, IN [3]Department of Pharmacy, Roper St. Francis Healthcare, Charleston, SC [4]James Winkle College of Pharmacy, University of Cincinnati, Cincinnati, OH [5]Department of Pharmacy, UMass Memorial Medical Center, Worcester, MA [6]Department of Pharmacy, OSF St. Anthony Medical Center, Rockford, IL

[7]Department of Pharmacy Practice, Purdue University College of Pharmacy, Indianapolis, IN

INTRODUCTION: For β-lactams, time that free serum concentrations remain above the minimum inhibitory concentration (*f*T>MIC) correlates with outcomes. However, most studies estimate free serum concentrations using available protein binding data.

RESEARCH QUESTION OR HYPOTHESIS: Is the probability of target attainment (PTA) for cefazolin different using estimated versus measured free serum concentrations?

STUDY DESIGN: Prospective, open-label, steady-state pharmacokinetic (PK) study with Monte Carlo simulations (MCS).

METHODS: Patients weighing ≤120 kg (Group 1) and >120 kg (Group 2) received 2 g q8 h and 3 g q8 h, respectively, infused over 0.5 h. Protein binding was determined by ultrafiltration, and total and free serum concentrations were measured. PK parameters were estimated, and 5,000-patient MCS were performed using PK parameters for the total concentrations (assuming free fraction ranging from 0.10 to 0.26) and free concentrations to calculate PTA for 8 dosing regimens at specific MICs using the pharmacodynamic (PD) targets of 40% and 60% *f*T>MIC.

RESULTS: Patient demographics for Group 1 vs. Group 2 were (mean ± SD): age, 62 ± 11 years vs. 53 ± 11 years; total body weight, 87.2 ± 15.4 kg vs. 174.5 ± 69.6 kg. Protein binding was significantly lower in Group 1 (64.0% vs. 71.7%, $p < 0.001$). For Group 1, all dosing regimens achieved >90% PTA for both PD targets at a twofold dilution higher MIC using measured free concentrations. For example, at 60% *f*T>MIC, PTA was >90% for 2 g q8 h at 4 μg/ml using measured free concentrations and 2 μg/ml using estimated free concentrations. Similar results were seen for Group 2, except for 2 dosing regimens at 60% *f*T>MIC.

CONCLUSION: PTA for cefazolin is higher when using PK parameters from measured, rather than estimated, free serum concentrations. For highly protein bound drugs, free concentrations should be measured to provide a more accurate assessment of the drug's PD profile.

219. Impact of an antimicrobial stewardship statewide collaborative participation on urinary tract infection management at an academic medical center *Eric Yang, Pharm.D. Candidate*[1], Ari Romans, Pharm.D. Candidate 2018[1], Matthew Miller, Pharm.D.[2], Gerard Barber, R.Ph.[3]; [1]Department of Pharmacy, University of Colorado Hospital, Aurora, CO [2]University of Colorado Hospital, Aurora, CO [3]Department of Pharmacy Services, University of Colorado Hospital, Aurora, CO

INTRODUCTION: Antibiotic resistance and C. difficile infections (CDI) are on the rise. Antibiotic misuse is a primary contributor to this disturbing trend. These complications contribute significant morbidity, mortality, and economic burden. Urinary tract infections (UTI) are among the most frequent indications for antibiotic use, accounting for approximately one quarter of prescriptions. The CDC indicates that 30–50% of antibiotic use is either unnecessary or inappropriate. Beginning May 2015, the University of Colorado Hospital (UCH) entered into a statewide antimicrobial stewardship (AMS) collaborative to optimize UTI diagnosis and management.

RESEARCH QUESTION OR HYPOTHESIS: Participation in a statewide AMS collaborative will contribute improved adherence to guideline based UTI management.

STUDY DESIGN: Prospective education with retrospective chart review of pre- and post-intervention.

METHODS: The UCH AMS team implemented materials to improve UTI diagnosis and management. The collaborative provided resources including: annual in-person meeting, quarterly presentations and peer discussion, and access to local/national AMS experts. A total of 80 UTI cases were reviewed during 2014 (baseline), then 20 cases quarterly thereafter for tracking improvement. Quarterly summaries of individual and peer performance were provided.

RESULTS: Twenty-seven acute care hospitals participated in the collaborative. Data were submitted for 1530 UTIs during the baseline period and 2514 UTIs during intervention. At UCH, over 90% of reviewed cases had a diagnosis of complicated UTI or pyelonephritis. Average total duration of antibiotic therapy remained unchanged overtime at 10 days. The rate of guideline concordant diagnosis improved from 43% to 62% ($p = 0.0254$), and initial fluoroquinolone use decreased from 19% to 2% ($p = 0.0369$). Discharge fluoroquinolone use declined from 23% to 20% ($p = 0.83$), and readmissions for UTI and CDI were uncommon overall.

CONCLUSION: Participation in a statewide AMS collaborative and targeted AMS education for UTIs produced significant reductions in fluoroquinolone utilization and improved guideline concordant diagnosis.

220. Impact of updated acute uncomplicated cystitis treatment guidelines on national prescribing patterns *Brandon Dionne, Pharm.D., BCPS, AAHIVP*[1], Kathleen A. Fairman, MA[2], Elizabeth B. Hirsch, Pharm.D., BCPS[3]; [1]Department of Pharmacy & Health Systems Sciences, School of Pharmacy, Bouvé College of Health Sciences, Northeastern University, Boston, MA [2]Department of Pharmacy Practice, Midwestern University, College of Pharmacy-Glendale, Glendale, AZ [3]Department of Experimental and Clinical Pharmacology, University of Minnesota, College of Pharmacy, Minneapolis, MN

INTRODUCTION: IDSA treatment guidelines for uncomplicated cystitis (UTI) were updated in 2011 and recommended use of nitrofurantoin (NIT), fosfomycin, and trimethoprim/sulfamethoxazole (SXT) as first-line options. Despite this recommendation, fluoroquinolones (FQs) continue to be commonly prescribed.

RESEARCH QUESTION OR HYPOTHESIS: Did national prescribing patterns for outpatient treatment of UTI change after publication of updated treatment guidelines?

STUDY DESIGN: Quasi-experimental retrospective national pre-post study.

METHODS: We compared the 2010 National Hospital Ambulatory Care Survey (NHAMCS) emergency department and National Ambulatory Care Survey (NAMCS) data with 2012 figures, using 2011 as a washout period. Female patients aged 18 to 50 years with an ICD-9 code consistent with UTI were included. Exclusion criteria were pregnancy, major comorbidities, and fever. Antibiotics were categorized into groups and included: β-lactams (amoxicillin/clavulanate and cephalosporins), FQs (ciprofloxacin and levofloxacin), NIT, SXT, or "other", which included antibiotics not typically prescribed for UTI. Cases were adjusted using sampling weights which correct for survey design and nonresponse to generate nationally representative data. Proportions were compared using chi-square.

RESULTS: In total, 1246 patients were included: 618 from 2010 and 628 from 2012. There were no baseline age differences between the two groups. The proportion of patients not prescribed antibiotics significantly increased from 25.1% to 32.8% ($p = 0.003$). FQs were the most commonly prescribed class in both years at 28.8% and 25.4%; NIT (19.8% vs. 15.2%, $p = 0.032$) and SXT (20.0% vs. 15.7%, $p = 0.048$) both decreased significantly in 2012 while β-lactam prescriptions increased from 8.6% to 13.4% ($p = 0.007$). Other antibiotics did not change significantly.

CONCLUSION: National prescribing patterns changed significantly between 2010 and 2012; specifically, β-lactams increased while NIT and SXT decreased. These changes, however, were not concordant with updated treatment guidelines. Analysis of subsequent years will be important to determine whether these trends continued.

Managed Care

221. Prior authorization policy as a strategy to limit long term use of proton pump inhibitors within a state Medicaid population *Melissa Smith, Pharm.D.*[1], Deanna Moretz, Pharm.D.[1], Luke Middleton, BS[2], Ted Williams, Pharm.D.[2], Megan Herink, Pharm.D.[1]; [1]College of Pharmacy, Oregon State University/Oregon Health & Science University, Portland, OR [2]Drug Use Research & Management Health Systems Division, Portland, OR

INTRODUCTION: There is limited evidence to support use of proton pump inhibitors (PPIs) beyond 8 weeks for the treatment of gastroesophageal reflux disease (GERD) and has been associated with significant risks. A prior authorization (PA) policy was implemented in the Oregon Medicaid Fee-For-Service (FFS) program to restrict the use of PPIs >8 weeks for the treatment of GERD or esophagitis.

RESEARCH QUESTION OR HYPOTHESIS: The objectives were to evaluate the impact of the PA policy on utilization of PPIs and determine if it caused an unintended interruption in therapy for those with severe conditions.

STUDY DESIGN: Retrospective, observational cohort analysis.

METHODS: Included patients had a paid or denied PPI drug claim before and after PA implementation, from June to December 2015 (control group) or June to December 2016 (study group). Patients with dual Medicare Part D coverage or loss of Medicaid eligibility were excluded. Demographics and associated diagnoses were collected. Change in utilization of PPIs after the PA was measured using paid claims. For those with a denied claim, diagnoses for severe conditions were flagged.

RESULTS: There were 1310 claims included in the control group (89.9% paid claims) and 1387 in the study group (53.6% paid claims). PPI utilization for GERD or esophagitis >8 weeks decreased from 7.9% (103/1310) in the control group to 0.4% (5/1387) in the study group. There were 132 and 644 denied claims in the control and study groups, respectively. Of the denied claims, 84 (63.6%) in the control group and 388 (60.2%) in the study group did not receive a PPI within 90 days, however no patients in either group had a severe condition.

CONCLUSION: The PA policy implemented by the Oregon FFS Medicaid program effectively limited the use of PPI therapy for GERD or esophagitis >8 weeks and did not result in an interruption in therapy for those with a severe condition.

222. The impact of removing prior authorization policy on non-vitamin K oral anticoagulants in the Oregon Medicaid Fee-for-service population *Kim Vo, Pharm.D.*, Deanna Moretz, Pharm.D., Luke Middleton, BS, Ted Williams, Pharm.D., Megan Herink, Pharm.D.; College of Pharmacy, Oregon State University/Oregon Health & Science University, Portland, OR

INTRODUCTION: A prior authorization (PA) policy for non-vitamin K oral anticoagulants (NOACs) was implemented to promote safe and effective anticoagulation therapy when they were first FDA approved. The policy resulted in appropriate prescribing based on FDA labeled indications. However, it also caused an interruption in therapy as nearly one third (29/96) of patients did not receive an anticoagulant because the PA was never requested. The potential risk for thrombotic events in these patients resulted in the removal of the PA policy in 2015.

RESEARCH QUESTION OR HYPOTHESIS: To evaluate the change in utilization of oral anticoagulants (NOACs or warfarin) and assess if NOACs were prescribed appropriately according to FDA indications before and after removal of the PA policy.

STUDY DESIGN: Retrospective, cohort analysis of claims data.

METHODS: Paid and denied claims from July 2014 to June 2015 (control group) and July 2015 to June 2016 (study group) were included. Patients with Medicare Part D or loss of Medicaid eligibility were excluded. Utilization of oral anticoagulants before and after removal of the PA was compared. Demographic information and associated diagnoses, contraindication or precautions were collected.

RESULTS: Warfarin continued to be the most utilized anticoagulant; however, utilization of NOACS increased from 37 to 64 patients and warfarin utilization decreased. There were fewer patients in the study group with a FDA approved indication for a NOAC compared to the control group (60.4% versus 79.5%). However, there were fewer (36.9% versus 43.2%) contraindications or precautions to NOACS identified and an increase with no known indication. There were no denied claims for a NOAC after removal of the PA.

CONCLUSION: Removal of the PA criteria resulted in an increase in utilization of NOACs. However, utilization remains low and this increase is consistent with clinical practice patterns. Removal of the PA eliminated a barrier to treatment with NOACs.

223. The impact of variation among hepatitis c prior authorization policies in the oregon medicaid program on utilization of direct acting antivirals *Megan Herink, Pharm.D.*[1], Kim Vo, Pharm.D.[1], Melissa Smith, Pharm.D.[2], Dan Hartung, Pharm.D.[2]; [1]College of Pharmacy, Oregon State University/Oregon Health & Science University, Portland, OR [2]Oregon State University College of Pharmacy, Portland, OR

INTRODUCTION: Coordinated Care Organizations (CCOs) provide care to Medicaid patients in Oregon. The direct acting antivirals (DAAs) have vastly improved treatment options for chronic Hepatitis C (CHC). However, they come with a significant cost burden for payers. Each CCO has implemented prior authorization (PA) policies to help prioritize treatment for those who need it most with the resources available. In January 2016, an initiative to align all of the policies with fee-for-service was instigated.

RESEARCH QUESTION OR HYPOTHESIS: How do different PA requirements effect the HCV treatment of Medicaid patients in Oregon?

STUDY DESIGN: Retrospective, descriptive analysis.

METHODS: PA policies implemented prior to January 2016 were requested from each CCO. The following approval criteria from each PA were collected: biopsy requirements, minimum fibrosis stage, specialist requirement, and substance and alcohol use restrictions. Change in utilization of DAAs from 2014 to 2017 using Medicaid pharmacy claims was compared in aggregate form based on CCO enrollment size and degree of permissiveness of the PA policy.

RESULTS: There were over 10,000 Medicaid enrollees in Oregon identified with a diagnosis of CHC. The mean percent change in overall utilization after the PA initiative was 1.98% from a baseline of 2.51%. There was extensive variability in the PA requirements throughout the state and approximately half of the CCOs required fibrosis stage 4. Nearly all required at least 6 months of abstinence from illicit drugs and alcohol use. CCOs with the least permissive PA criteria initially had the biggest percent change in utilization (2.58%) compared to those characterized as the most permissive (0.01%).

CONCLUSION: There was variability in PA criteria requirements when compared by CCO. The change in utilization did not seem to differ based on enrollment size but was effected by level of permissiveness of the policy. Variability within Oregon Medicaid PA policies can affect utilization rates across the state.

224. Hepatitis C prior authorization: prudent cost saving measure or inconsistencies with fibrosis score criteria? *Ellyn Polley, BS*, Kelsey VandenBerg, BS, MS, Juliana Chan, Pharm.D.; College of Pharmacy, University of Illinois at Chicago, Chicago, IL

INTRODUCTION: Direct-acting antivirals (DAAs) are the treatment of choice for chronic hepatitis C (CHC). High DAA cost causes state Medicaid programs to restrict patient access by requiring prior authorization (PA) before approving therapy, such

as a Metavir fibrosis score. The American Society for the Study of Liver Disease (AASLD) 2016 recommend treating all patients with CHC with no restrictions to staging for treatment.
RESEARCH QUESTION OR HYPOTHESIS: How do restrictions on Metavir fibrosis scores for approval of DAAs vary across state Medicaid plans?
STUDY DESIGN: Qualitative.
METHODS: An online search of 50 States' Medicaid services were conducted. Two individuals reviewed the most recent PA forms and treatment criteria on state Medicaid websites between 5/22/2017–6/5/2017. The minimum Metavir fibrosis score required for approval was documented, and states without fibrosis restrictions or a minimum Metavir score of F0 were labeled "No Restrictions". States not providing any criteria were deemed "unspecified" and removed from the analysis.
RESULTS: Fifty states were included in the original study, but 8 (16%) were labeled "unspecified" due to lack of information available through their Medicaid website and were removed from the remainder of the analysis. A minimum Metavir fibrosis score of F3 was found in 15 states (35.7%), and 15 other states require a score of F2. Thirty states (71.4%) require evidence of moderate fibrosis to approve treatment. Three states (7.1%) require a minimum Metavir fibrosis score of F1, while 9 states (21.4%) have no restrictions. No state requires evidence of Metavir fibrosis score F4.
CONCLUSION: Though the criteria required for CHC treatment with DAAs vary by state, 42 states require a Metavir fibrosis score of F2 or F3. These data prove there is no consistency in Metavir fibrosis score requirements. Further studies must be conducted to better understand the factors that influence changes in the authorization of DAA treatment.

Medication Safety

225. All-Cause and drug-related medical events associated with overuse of gabapentin and/or opioid medications in a commercially insured U.S. population: a retrospective cohort analysis *Alyssa M. Peckham, Pharm.D., BCPP*, Kathleen A. Fairman, MA, David A. Sclar, B.Pharm., Ph.D.; Department of Pharmacy Practice, Midwestern University, College of Pharmacy-Glendale, Glendale, AZ
INTRODUCTION: Overuse of gabapentin and/or opioids occurs in a small percentage of patients at >3-fold labeled dosages. Gabapentin may potentiate opioid effects.
RESEARCH QUESTION OR HYPOTHESIS: Assess patient harm, defined as use of inpatient hospital (IPH) or emergency department (ED) services, associated with overuse of gabapentin and/or opioids.
STUDY DESIGN: Data source was Truven Health MarketScan® Commercial Claims and Encounters database; years 2013–2015. Eligibility criteria was ≥2 claims and ≥120 days treatment with gabapentin and/or opioids.
METHODS: Cohort identification was based on daily-dosage thresholds of 50 morphine-milligram equivalents and 3,600 milligrams gabapentin in 12-month follow-up: (1) no overuse; (2) mild overuse (≥2 claims or ≤2 calendar quarters over-threshold); (3) sustained overuse (≥3 over-threshold calendar quarters). IPH and ED use were measured for 6 months after first overuse date (cohorts 2 and 3), or a randomly assigned date (cohort 1). Logistic regression analyses controlled for pre-treatment IPH/ED utilization, indication, addiction diagnosis, concomitant sedative/hypnotic use, and demographics.
RESULTS: All-cause and drug-related IPH/ED utilization increased monotonically with degree of overuse, particularly of >1 medication. Sustained overuse of gabapentin multiplied odds of all-cause IPH by 1.37, drug-related IPH by 1.44, and IPH/ED for altered mental status (e.g., euphoria, anxiety) by 1.86. Sustained overuse of both medications quadrupled odds of all-cause IPH, drug-related IPH, and IPH/ED for altered mental status or respiratory depression.
CONCLUSION: Despite modest effects of gabapentin overuse alone, overuse of gabapentin with opioids may increase risk of harm and health-service utilization, supporting calls to make gabapentin a controlled substance in the U.S.

226. Evaluation of harm associated with dose-range checking clinical decision support overrides in the intensive care unit *Adrian Wong, Pharm.D., MPH*[1], Christine Rehr, BA[2], Diane Seger, R.Ph.[2], Mary Amato, Pharm.D., MPH[3], Patrick Beeler, M.D.[4], Sarah Slight, MPharm, Ph.D., PGDip[5], Adam Wright, Ph.D.[6], David Bates, M.D., MSc[1]; [1]The Center for Patient Safety Research and Practice; Division of General Internal Medicine and Primary Care, Brigham and Women's Hospital, Boston, MA [2]Clinical and Quality Analysis, Partners HealthCare, Somerville, MA [3]Department of Pharmacy Practice, MCPHS University, Boston, MA [4]Research Center for Medical Informatics, University Hospital, Zurich, Switzerland [5]School of Medicine, Pharmacy and Health, The University of Durham, Stockton on Tees, Stockton on Tees, United Kingdom [6]Division of General Internal Medicine and Primary Care, Brigham and Women's Hospital, Boston, MA
INTRODUCTION: Medication-related clinical decision support (CDS) alerts have been shown to be effective at reducing adverse drug events (ADEs). However, these alerts are frequently overridden, with limited data linking these overrides to harm. Dose-range checking alerts are a type of CDS alert which may have a significant impact on morbidity and mortality, especially in the intensive care unit (ICU) setting.
RESEARCH QUESTION OR HYPOTHESIS: Are inappropriately overridden dose-range CDS alerts associated with an increased risk of ADEs compared to appropriately overridden dose-range alerts?
STUDY DESIGN: Single-center, prospective, observational study of six adult ICUs from September 2016 to April 2017.
METHODS: Targeted alerts included doses ≥20% over the maximum dose recommended by our medication knowledge base and high-risk medications, as identified by the Institute for Safe Medication Practices. The primary outcome was the appropriateness of the override determined by two independent reviewers using pre-specified criteria formulated by a multidisciplinary group. Overrides which resulted in medication administration were then evaluated for ADEs by chart review. A Fisher's exact test was performed using SAS.
RESULTS: The override rate of dose-range alerts was 93.0% during the study period. A total of 1567 alerts from 615 unique patient encounters were evaluated for appropriateness and ADEs. The appropriateness rate of overrides was 89.4%. A total of 1021 appropriately overridden (40.0%) and 46 inappropriately overridden alerts (27.8%) resulted in medication administration. The rate of ADEs for the appropriately and inappropriately overridden alerts per 100 overridden alerts was 5.48 and 2.17, respectively ($p < 0.001$). Appropriate overrides were exclusively non-preventable ADEs.
CONCLUSION: Overridden dose-range checking CDS alerts are common and often appropriately overridden, suggesting that thresholds may be too low in some instances. Some alerts were also clearly inappropriate, such as continuous infusions with parameters (e.g., dose and rate) ordered within institution guidelines. Removal of these alerts may be appropriate. Appropriate overrides were associated with an increased risk of ADEs.

227. Institutional evaluation of blinatumomab use and toxicity management *Ethan Sabers, Pharm.D. Candidate*[1], Katie Gaspar, Pharm.D., BCOP[2]; [1]College of Pharmacy, University of Iowa, Iowa City, IA [2]Department of Hematology/Oncology, University of Iowa Hospitals and Clinics, Iowa City, IA

INTRODUCTION: Blinatumomab is a novel anti-cancer agent approved in December 2014 for Philadelphia chromosome-negative relapsed or refractory B-cell precursor acute lymphoblastic leukemia. It is a bispecific T-cell engager that causes T-cell mediated destruction of CD19-expressing B-precursor leukemia cells. Given the high cost and extensive side-effect profile of blinatumomab, we aimed to evaluate its use and toxicity management at our institution.
RESEARCH QUESTION OR HYPOTHESIS: The objective of this study was to evaluate the use of blinatumomab at the University of Iowa Hospitals and Clinics (UIHC), including the management of adverse events. Additionally, safety and efficacy data at our institution was compared to data observed in the literature.
STUDY DESIGN: Retrospective cohort study performed via chart-review.
METHODS: Patients who received blinatumomab at UIHC from January 2015 through June 2016 were included in study analysis. The primary outcome was the percentage of patients prescribed blinatumomab according to its FDA indication. The secondary outcome included appropriate management of toxicities as defined in the original study protocol. Efficacy analysis compared complete remission (CR), relapse-free survival (RFS), overall survival (OS), and proportion of responders receiving allogeneic hematopoietic stem cell transplant (HSCT) to data reported in the literature.
RESULTS: Seven patients were identified and included in our cohort. Six of the seven patients were prescribed blinatumomab per the FDA approved indication (85.7%). Of the seven patients who received blinatumomab, two (28.6%) experienced any grade neurotoxicity or hepatotoxicity, and three (42.9%) experienced any grade cytokine release syndrome. Nine adverse events were reported, of which, seven (77.8%) were managed appropriately per published guidelines. The efficacy and safety data observed at our institution closely matches the data reported in the literature.
CONCLUSION: Although our academic medical center has been using blinatumomab according to its FDA labeling, measures to improve our management of blinatumomab-associated toxicities are warranted.

228. Characterization of opioid use and adverse outcomes using longitudinal data from a statewide health information exchange *David Foster, Pharm.D.*[1], Sariya Udayachalerm, BS, MS[1], Jane Wang, Ph.D.[2], Michael Murray, Pharm.D., MPH[3]; [1]College of Pharmacy, Purdue University, Indianapolis, IN [2]Regenstrief Institute, Indianapolis, IN [3]College of Pharmacy, Purdue University and Regenstrief Institute, Indianapolis, IN
INTRODUCTION: The opioid epidemic has been fueled in large part by opioid prescribing. We used the Indiana Network for Patient Care, a longitudinal statewide research health information exchange (HIE), to study adverse outcomes of opioid prescriptions.
RESEARCH QUESTION OR HYPOTHESIS: Our objective was to determine factors associated with poor outcomes related to opioids using a statewide HIE.
STUDY DESIGN: Retrospective observational study.
METHODS: The HIE was used to identify adult subjects with opioid prescriptions between 01/01/2012 and 12/30/2016 who had not received an opioid prescription in the previous 12 months. Subjects with cancer, dementia, and/or moderate/severe liver disease were excluded. A composite endpoint of death, abuse, dependency, and/or overdose was established based on ICD-9/ICD-10 codes. Stepwise multiple logistic regression models were used to identify subject characteristics associated with the composite endpoint. A p value of <0.05 was considered statistically significant for final model variable retention.
RESULTS: 914,834 opioid prescriptions were identified, representing 202,984 unique subjects (mean age 55.2±18.0 years, 60.4% female, 75.8% white and 12.7% African American). The most frequently prescribed opioids were hydrocodone (57.5%), tramadol (17.7%) and oxycodone (12.6%). 92.7% of opioid prescriptions were immediate release. Mean daily mg of morphine equivalent (MME) dose was 36.8± 22.9 mg, and mean days supply was 8.9±8.6 days. Based on opioid days supply, subjects had an active opioid prescription for a median of 9.9% of the total time. 1,485 (0.73%) subjects had the composite endpoint of death, abuse, dependency, and/or overdose. In multiple logistic regression models, variables associated with the composite endpoint included male sex, African American, use of both immediate release and extended release/long-acting opioids, mean opioid days supply, and daily MME.
CONCLUSION: Several opioid prescribing characteristics are associated with poor outcome in patients initiated on opioid therapy. Leveraging HIE's may lead to identification of risks associated with opioid prescribing, and ultimately, safer prescribing practices.

229E. Workflow impact on medication errors during care transitions between rural facilities *Mark E. Patterson, Ph.D, M.P.H.*[1], Sandra Bollinger, Pharm.D.[2], Janice Foust, Ph.D., R.N.[3], Chandler Coleman, BA[4], Diepngan Nguyen, BA[4]; [1]Department of Pharmacy Practice and Administration, University of Missouri-Kansas City School of Pharmacy, Kansas City, MO [2]Health Priorities, Inc., Cape Girardeau, MO [3]Department of Nursing, University of Massachusetts- Boston, Boston, MA [4]University of Missouri-Kansas City School of Pharmacy, Kansas City, MO
Presented at the American Association of Colleges of Pharmacy, Nashville, TN July 15-19, 2017.

230. Serotonin syndrome: Case series from an academic medical center and comparison to published case reports *Patrick McCarthy, Pharm.D.*[1], Sadia Minhas, Pharm.D.[1], Adrian Wong, Pharm.D., MPH[2], David Bates, M.D., MSc[2], Mary Amato, Pharm.D., MPH[1]; [1]Department of Pharmacy Practice, MCPHS University, Boston, MA [2]The Center for Patient Safety Research and Practice; Division of General Internal Medicine and Primary Care, Brigham and Women's Hospital, Boston, MA
INTRODUCTION: Serotonin syndrome is a potentially life-threatening condition that can occur when patients are treated with serotonergic medications or when drug interactions result in excess serotonergic effects. Clinical decision support warnings about potential serotonin syndrome are frequent at our institution; however, clinicians are often unsure about the clinical importance of these alerts.
RESEARCH QUESTION OR HYPOTHESIS: How common is serotonin syndrome and which medications are most commonly implicated?
STUDY DESIGN: Case series from an academic health center.
METHODS: The Partners Research Patient Data Registry was searched from October 1996-September 2015 for patients with a diagnosis of serotonin syndrome. Medical records were reviewed to identify potential cases. For identified cases, demographic data, serotonergic medications, and whether cyproheptadine was given were recorded. Implicated medications and identified cases were compared to cases previously reported in the literature.
RESULTS: Of over 2 million patient records from the data registry, 32 cases of potential serotonin syndrome were identified. Median age for the identified patients was 54.5 yr (IQR 43.8,68) and 63% were female. A total of 34.4%, 15.6%, and 12.5% of patients were taking two, three, or four serotonergic medications, respectively. The most common contributing medications were venlafaxine (n = 8, 25.0%), bupropion (n = 7, 21.9%) and citalopram (n = 6, 18.8%). Nine patients were treated with cyproheptadine. Of 150 cases identified in a PubMed literature search from January 2007- December 2016, the top three most

common implicated medications were citalopram (n = 23, 15.3%), venlafaxine (n = 20, 16.7%) and fluoxetine (15, 10.0%). Bupropion was the 10th most common medication noted (n = 8, 5.3%).
CONCLUSION: Serotonin syndrome cases at our institution are rare but consistent with published reports. More data analysis and detailed case reviews regarding outcomes may help detect associated risk factors to help guide decision making for those presented with alerts when ordering medication combinations with risk of serotonin syndrome.

Nephrology

231. Influence of intermittent hemodialysis (IHD) frequency on meropenem probability of target attainment in critically Ill patients *Soo Min Jang, Pharm.D.*, Bruce Mueller, Pharm.D.; Department of Clinical Pharmacy, University of Michigan College of Pharmacy, Ann Arbor, MI
INTRODUCTION: Meropenem dosing in critically ill patients receiving IHD has never been studied. These patients differ from end-stage renal disease (ESRD) patients as they have different meropenem pharmacokinetics (Vd and non-renal clearance) and often require daily IHD (QD-IHD) or every other day IHD (QOD-IHD). However, published dosing recommendations are entirely based on studies conducted in thrice-weekly IHD in ESRD patients.
RESEARCH QUESTION OR HYPOTHESIS: ESRD-IHD-based dosing recommendations applied in critically ill patients receiving IHD will not attain pharmacodynamic targets.
STUDY DESIGN: Monte Carlo Simulations (MCS).
METHODS: MCS using previously-published pharmacokinetic and demographic data from critically ill patients with acute kidney injury were conducted using modeled 4 h QD-IHD and QOD-IHD. Published ESRD-IHD dosing recommendations were applied in a series of 5,000-subject MCS: 500 mg q24 h post-IHD; 1 g and 2 g post-IHD with QD-IHD & QOD-IHD. The MCS accounted for the day of QOD IHD initiation (IHD on days 1&3 or 2&4). The pharmacodynamic target was free concentration ≥MIC for ≥40% of the dosing interval during the first 96 h of therapy using a MIC of 2 mg/L (P. aeruginosa breakpoint). The probability of target attainment (PTA) in ≥90% of modeled patients was considered an acceptable regimen.
RESULTS: PTA for each modeled meropenem regimen and QD-IHD combination were as follows: 500 mg q24 h QD-IHD 87%; 1 g q24 h QD-IHD 93%; 2 g q24 h QD-IHD 97%. QOD-IHD PTA was dependent on when QOD-IHD occurred relative to the dose, consequently ranges of all combinations are reported: 500 mg q24 h QOD-IHD 87%-88%; 1 g q48 h QOD-IHD 73%-74%; 2 g q48 h QOD-IHD 82%-83%.
CONCLUSION: The MCS showed that meropenem 500 mg q24 h unacceptable PTA regardless of IHD frequency. Most QD-IHD patients (>93%) achieved the pharmacodynamic target when meropenem 1 g or 2 g q24 h was administered. For QOD-IHD regimens, 1 g and 2 g q48 h did not achieve acceptable PTA rates. It is crucial to administer meropenem at least 1 g q24 h in critically ill patients regardless of IHD frequency.

232. Risk of acute kidney injury in proton pump inhibitor naïve patients *Summer Dyer, Pharm.D.*[1], Brett Venker, Pharm.D.[1], Jonathan Lacro, Pharm D., BCPS, BCPP, FASHP[2]; [1]VA San Diego Healthcare System, San Diego, CA [2]Pharmacy, VA San Diego Healthcare System, San Diego, CA
INTRODUCTION: It has been well established that proton pump inhibitor (PPI) use does not come without risk however new data is conflicting as to whether PPI use is associated with increased risk of developing acute kidney injury (AKI).
RESEARCH QUESTION OR HYPOTHESIS: The goal of this study was to investigate the risk of AKI in patients who received their first dose of a PPI during an inpatient admission in comparison to an active control of patients who received a H_2 receptor antagonist (H2RA).
STUDY DESIGN: This was a retrospective cohort study that included 23,734 patients admitted to Veteran's Desert Pacific Healthcare Network from January 1, 2006–2016.
METHODS: This study included patients who were PPI naïve which was defined as not having an inpatient or outpatient PPI prescription in the VA healthcare system from January 1, 2000 to the date of admission. Patients were excluded if they had a CrCl <15 mL/min. AKI was defined by Kidney Disease Improving Global Outcomes (KDIGO) criteria guidelines. Logistic regression was performed using SPSS to identify factors that influence the development of AKI.
RESULTS: Of the total 23,734 patients admitted to VISN 22 healthcare systems, 4,351 received an H2RA and 19,383 received a PPI. AKI incidence was higher in the H2RA group than the PPI group (7.1% vs. 4.8%, $p < 0.001$). A logistic regression model identified that initial CKD stage, ICU admission, Charlson comorbidity index, IV formulation and concomitant medications were all significant predictors for the development of AKI.
CONCLUSION: Our results demonstrated that first time administration of a PPI in an inpatient setting was not associated with increased risk for development of AKI as compared to administration of a H2RA despite adjusting for several confounding factors in a logistic regression model.

233E. Quantification of antibiotic removal by sustained low efficiency dialysis Joanna Hudson, Pharm.D.[1], Jagannath Saikumar, M.D.[2], Benjamin T. Duhart, Jr, M.S., Pharm.D.[3], Morgan Jones, Pharm.D.[4], Elvira Gosmanova, M.D.[5]; [1]The University of Tennessee Departments of Clinical Pharmacy and Medicine (Nephrology), Memphis, TN [2]Department of Medicine (Nephrology), The University of Tennessee, Memphis, TN [3]Department of Clinical Pharmacy, The University of Tennessee College of Pharmacy, Memphis, TN [4]Department of Pharmacy, Methodist University Hospital, Memphis, TN [5]Medicine, Stratton VA Medical Center, Albany, NY
Presented at the International Society of Nephrology Meeting, Mexico City, Mexico, April 22, 2017.

234. Effect of phosphorous-containing prescription medications on phosphorous levels in dialysis patients *Kristina Bennwitz, Pharm.D.*[1], Kimberly Holdener, Pharm.D., BCPS[1], Emily Dworkin, Pharm.D.[1], Karen Hansen, M.D., MS[2], Meghan Crain, BS[3], Daniel Guerra Rodas, M.D.[3], R. Allan Jhagroo, M.D.[3]; [1]Department of Pharmacy, UW Health, Madison, WI [2]Division of Rheumatology, University of Wisconsin School of Medicine & Public Health, Madison, WI [3]Division of Nephrology, University of Wisconsin School of Medicine & Public Health, Madison, WI
INTRODUCTION: Dialysis patients must restrict phosphorous intake to prevent complications of hyperphosphatemia including cardiovascular disease and secondary hyperparathyroidism. Dialysis patients are educated to limit phosphorus-rich foods. Recently, Sherman et al. (Kidney International 2015; 87:1097–1099) found that some medications contain phosphorous. However, the phosphorus amount varied by drug, dose and manufacturer, making intake challenging to quantify. It is unclear whether common medications contribute to hyperphosphatemia in dialysis patients.
RESEARCH QUESTION OR HYPOTHESIS: Do phosphorus-containing medications contribute to hyperphosphatemia in patients on chronic dialysis?

STUDY DESIGN: Retrospective chart review.
METHODS: We compared dialysis patients with hyperphosphatemia (serum phosphorus ≥5.6 mg/dL, n = 99) to those with normal phosphorous (≤5.5 mg/dL, n = 88). Patient specific data collected during one month in 2016 included age, dialysis duration, co-morbidities, serum calcium, parathyroid hormone, Kt/V and number of phosphorus-binding medications and phosphate-containing medications. The primary outcome was the amount of phosphorus consumed from medications in each group. The secondary outcome was the number of phosphorus-binding medications prescribed for each group.
RESULTS: Patients with hyperphosphatemia were younger than controls (58±16 vs. 65±15 years old, p = 0.001) but received dialysis for a similar duration (4±5 vs. 4±4 years, p = 0.88). Subjects with hyperphosphatemia ingested similar amounts of phosphorus from medications, compared to controls (14±20 vs. 17±28 mg/day, p = 0.45) but received more phosphorus-binding medications (1.3±0.7 vs. 0.8±0.8, p < 0.01). Likewise, the doses of phosphorus-binding medications were numerically higher in patients with hyperphosphatemia compared to controls (lanthanum 2750±612 vs. 1000±707 mg/day, p = 0.01; sevelamer 6476±3501 vs. 4946±2582 mg/day, p = 0.06; calcium acetate 4219±1708 vs. 3585±1768 mg/day, p = 0.16).
CONCLUSION: Theoretically, phosphorus-containing medications could contribute to hyperphosphatemia in dialysis patients. However, we found that patients with hyperphosphatemia did not consume greater phosphorus from medications, suggesting that their hyperphosphatemia was largely due to excess dietary intake. Further studies are warranted to determine the clinical relevance of phosphorus content in medications.

235. Comparison of intradialytic and interdialytic vancomycin and daptomycin dosing in patients with end stage renal disease receiving intermittent hemodialysis *Jared Heiles, Pharm.D.*[1], Benjamin T. Duhart, Jr, M.S., Pharm.D.[2], Leonette Kemp, Pharm.D.[1], Joanna Hudson, Pharm.D.[3]; [1]The University of Tennessee College of Pharmacy, Methodist University Hospital, Memphis, TN [2]Department of Clinical Pharmacy, The University of Tennessee College of Pharmacy, Memphis, TN [3]The University of Tennessee Departments of Clinical Pharmacy and Medicine Nephrology, Memphis, TN
INTRODUCTION: The risk of Methicillin-resistant *Staphylococcus aureus* (MRSA) bacteremia is nearly 100 times greater in hemodialysis (HD) patients. Most commonly, HD patients receive antibiotic treatment with either vancomycin (V) or daptomycin (D). While interdialytic (between HD) administration is common, intradialytic (during HD) administration has been adopted by several institutions. Optimal dosing strategies in HD patients remain unclear; however, some evidence supports higher doses with intradialytic administration.
RESEARCH QUESTION OR HYPOTHESIS: Do outcomes differ between intradialytic and interdialytic antibiotic administration in HD patients with MRSA bacteremia?
STUDY DESIGN: Multisite, longitudinal, retrospective cohort.
METHODS: Patients with end-stage renal disease requiring HD and with MRSA bacteremia admitted to Methodist Le Bonheur Healthcare (MLH) from October 2009 to August 2016 were evaluated. The study population was divided into two groups based on antibiotic administration time (intra- or inter-) and by predominant antibiotic received (V or D). The achievement of microbiological cure was compared between groups. The mean dose (mg/kg actual body weight), length of stay, and in-hospital mortality were also compared. Statistical tests were performed using SPSS® program: Student's t-test for continuous data; Fisher's exact for nominal data.
RESULTS: Of the 378 patients screened, 175 met inclusion criteria: 65% male, age (yrs) (59 ± 15), weight (kg) 78 ± 17, with groups divided into intra- (n = 83) and inter- (n = 92). Achievement of microbiologic cure occurred in 64% of intra-V and 83% of inter-V patients, respectively (p = 0.01). The mean dose was 10 ± 3 for intra-V and 12 ± 4 for inter-V, respectively (p = 0.01). No differences were found between other associated factors.
CONCLUSION: The better achievement of microbiologic cure with interdialytic vancomycin administration requires further evaluation. Our results suggest that higher doses of vancomycin are needed with intradialytic administration to account for removal during HD.

Neurology

236. Evaluation of stroke severity using National Institute of Health Stroke Scale (NIHSS) as a predictor for readmissions in a veteran population *Haig Haig, Pharm.D. Candidate*[1], Gurpreet Sahi, Pharm.D. Candidate[1], Bradley Cole, M.D.[2], Amina Olatunji, MSN, GCNS-BC[2], Marie Davies, Pharm.D., MS, BCACP, TTS[1], Hyma Gogineni, MS, Pharm.D., TTS[1]; [1]Western University of Health Science College of Pharmacy, Pomona, CA [2]Neurology, VA Loma Linda Healthcare System (VALLHS), Loma Linda, CA
INTRODUCTION: Stroke is a leading cause of death and results in readmissions up to 20–27% within the first 1 year. The National Institute of Health Stroke Scale (NIHSS) is a score used to quantify stroke severity (higher being more severe). Mixed data exist as to whether this score can predict readmission.
RESEARCH QUESTION OR HYPOTHESIS: The purpose of this study was to assess the NIHSS score as a predictor for readmission rates and whether higher NIHSS scores are associated with 30-day readmission rates.
STUDY DESIGN: This IRB-approved retrospective chart review included patients admitted to the VA Loma Linda Healthcare System for ischemic stroke, hemorrhagic stroke, or a transient ischemic attack from June 2015-July 2016.
METHODS: Data collected included demographics, NIHSS score at index stroke, comorbidities, time interval to readmission, and readmission diagnosis. Statistical analyses included Student's T-test and Fisher's exact for assessing NIHSS as a continuous and categorical (mild vs. moderate/severe) predictor respectively.
RESULTS: Among 72 stroke patients, 16 patients were readmitted. There was no difference in the mean NIHSS of readmitted vs. non-readmitted patients (2.56 (2.71) vs. 2.55(2.97)). Patients with moderate/severe NIHSS had higher readmission rates compared to those with mild NIHSS, but this was not statistical significant (40% vs. 21%; P = 0.31). However, patients readmitted within 30 days had a significantly higher mean NIHSS than those readmitted >30 days (3.58 vs. 1.53; 95% CI = 0.52–4.12; P = 0.014). There was no significance in readmission based on discharge disposition or administration of tissue plasminogen activator.
CONCLUSION: Patients readmitted within 30 days of index stroke had higher NIHSS scores and therefore more severe stroke symptoms. There was a trend that patients with moderate/severe NIHSS scores were more likely to be readmitted, but this was not significant. Collectively these finding indicate NIHSS may be important for predicting readmissions.

237E. Can use of the standard and revised winter-tozer formulas accurately predict free phenytoin concentrations in non-critically ill hospitalized patients? *Ayesha Khan, Pharm.D., BCPS*[1], Marketa Marvanova, Pharm.D., Ph.D., BCGP, BCPP[2]; [1]Chicago State University College of Pharmacy, Chicago, IL [2]Pharmacy Practice, NDSU School of Pharmacy, Fargo, ND
Presented at the 2017 ACCP Virtual Poster Symposium, May 17-18, 2017.

238E. Quantitative analysis confirms the potential of the Photosensitivity Model to predict the clinically efficacious Anti-Epileptic Drug (AED) dose. *Ronald Reed, BS Pharm, Pharm.D., FCCP, FAES*[1], Dorothee Kasteleijn-Nolst Trenite, M.D., Ph.D.,

MPH[2]; [1]Department of Pharmacy Practice, Husson University School of Pharmacy, Bangor, ME [2]Faculty of Medicine & Psychology, University of Rome "Sapienza" II, Roma, Italy
Presented at the 31st International Epilepsy Congress, Istanbul, Turkey, September 5-9, 2015.

239. Control of blood pressure variability after spontaneous intracerebral hemorrhage is better achieved with intravenous nicardipine *Janelle Poyant, Pharm.D.*[1], Philip Kuper, Pharm.D., BCPS[2], Ross Dierkhising, MS[3], Kristin Mara, MS[4], Rabinstein Alejandro, M.D.[5], Eelco Wijdicks, M.D., Ph.D.[5], Brianne Ritchie, Pharm.D., MBA[6]; [1]Department of Pharmacy, Mayo Clinic Hosptail, Rochester, MN [2]Department of Pharmacy, Mayo Clinic Hospital – Rochester, Rochester, MN [3]Division of Biomedical Statistics and Informatics, Mayo Clinic, Rochester, MN [4]Department of Biomedical Statistics and Informatics, Mayo Clinic Hosptail, Rochester, MN [5]Department of Neurology, Mayo Clinic Hosptail, Rochester, MN [6]Mayo Clinic Hosptail, Rochester, MN
INTRODUCTION: Blood pressure variability (BPV) is an independent predictor for early hematoma expansion, neurologic deterioration, and mortality. Despite this, little data exists to describe BPV's association with specific medication regimens.
RESEARCH QUESTION OR HYPOTHESIS: We sought to determine if patients have more BPV with certain antihypertensive agents, particularly comparing bolus therapy to infusion therapy, in patients following ICH at our institution.
STUDY DESIGN: Single-center, retrospective chart review.
METHODS: This study was conducted at an academic medical center in the United States. Individuals diagnosed with spontaneous ICH receiving labetalol, hydralazine, and/or nicardipine within 24 hours of hospital admission were included to assess the primary endpoint of BPV, defined as the standard deviation of systolic BP. The bolus group consisting of labetalol and/or hydralazine was compared to the infusion group consisting of nicardipine ± labetalol and/or hydralazine. Descriptive statistics were utilized as appropriate and repeated measures linear regression was performed to describe BPV for each regimen.
RESULTS: Of 1,330 patients screened, 272 patients were included in our analysis; the bolus group consisted of 164 patients who received bolus antihypertensives alone (labetalol and/or hydralazine) and the infusion group of 108 patients who received nicardipine with or without additional bolus doses (labetalol and/or hydralazine). Compared to the bolus group, the infusion group had significantly less BPV ($p = 0.04$) and was more likely to attain an SBP goal <140 mmHg (HR: 1.57; 95% CI 1.17–2.10).
CONCLUSION: Our study suggests patients with ICH who do not receive a nicardipine-based antihypertensive regimen have more BPV, which has been associated with poor clinical outcomes. Prospective, randomized, controlled trials are needed to determine the impact of specific antihypertensive regimens on clinical outcomes.

240. Potential drug interactions with antiepileptic agents in neurosurgical patients *Gabriel Pinilla, M.D. A.S. Pharm.*[1], Liz Ascencio, A.S. Pharm. A.S. Eng.[2], Luis Pineda, Pharm.D. M.Sc.[3]; [1]Department of Neurosurgery, Johns Hopkins University, Baltimore, MD [2]Pharmaceutical Services, FOSCAL International Clinic, Floridablanca, Colombia [3]Institute for Regional Projection and Distance Education, Industrial University of Santander, Bucaramanga, Colombia
INTRODUCTION: Adherence to antiepileptic agents is key for the control of seizures. Nonetheless, it is compromised by the appearance of adverse reactions and the potential for multiple drug-drug interactions (PDI). Neurological patients are especially at risk of these due to their age and polypharmacy rates.
RESEARCH QUESTION OR HYPOTHESIS: The objetive of this project was to describe PDI with antiepileptic agents in neurosurgical patients, and to determine which variables might be associated with serious PDI.
STUDY DESIGN: This is a retrospective cohort study based on the pharmacotherapeutic profiles of 145 patients admitted to a Colombian neurosurgery service during three trimesters.
METHODS: Prescriptions were evaluated in patients admitted to the neurosurgery service during the period of study (N = 596), selecting those who were prescribed at least one antiepileptic agent. Unitary prices were extracted from the Uppsala Monitoring Center and PDI were assessed using Medscape database, as have been previously proposed. Logistic regression was used to determine factors associated with serious PDI in prescriptions.
RESULTS: 195 antiepileptic agents were prescribed during the hospitalization (16 days, IQR 10–28) with a median regiment of 6 doses (IQR 2–16). Median age was 55 years (IQR 36–71) and most frequent diagnoses were neoplastic diseases (22.07%). Related to PDI, 35 serious, 114 significant and 161 minor were identified. Prescriptions for 63.44% of the patients exhibit at least one potential interaction, and serious PDI were observed mainly in patients treated with phenytoin ($n = 10$), carbamazepine ($n = 6$) and sodium valproate ($n = 5$). Female sex ($p = 0.000$), carbamazepine treatment ($p = 0.001$), lower drug unitary prices ($p = 0.014$) and non-neoplastic diagnoses ($p = 0.022$) were associated with prescriptions including at least one serious PDI.
CONCLUSION: High prevalence of PDI was observed among neurological patients who were prescribed antiepileptic medications. Further prospective studies are required to determine factors associated to serious potential drug interactions.

Oncology

242. Tetrahydrocurcumin induces autophagy via the inhibition of PI3K/Akt/mTOR in non-small-cell lung carcinoma cells *Bin Lin, B.S.Pharm*[1], Guoqiang Song, M.D.[2], Weibin Fan, B.S.Pharm[1], Youmei Wang, B.S.Pharm[1], Huoquan Lu, M.D.[2], Honghui Lu, B.S.Pharm[1]; [1]Department of Pharmacy, Changxing People's Hospital, Changxing, China [2]Department of Respiratory Medicine, Changxing People's Hospital, Changxing, China
INTRODUCTION: Lung carcinoma has become the most common cause of death from cancer in the world. Autophagy plays an important role in Non-Small-Cell Lung Carcinoma (NSCLC) development and progression.
RESEARCH QUESTION OR HYPOTHESIS: Tetrahydrocurcumin therapeutic efficacy against non-small cell lung cancer (NSCLC) by blocking autophagyvia the inhibition of PI3K/Akt/mTOR pathway.
STUDY DESIGN: Lung cancer cell model was used to verify the induced autophagy by tetrahydrocurin.
METHODS: Tetrahydrocurcumin was isolated (THC) from Curcuma wenyujin Y.H.Chen et C.Ling that a chinese traditional medicine and demonstrated that it induced autophagy in human NSCLC A549 cells. We demonstrated that THC induced autophagy in A549 cells by use of various assays including CCK8 assay, acridine orange (AO) staining, flow cytometry(FC), quantitative real-time PCR (qPCR), and western blot detection of the autophagy markers of Beclin-1, mTOR, p-mTOR, AKT, p-AKT, LC3II/I, p62 and PI3K.
RESULTS: THC inhibited the growth and proliferation of NSCLC A549 cells and promoted apoptosis ($p < 0.05$).The AO staining and flow cytometry of the A549 cells indicated that the THC treatment significantly enhanced autophagic cell death compared with control ($p < 0.05$). The qPCR assay showed that THC induced the expression of Beclin-1 was positive compared to control group ($p < 0.05$). The ratio of LC3-II/LC3-I was Lower compared to the control group ($p < 0.05$). Protein expression of p62, p-mTOR, PI3K, AKT and p-Akt were significantly decreased in the THC administration ($p < 0.05$).

CONCLUSION: Thus, the current research not only reveals mechanisms accounting for THC induced autophagy, but also suggests an promising method to enhance THC therapeutic efficacy against non-small cell lung cancer(NSCLC) by blocking autophagyvia the inhibition of PI3K/Akt/mTOR pathway.

243E. Letrozole inhibits HERG current and reduces proliferation in cultured glioblastoma CELLS *Tyler Shugg, Pharm.D.*[1], Nimita Dave, Ph.D.[2], Jason Robarge, Ph.D.[2], Karen Pollok, Ph.D.[3], Brian Overholser, Pharm.D.[1]; [1]Department of Pharmacy Practice, Purdue University, Indianapolis, IN [2]Division of Clinical Pharmacology, Indiana University School of Medicine, Indianapolis, IN [3]Herman B. Wells Center for Pediatric Research, Indiana University School of Medicine, Indianapolis, IN
Presented at the 2017 Annual Meeting of the American Society for Clinical Pharmacology and Therapeutics, Washington, DC, March 15-18, 2017.

244E. Efficacy by outpatient vs. inpatient administration of consolidation: subgroup analysis of a Phase 3 Study of CPX-351 versus 7+3 in older adults with newly diagnosed, high-risk acute myeloid leukemia Jonathan Kolitz, M.D., FACP[1], Stephen Strickland, M.D.[2], Jorge Cortes, M.D.[3], Donna Hogge, M.D., Ph.D., FRCPC[4], Jeffrey Lancet, M.D.[5], Stuart Goldberg, M.D.[6], *Karen Chung, MS, Pharm.D.*[7], Robert Ryan, MS[7], Michael Chiarella, BS[7], Arthur Louie, M.D.[7], Robert Stuart, M.D.[8], Bruno Medeiros, M.D.[9]; [1]Monter Cancer Center, Northwell Health System, Lake Success, NY [2]Vanderbilt-Ingram Cancer Center, Nashville, TN [3]M.D. Anderson Cancer Center, Houston, TX [4]Gordon and Leslie Diamond Health Care Centre, Vancouver, BC, Canada [5]H. Lee Moffitt Cancer Center, Tampa, FL [6]John Theurer Cancer Center at Hackensack Univ. Medical Center, Hackensack, NJ [7]Jazz Pharmaceuticals, Palo Alto, CA [8]Medical Univ. of South Carolina & Hollings Cancer Center, Charleston, SC [9]Stanford Comprehensive Cancer Center, Stanford, CA
Presented at the Annual Meeting of the European Hematology Association (EHA), Madrid, Spain, June 22-25, 2017.

245. Role of obesity in anthracycline-induced cardiomyopathy *Cora Housley, Pharm.D.*[1], Jacob Kettle, Pharm.D.[2]; [1]Skaggs School of Pharmacy and Pharmaceutical Sciences, University of Colorado Anschutz Medical Campus, Aurora, CO [2]Pharmacy Department, University of Missouri Health Care, Columbia, MO
INTRODUCTION: Anthracyclines are known for their deleterious effects on the heart with long-term complications including left ventricular dysfunction, heart failure, and cardiovascular events. Obesity is an independent risk factor for the development of heart failure in the general population.
RESEARCH QUESTION OR HYPOTHESIS: This study seeks to expand on current literature by reviewing patients with various malignancies on anthracycline-based chemotherapy regimens to determine the association between obesity and the development of clinical heart failure.
STUDY DESIGN: Patients who underwent chemotherapy that included an anthracycline at a single academic medical center between 2005 and 2013 were retrospectively identified for analysis.
METHODS: Patients were divided into two groups based on body mass index (BMI) – Obese (BMI $\geq$ 30.0 kg/m2) and non-obese (BMI < 30 kg/m^2). The primary outcome assessed was clinical diagnosis of heart failure. Secondary outcomes include a reduction in baseline left ventricular ejection fraction (LVEF) by 15% or more, a reduction in LVEF to less than 50%, hospitalization for heart failure, myocardial infarction, transient ischemic attack, stroke, and cardiac and all-cause mortality. A subgroup analysis using further BMI subdivisions was also performed for the primary outcome.
RESULTS: 9 patients (11.8%) in the research population (n = 76) developed heart failure with a similar incidence in the non-obese (10%) and obese (15.4%) patient groups (p-value = 0.491). Secondary measures further demonstrated comparable outcomes between groups with no significant differences. Subgroup analysis revealed the greatest incidence of heart failure occurred in underweight patients (33.3%) followed by obese (15.4%), overweight (12%), and normal weight (4.5%).
CONCLUSION: While no difference was found in the incidence of heart failure between obese and non-obese patients, the trend toward a lower incidence in healthy weight patients is noteworthy. Further research is necessary, particularly to determine if an active weight management program during and after chemotherapy is an effective means to reduce incidence of cardiac events.

247. Efficacy and cost-savings of single-dose versus weight-based dosing of rasburicase *Brian Fox, Pharm.D., BCPS*[1], Krista Voytilla, Pharm.D., BCOP[2]; [1]Medical Center of the Rockies, UCHealth, Loveland, CO [2]Saint Joseph Hospital/Comprehensive Cancer Center, SCL Health, Denver, CO
INTRODUCTION: Rasburicase is used to treat elevated uric acid levels due to malignancy. Package insert dosing is 0.2 mg/kg/day intravenously (IV) for up to five days. Studies have shown a single-dose of 6 mg IV is efficacious and cost-effective. Saint Joseph Hospital (SJH), in Denver, CO, approved a new single-dose algorithm for rasburicase in January 2016.
RESEARCH QUESTION OR HYPOTHESIS: Changing rasburicase to a single 6-mg dose would provide significant cost-savings without decreasing efficacy.
STUDY DESIGN: A retrospective chart review examining cost-savings and efficacy from January 1st, 2016 to December 31st, 2016 compared to 2015.
METHODS: All patients receiving rasburicase from January 1st, 2015 – December 31st, 2016 were included. Patients were identified through Vigilanz Real-Time Surveillance. Primary outcome was the cost difference pre- and post-implementation of the new algorithm. Secondary outcomes included: percent patients requiring repeat dosing with the single-dose algorithm, changes in uric acid from baseline, and proactive versus reactive administration.
RESULTS: In 2015, SJH administered 17 doses, 248-mg total of rasburicase, to eight patients and spent $121,024. In 2016, post-implementation of single-dose rasburicase, SJH administered 12 doses, 73.5-mg total of rasburicase, to nine patients and spent $35,868. However, if during 2016, weight-based dosing were used it would have cost $150,426. This is a difference of $114,558 compared to single-dose administration during the same timeframe. Total savings between 2015 and 2016 was $85,156. In addition, six 7.5 mg vials of rasburicase were returned to the manufacturer for $15,540. Grand total savings was $100,696. All patients at 24-h post-dose were at goal ($\leq$7.5 mg/dL) serum uric acid levels. Only 1 of 9 patients (11%) required a repeat dose after initiation of single-dose algorithm. Proactive and reactive dosing strategies were implemented in 7/12 (58.3%) and 5/12 (41.6%) patients, respectively.
CONCLUSION: Single-dose rasburicase was effective and resulted in a significant cost-reduction for the pharmacy department at our institution.

248. Pravastatin in patients with diabetes mellitus and solid tumors – are all statins created equal? *Anna Slavinsky, BA*, Zachary Wintrob, MS, George Nimako, Pharm.D., MS, Caitlin Frohnapple, Pharm.D., Dustyn Miller, Pharm.D., Alice Ceacareanu, Pharm.D., Ph.D.; NYS Center of Excellence in Bioinformatics and Life Sciences, Buffalo, NY

INTRODUCTION: Statins' pleiotropic effects reach far beyond cholesterol metabolism. Their unintended anti-inflammatory and cancer-related benefits are of particular interest in patients with type 2 diabetes mellitus (T2DM), a population at higher risk for cancer. Interestingly, although statin treatment is recommended in all T2DM individuals over 40 regardless of lipid levels, it is unknown whether all statins provide equal benefits in relationship with cancer outcomes.
RESEARCH QUESTION OR HYPOTHESIS: To evaluate whether or not statin type (hydrophilic vs. lipophilic) is linked to improved cancer outcomes in patients diagnosed with T2DM and cancer.
STUDY DESIGN: We conducted a single-site retrospective cohort study involving all eligible T2DM adults with new cancer of the breast, ovary, prostate, gastrointestinal tract, lung or kidney diagnosed at Roswell Park Cancer Institute in Buffalo, NY (01/01/03–12/31/10).
METHODS: Demographics, clinical history, and vital status updates were collected from medical records, N = 1,000. The association between self-reported statin use and cancer outcomes (overall and disease-free survival, OS and DFS) was evaluated with multivariate Cox proportional hazards models. The Cox analysis included adjustments for age, gender, cancer type and stage, body mass index, alcohol history, and cardiovascular comorbidity.
RESULTS: While any statin use was associated with no significant cancer benefit ($HR_{OS} = 1.19$, $p = 0.066$; $HR_{DFS} = 1.12$, $p = 0.198$), the stratified analysis by statin type revealed significantly better outcomes among hydrophilic statin users as compared to non-users ($HR_{OS} = 0.65$, $p = 0.0092$; $HR_{DFS} = 0.71$, $p = 0.0256$). Interestingly, when stratifying by specific statin use, only pravastatin provided a survival benefit as compared to non-users ($HR_{OS} = 0.61$, $p = 0.0126$). By comparison, simvastatin had significantly poorer outcomes than pravastatin.
CONCLUSION: We report that not all statins are therapeutically equivalent in exerting their cancer-related pleiotropic benefits. While statins overall presented no cancer outcomes advantage, hydrophilic statin use was associated with improved recurrence and survival. Our findings identified pravastatin as the one statin associated with best cancer outcomes.

249. Subcutaneous versus intravenous granulocyte colony stimulating factor to enhance neutrophil engraftment in hematopoietic stem cell transplant patients *Samantha Ellingson, Pharm.D.*[1], Justin B. Usery, Pharm.D., BCPS[2], Carrie Oliphant, Pharm.D., FCCP, BCPS-AQ Cardiology, AACC[3], Susan Wheelis, Pharm.D., BCOP[4], Diwura Owolabi, Pharm.D., BCOP[1]; [1]Methodist University Hospital, Memphis, TN [2]Methodist University Hospital and University of Tennessee College of Pharmacy, Memphis, TN [3]Department of Pharmacy, Methodist University Hospital, Memphis, TN [4]Methodist Germantown Hospital, Memphis, TN
INTRODUCTION: Granulocyte colony stimulating factor (G-CSF) stimulates the production, maturation and proliferation of neutrophils. Previous research shows that G-CSF decreases time to neutrophil engraftment, rate of infection, and incidence of febrile neutropenia. Although subcutaneous (SQ) administration is preferred, intravenous (IV) administration may be utilized for ease of administration and fewer side effects. There is limited data comparing SQ versus IV G-CSF in patients undergoing hematopoietic stem cell transplants (HSCT).
RESEARCH QUESTION OR HYPOTHESIS: Does route of administration of G-CSF impact the time to neutrophil engraftment in HSCT patients undergoing either autologous or allogenic transplant?
STUDY DESIGN: This project was a retrospective study conducted at a single center large academic hospital in Memphis, TN, USA.
METHODS: A retrospective chart review was conducted of adult inpatients undergoing autologous or allogeneic HSCT and receiving SQ or IV G-CSF from July 1, 2015 to December 31, 2016. Patients were excluded if more than two consecutive doses of G-CSF were missed or if there was improper preparation of IV G-CSF. The primary objective was to evaluate the days to neutrophil engraftment in HSCT patients who received SQ versus IV G-CSF. Secondary outcomes included incidence of febrile neutropenia and infection, in-hospital mortality, length of stay, and time to engraftment between autologous and allogenic HSCTs.
RESULTS: A total of 98 patients were included with 55 in the SQ group and 43 in the IV group. Thirty-five patients underwent allogeneic HSCT and 63 received autologous HSCT. The time to neutrophil engraftment was 13.5 ± 5.0 days for SQ administration and 14.0 ± 3.1 days for IV ($p = 0.57$). There was no difference in febrile neutropenia, positive cultures, length of stay, or in-hospital mortality.
CONCLUSION: No difference appears to exist between the route of administration and the time to neutrophil engraftment, incidence of febrile neutropenia, occurrence of infection, or in-hospital mortality.

250. Zerumbone inhibits growth and migration of ovarian cancer cells including paclitaxel resistant ovarian cancer cells by targeting Jak2/Stat3 and NF-kB signaling pathway both in vitro and in vivo Eddy Chan, Pharm.D. Candidate, Ivy Leung, Pharm.D. Candidate, *Thu Nguyen, Pharm.D. Candidate*, Arup Chakraborty, Ph.D; Roseman University, College of Pharmacy – Henderson, Henderson, NV
INTRODUCTION: Paclitaxel and platinum-based chemotherapy is a standard therapy for ovarian cancer, but still the 5-year survival rate is low due to chemotherapy-resistant residual tumor cells. Therefore, the identification of new drugs for chemotherapy resistance is imperative. Stat3 and NF-kB are transcription factors involved in tumor cell proliferation, survival, angiogenesis, and metastasis. High-grade ovarian cancers are characterized by high expression of activated Stat3 and/or NF-kB. Recently we have shown that zerumbone, a phytochemical from Asian ginger, is a novel dual inhibitor of Jak2, and upstream inhibitor of Stat3 and NF-kB.
RESEARCH QUESTION OR HYPOTHESIS: Zerumbone can inhibit proliferation and transmigration of ovarian cancer cells under hypoxic and normoxic conditions. Secondly, zerumbone is effective in preventing tumor growth in animal models of ovarian cancer.
STUDY DESIGN: Zerumbone's efficacy against ovarian cells are assessed in both *in vitro* and *in vivo* studies.
METHODS: Cytotoxicity assays were performed using NCI-ADR/RES and SKOV3 cells treated with zerumbone, both in normoxic and hypoxic conditions. Western blots assessed Jak2, Stat3, and NF-kB expression of ovarian cells after 72 h treatment with zerumbone. Zerumbone treated ovarian cell lines were placed in boyden chambers to assess transmigration inhibition.
RESULTS: Constitutive activation of Jak2, Stat3 and NF-kB was observed in 5 of the 5 ovarian cancer cell lines with highest expression in paclitaxel resistant NCI-ADR/RES cells. Zerumbone inhibited transmigration and growth of ovarian cancer cells by inhibiting Jak2/Stat3 and NF-kB signaling pathway and downstream gene expression like Cyclin D1, survivin and BCL-XL as determined by cytotoxicity assay and western blotting. Zerumbone also inhibited the tumor growth in an ovarian cancer animal model *in vivo*.
CONCLUSION: A novel and natural chemical, zerumbone, inhibits growth, migration and induces apoptosis in ovarian carcinoma cells targeting oncogenic pathways both in vitro. and in vivo. Zerumbone may be combined to paclitaxel to treat paclitaxel resistant ovarian carcinoma to circumvent paclitaxel induced nonspecific cytotoxicity.

Other

251E. An online database of industry research sponsors created for a national PBRN *Diana M. Sobieraj, Pharm.D., BCPS*[1], Nicole M. Acquisto, Pharm.D.[2], Collin Hovinga, Pharm.D., MS, FCCP[3], Daniel Riche, Pharm.D., FCCP, BCPS, CDE, ASH-CHC[4], Rachel Chennault, Ph.D.[5]; [1]Pharmacy Practice, University of Connecticut School of Pharmacy, Storrs, CT [2]University of Rochester Medical Center, Rochester, NY [3]UT Austin College of Pharmacy, Austin, TX [4]The University of Mississippi School of Pharmacy, Jackson, MS [5]American College of Clinical Pharmacy Research Institute, Lenexa, KS
Presented at the North American Primary Care Research group PBRN Conference, Rockville, MD, June 22-23, 2017.

252. Trends in research presented at the American College of Clinical Pharmacy annual meeting 2010–2016 *Michael J. Gonyeau, BSPharm, Pharm.D., MEd, BCPS, FCCP*[1], Cassidy Duncan, BS[2], Seungyun Kim, BS[3], Dennis Lau, BS[3], Justin Yap, BS[3]; [1]School of Pharmacy, Northeastern University, Boston, MA [2]Pharmacy and Health Systems Sciences, Northeastern University, Boston, MA [3]Northeastern University, Boston, MA
INTRODUCTION: Professional conferences offer opportunities to network, educate, and support professional advancement. Investigating research trends should allow us to identify areas researched extensively or relatively ignored, allowing development of specific organizational/professional research agenda.
RESEARCH QUESTION OR HYPOTHESIS:

1 Identify trends in number/type of posters presented at ACCP annual meetings from 2010 to 2016
2 Identify publication output/trends from poster presentations

STUDY DESIGN: Retrospective analysis of 2010–2016 ACCP annual meeting poster presentations.
METHODS: Abstracts categorized into 39 areas including practice environment, study population (e.g. pediatrics, students), medical disorder groups (e.g. cardiovascular, infectious disease), education (e.g. experiential, technology), pharmacist impact, kinetics/genomics and monitoring/follow up. Abstracts were allocated into as many categories as appropriate and aggregate and individual data analyzed for trends. Additional bibliometric analysis conducted to identify publication trends in six categories. SPSS® utilized for statistical analysis. IRB approval exempted.
RESULTS: 2997 poster abstracts analyzed. A variety of practice environments represented: 39.9% general patient care, 19% critical care, 16.7% ambulatory care, 9.1% community. Majority of posters focused on safety (42.3%) or efficacy (42.3%). Medical disorder trends: infectious diseases (519 (17.3%)), cardiovascular (355 (11.8%)), hematology (273(9.1%)), endocrinology (203 (6.8%)) and others. Areas of scant presentation: substance abuse/pain (109 (3.6%)), oncology (103(3.4%)), psychiatry (92 (3.1%)) and neurology (74 (2.5%)). Publication trends: kinetics/genomics (134/412 (32.5%)), infectious diseases (52/186 (28%)), cardiovascular (93/355 (26.2%)), ambulatory care (86/343 (25%)), critical care (82/388 (21.1%)) and pharmacist impact (104/547 (19%)). Kinetic/Genomic publication rate statistically significantly higher than critical care ($p = 0.0002$), ambulatory care ($p = 0.025$) and pharmacist impact ($p = 0.00002$).
CONCLUSION: Results indicate a potential need for increased research in the community setting, given increasing presence of clinical services provided there. Efficacy and safety evaluated by most posters and relative lack of pharmacoeconomic (145 (4.8%)) and ease-of-use/adherence (147 (4.9%)) posters may be important, as patient-centered medication optimization requires cost and ease-of-use considerations. A wide variety of medical disorders represented, but paucity of posters in oncology and substance-use seem noteworthy given cancer incidence and current opioid abuse epidemic. Publication rates varied, with posters regarding impact of pharmacy/pharmacist services less published. These data reveal potential targets for association's future research agenda.

253. Pharmacist authorship on national guidelines *April Thompkins, Pharm.D. Candidate*[1], Brian Norman, Pharm.D. Candidate[1], Brandon Hill, Pharm.D.[2], P. Brandon Bookstaver, Pharm.D., FCCP, BCPS, AAHIVP[3]; [1]South Carolina College of Pharmacy- University of South Carolina Campus, Columbia, SC [2]Department of Pharmacy, Palmetto Health Richland, Columbia, SC [3]Department of Clinical Pharmacy & Outcomes Sciences, University of South Carolina College of Pharmacy, Columbia, SC
INTRODUCTION: Up to one-half of guideline recommendations are supported by Level III evidence, highlighting the importance of critical literature evaluation, ideally by an interdisciplinary guideline committee. The purpose of our study was to describe pharmacist authorship on national guidelines.
RESEARCH QUESTION OR HYPOTHESIS: What is the rate of pharmacist authorship on national guidelines involving medication therapy?
STUDY DESIGN: Descriptive, observational study of publicly available national guidelines.
METHODS: Guidelines published between January 1, 2010, and December 31, 2016 and available in the Agency for Healthcare Research and Quality's National Guideline Clearinghouse database were eligible for study inclusion. Only guidelines pertaining to medication therapy were included. Guidelines were screened in reverse chronological order to include a minimum of 10 guidelines per specialty practice area. The primary endpoint was the rate of pharmacist authorship on national guidelines. The rate of pharmacist authorship per specialty and characteristics of pharmacist authors were described.
RESULTS: Of the 112 guidelines included, 47 had at least one pharmacist author (42%). A pharmacist served as the first or senior author on 21.3%. There were 1,570 authors with an average of 14 (+ 7.4) authors per guideline. Pharmacists represented 7.5% (n = 117) of all authors, and 83 were unique pharmacist authors appearing on a minimum of 1 and maximum of 12 guidelines. Critical care, emergency medicine, and adult internal medicine guidelines had the largest proportion of pharmacist-authored guidelines, while oncology guidelines had the smallest. Guidelines developed by the Veterans Affairs/Department of Defense (n = 7) and the Clinical Pharmacogenetics Implementation Consortium (n = 13) always included at least one pharmacist. Excluding VA and CPIC guidelines, the proportion of pharmacist authorship was 29.4%. Pharmacy organizations sponsored or endorsed 3.6% of guidelines.
CONCLUSION: Less than half of national guidelines focused on medication therapy include a pharmacist author. National pharmacy organizations should support pharmacist inclusion in guideline writing committees.

254. The evolution of pharmacist authorship among Infectious Diseases Society of America clinical practice guidelines *Lauren Freeman, Pharm.D. Candidate*[1], Jasmine Lindsay, Pharm.D. Candidate[1], Brian Norman, Pharm.D. Candidate[1], April Thompkins, Pharm.D. Candidate[1], P. Brandon Bookstaver, Pharm.D., FCCP, BCPS, AAHIVP[2]; [1]South Carolina College of Pharmacy- University of South Carolina Campus, Columbia, SC [2]Department of Clinical Pharmacy & Outcomes Sciences, University of South Carolina College of Pharmacy, Columbia, SC
INTRODUCTION: The Institute of Medicine (IOM) standards for developing trustworthy clinical practice guidelines (CPG) recommend balanced, multidisciplinary committees. Prior study of

Infectious Disease Society of America (IDSA) practice guidelines found that 80% of recommendations were supported by level II or III evidence, emphasizing the need for multidisciplinary, expert writing committees. The purpose of this study is to describe the rate and temporal trend in pharmacist authorship on IDSA guidelines.
RESEARCH QUESTION OR HYPOTHESIS: What is the rate of pharmacist authorship among current and corresponding prior editions of IDSA practice guidelines?
STUDY DESIGN: Descriptive, observational study of publically available guidelines.
METHODS: Clinical practice guidelines issued or endorsed by the IDSA through May 2017 were evaluated. The rates of pharmacist authorship on current guidelines available on the IDSA website and prior guideline editions identified through a MEDLINE search were calculated and compared. Pharmacist authorship was defined as presence of at least one pharmacist author on the guideline writing committee. Additional endpoints included rate of pharmacist authorship by practice guideline category, pharmacy organization endorsement, and pharmacist author characterization.
RESULTS: Rate of pharmacist authorship was 19% (11/57) on current IDSA guidelines compared to 13% (5/39) on corresponding prior editions ($p = 0.58$). Of 1,231 total authors, 3% ($n = 32$) were pharmacists. Thirty unique pharmacists were represented overall, which remained consistent on current ($n = 16$) and prior ($n = 14$) editions. The antimicrobial agent use category was the most represented by pharmacist authorship, 50% current (3/6) and 40% prior (2/5). Guidelines primarily included a single pharmacist author (69%, 11/16). Three pharmacists appeared on multiple guidelines, with a maximum of 3 guidelines co-authored.
CONCLUSION: Although there was a non-significant increase of 6% in pharmacist authorship between previous and current IDSA guidelines, overall rate remains low. These findings accentuate the need for increased pharmacist inclusion in guideline writing committees as supported by IOM recommendations.

Pain Management/Analgesia

255. The mortality and medical service utilization by long-term opioids patients for chronic non-cancer pain *Ya-Han Lee, M.S.*, Yu-Ning Huang, M.S., Hsiang-Yin Chen, Pharm D., MS; Department of Clinical Pharmacy, School of Pharmacy, Taipei Medical University, Taipei, Taiwan
INTRODUCTION: Long-term use of opioids for chronic noncancer pain was controversial since the safety and effectiveness of chronic opioid therapy had not been well established. Mortality and medical service utilization for patients treated by different pharmacotherapies were warranted study.
RESEARCH QUESTION OR HYPOTHESIS: Chronic noncancer patients receiving opioids were hypothesized to associate with greater risks on mortality rate and medical service utilization than those who used adjuvant medications.
STUDY DESIGN: This was a retrospective, population-based cohort study with active-comparators.
METHODS: Two cohorts newly prescribed with chronic opioid or adjuvant medications for chronic noncancer pain during 2005 to 2011 were identified in Taiwan National Health Insurance Research Database. They were 1:4 matched by propensity score and followed-up for two-years after the last medication supply. Chronic opioid cohort included subjects having persisted pain with at least 2 outpatient visits in 3 months, and receiving opioids continuously more than 14 days, or intermittently over 28 days within 3 months. Adjuvant cohort included patients treated by antidepressants, anticonvulsants and lidocaine patch for pain. Primary outcome of interest was mortality, and secondary was cause-specific medical service utilization, including hospitalizations and emergency department (ED) visits. Time-to-event risks were analyzed by using Cox proportional hazard model. All analyses were performed with SAS Enterprise Guide 7.1.
RESULTS: There were 158 new opioid and 601 adjuvant patients. Compared to the adjuvant cohort, the adjusted risks for opioid cohort were significantly higher in all-cause mortality (HR, 3.88; 95% CI, 1.02–14.72), all-cause ED visits (HR, 1.66; 95% CI, 1.32–2.11), chronic pain-related hospitalizations (HR, 1.88; 95% CI, 1.04–3.40), and respiratory-related ED visits (HR, 2.73; 95% CI, 1.05–7.09).
CONCLUSION: Chronic opioid therapy for chronic noncancer pain was associated with significantly increased risks in all-cause mortality and ED utilization. Risk-benefit assessment should be carefully considered when prescribing opioids to patients chronically for noncancer pain.

256. Synergistic effect of bupivacaine and meloxicam in HTX-011 across multiple doses and surgeries *Erol Onel, M.D.*, Alice Chu, MA, Sanjay Patel, Ph.D., Thomas Ottoboni, Ph.D., Clynn Wilker, DVM, Ph.D., Barry Quart, Pharm.D.; Heron Therapeutics, San Diego, CA
INTRODUCTION: Pain is most severe in the first 72 h post-surgery. However, no currently approved formulations of local anesthetics exhibit meaningful efficacy beyond 24 h, leading to an over-reliance on opioids. To address this unmet need, HTX-011, a non-opioid proprietary combination of bupivacaine and meloxicam in Biochronomer® technology for extended release (ER), was developed.
RESEARCH QUESTION OR HYPOTHESIS: Does HTX-011 provide better pain relief and greater opioid-free recoveries than saline placebo, and are those effects synergistic (ie, greater than the sum of ER bupivacaine plus ER meloxicam)?
STUDY DESIGN: HTX-011, ER bupivacaine, and ER meloxicam were investigated within 2 blinded, randomized, phase 2 studies in subjects undergoing bunionectomy or herniorrhaphy.
METHODS: Subjects received HTX-011 (bunionectomy: 60 mg bupivacaine base; herniorrhaphy: 300 mg bupivacaine base), equipotent ER bupivacaine, equipotent ER meloxicam, or saline placebo, and were followed in-hospital through 72 h.
RESULTS: Subjects who received HTX-011 after undergoing bunionectomy ($N = 208$) exhibited significantly lower area under the curve through 72 h ($AUC_{0\text{-}72}$) for pain intensity than those who received saline placebo ($p = 0.0003$), and a significantly greater percentage of HTX-011 subjects were opioid free (17% vs. 4%; $p = 0.0106$). Similarly, subjects who received HTX-011 after undergoing herniorrhaphy ($N = 146$) showed significantly lower $AUC_{0\text{-}72}$ ($p = 0.0086$) and a greater proportion of these subjects were opioid free (50% vs. 13%; $p = 0.0272$). Synergy of meloxicam and bupivacaine within HTX-011 was confirmed by an $AUC_{0\text{-}72}$ least squared mean difference analysis in both 60 mg bunionectomy (HTX-011 vs. ER bupivacaine + ER meloxicam: 101.7 vs. 28.5) and 200 mg herniorrhaphy (118.2 vs. −3.3).
CONCLUSION: Across 2 clinical studies, HTX-011 not only proved more efficacious through 72 h regarding pain control and opioid-free recovery, but also provided significantly greater analgesia than the sum of ER bupivacaine and ER meloxicam, thus validating the synergy of the combination.

Pediatrics

257. Increased risk of acute kidney injury in critically ill children treated with vancomycin and piperacillin/tazobactam Maya Holsen, Pharm.D.[1], Calvin Meaney, Pharm.D., BCPS[2], Amanda Hassinger, M.D.[3], *Nicholas Fusco, Pharm.D., BCPS, BCPPS*[2]; [1]University at Buffalo School of Pharmacy and Pharmaceutical Sciences, Buffalo, NY [2]Department of Pharmacy Practice, University at Buffalo School of Pharmacy and Pharmaceutical Sciences, Buffalo, NY [3]University at Buffalo Jacobs School of Medicine and Biomedical Sciences, Buffalo, NY

INTRODUCTION: The combination of vancomycin (VAN) and piperacillin-tazobactam (PTZ) has been associated with acute kidney injury (AKI) in adults and is frequently used as empiric therapy in critically ill children. Limited data exists on the rate of AKI in children receiving combination VAN and PTZ.
RESEARCH QUESTION OR HYPOTHESIS: Are critically ill children treated with VAN and PTZ at a higher risk of AKI compared to children treated with VAN and ceftriaxone (CTX)?
STUDY DESIGN: Retrospective cohort study.
METHODS: The rates of AKI in children (≥2 months of age) admitted to the pediatric intensive care unit were compared between those treated with ≥48 consecutive hours VAN plus PTZ and VAN plus CTX. AKI was defined as a 50% increase in serum creatinine from baseline within 48 h. Bivariate analysis compared treatment groups and AKI groups with Wilcoxon or chi-square tests as appropriate. A multivariable logistic regression model was fit for AKI including covariables analysis. Statistical analysis was completed using SAS version 9.4 with alpha set at 0.05.
RESULTS: There were no differences between treatment groups in terms of age, severity of illness, baseline renal function, VAN dosing, or VAN trough concentrations. The cumulative incidence of AKI was higher in children who received VAN and PTZ (15/58 [25.9%]) compared to those who received VAN and CTX (3/35 [8.57%], p = 0.041). After controlling for VAN trough, age, concurrent nephrotoxin exposure and use of vasopressors, exposure to PTZ significantly increased the risk of AKI (aOR 4.55, 95% CI 1.11–18.7, p = 0.035]. Additional risk factors for AKI were vasopressor use [OR 3.73 (95% CI 1.14–12.3)] and VAN trough ≥15 mg/L [OR 4.12 (95% CI: 1.12–15.2)].
CONCLUSION: AKI occurred more in critically ill children treated with VAN and PTZ versus VAN plus CTX. Children should be critically evaluated for the need for broad-spectrum antibiotic coverage and this combination should be avoided, when possible.

258E. Drug utilization evaluation of vancomycin among paediatric patients after implementation of antibiotic stewardship programme
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259. Human papillomavirus vaccination patterns of male teens for the years 2011–2015
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INTRODUCTION: Human papillomavirus (HPV) is a common sexually transmitted infection associated with cancers in males and females. In 2012, ~6.9% of boys aged 13–15 years received the recommended HPV vaccination in comparison to the national goal of 80.0% by 2020.
RESEARCH QUESTION OR HYPOTHESIS: The primary research question was to determine the percentage of male teens that initiated/completed the immunization series for the years 2011 to 2015. The secondary research question was to determine if an association between sociodemographic variables and the initiation/completion of recommended vaccination exists.
STUDY DESIGN: Retrospective, cross-sectional, observational study of males 13–17 years that participated in the National Immunization Survey-Teen.
METHODS: Endpoints were receipt of an initial vaccination and the completion of the immunization series. Sociodemographic variables included age at check-up, race, ethnicity, provider recommendation, geographical region, and mother's education level. Visual examination of initiation/completion rates with point estimates and 95% confidence intervals (CI) were used for the primary question. Individual chi-square tests and a multivariable logistic regression model were utilized to determine predictors of vaccination initiation and completion. Per the complex survey design, data were appropriately weighted and clustered to generate average annual national population estimates.
RESULTS: Rates of initiation increased from 8.3% (2011), 20.8% (2012), 34.6% (2013), 41.8% (2014), and 49.8% (2015). Completion rates increased from 1.3% (2011), 6.8% (2012), 13.9% (2013), 21.6% (2014), and 28.1% (2015). No overlap in 95%CI between years was observed, indicating a statistically significant upwards trend. Sociodemographic variables significantly associated with initiation/completion of vaccination were age at check-up of 16–17 years, non-white, Hispanic, provider recommendation, mother's education level of high school diploma or less, and geographic region.
CONCLUSION: This study demonstrates an increasing rate of initiation and completion of HPV vaccination amongst male teens. The differences in the association of sociodemographic characteristics and HPV vaccination compliance warrants further research.

260. An analysis of US childhood vaccination uptake and associated predictors utilizing the national immunization survey for years 2008 through 2015
Meredith McSwain, BS[1], Ashley Holombo, BS[1], Michael Jiroutek, DrPH, MS[2], Melissa Holland, Pharm.D., MSCR[1]; [1]Department of Clinical Research, Campbell University College of Pharmacy and Health Sciences, Buies Creek, NC [2]Department of Clinical Research, Campbell University College of Pharmacy & Health Sciences, Buies Creek, NC
INTRODUCTION: Vaccines prevent 14 million cases of disease and reduce healthcare costs by $9.9 billion for each birth cohort following the recommended vaccination schedule. Each year approximately 300 children in the US die from vaccine preventable diseases. Prior studies have found varying rates of vaccination in young children, possibly due in part to the highly-publicized Wakefield study (1998) which was subsequently retracted (2010).
RESEARCH QUESTION OR HYPOTHESIS: Is there evidence of an effect of the Wakefield study retraction or other key sociodemographic variables on the receipt of the CDC standard vaccination series?
STUDY DESIGN: Retrospective, cross-sectional, observational, IRB-exempt study.
METHODS: Children 19–35 months old with adequate provider data in the National Immunization Survey from 2008 to 2015 were assessed for up-to-date (UTD) status of the standard vaccination series. Individual chi-square tests and a multivariable logistic regression model were utilized to determine predictors of UTD status. Per the complex survey design, data were appropriately weighted and clustered to generate average, annual national population estimates.
RESULTS: Data from 131,783 children were included, representing an extrapolated national estimate of 5,945,295. The percentage of children UTD increased over the study years from 9.2% (2008) to 60.0% (2015). From the multivariable model, adjusting for factors of interest, being UTD was significantly more likely in the 2011–2015 year group, Hispanics, 24–29 month olds, mother's age ≥30, and the census regions West, South and Midwest. UTD status was significantly less likely in 30–35 month olds, non-

Hispanic blacks, families with four or more children, non-first-borns, two or more vaccine providers, mothers with less than a college degree, those with multiple insurance types and those with Medicaid/SCHIP, and those not receiving a flu shot.
CONCLUSION: Receipt of the CDC recommended standard vaccination series has increased dramatically over the study years. Statistically significant predictors of vaccine uptake corroborate older studies and suggest disparities still exist.

261. Rate and predictors of education and action plan use in U.S. office visits for asthma made by patients aged 0–21 years *Titilola Afolabi, Pharm.D.*[1], Kathleen A. Fairman, MA[2], Stacy Haber, Pharm.D.[1], David A. Sclar, B.Pharm., Ph.D.[2]; [1]College of Pharmacy, Midwestern University, Glendale, AZ [2]Department of Pharmacy Practice, Midwestern University, College of Pharmacy-Glendale, Glendale, AZ
INTRODUCTION: Asthma education and asthma action plans (AAPs) are essential components to self-managing asthma symptoms and improving asthma-related outcomes. Limited evidence is available regarding rates of asthma education and AAP provision in patients aged 0–21 years with increased risk of asthma exacerbations.
RESEARCH QUESTION OR HYPOTHESIS: Patients aged 0–21 years with increased risk for asthma exacerbations are provided asthma education and AAPs at office-based physician visits.
STUDY DESIGN: Retrospective analysis of cross-sectional survey database.
METHODS: National Ambulatory Medical Care Survey (NAMCS) data were used to identify asthma-related visits made by patients aged 0–21 years in 2013–2014. The definition of higher-risk asthma-related visits comprised: new diagnosis/flare-up of asthma; complaints of breathing difficulties; asthma classified as moderate or severe; asthma control designated as not well-controlled or very poorly controlled. Primary outcomes included receipt of asthma education and AAPs.
RESULTS: More than 3 million asthma-related office visits were made by patients aged 0–21 years in 2013–2014. Only 31% were provided asthma education, 20% were provided AAPs, and 17% were provided both. Demographic groups relatively more likely to receive education or an AAP included females, patients in the northeastern U.S. region and White non-Hispanic patients. Patients receiving care from non-physician providers (e.g., nurse practitioners, physician assistants) were more likely to be provided asthma education and AAPs compared with physician providers (odds ratio [OR] = 4.665; 95% confidence interval [CI] = 1.807–12.046). Factors consistently negatively associated with receipt of education or an AAP included receipt of the visit in 2014 (OR for AAP = 0.430; 95% CI = 0.240–0.770), and Black non-Hispanic race (OR for AAP = 0.435; 95% CI = 0.190–0.995).
CONCLUSION: A suboptimally low percentage of patients aged 0–21 years with higher risk for asthma exacerbations receive asthma education and AAPs. Black non-Hispanic race reduces the odds of receiving education and AAP by >50%. Additional research and/or provider education are needed to address these disparities.

263. Effect of enrollment in a transition clinic for medically complex adolescents on medication laboratory monitoring *Scott Bolesta, Pharm.D., BCPS, FCCM*[1], Emily Black, Pharm.D., BCPS[2], Andrea Berger, MA, MAS[3], Thomas Davis, M.D.[4], Gerard Greskovic, R.Ph., CACP, CDE[2]; [1]Center for Pharmacy Innovation and Outcomes, Geisinger Health System, Forty-Fort, PA [2]Pharmacy – Medication Therapy Disease Management, Geisinger Health System, Danville, PA [3]Research Support Cores, Geisinger Health System, Danville, PA [4]General Internal Medicine, Geisinger Health System, Danville, PA
INTRODUCTION: Pediatric patients with complex chronic conditions who transition into adulthood are often on multiple medications, many of which require laboratory monitoring. To assist with the medication therapy management of these patients the medical team in Geisinger Health System's Complex Care Clinic (CCC) includes a pharmacist.
RESEARCH QUESTION OR HYPOTHESIS: Patient enrollment in a clinic for medically complex adolescents staffed with a pharmacist improves medication laboratory monitoring.
STUDY DESIGN: Retrospective cohort study.
METHODS: Patients whose first visit in the CCC occurred between July 2012 and March 2015 were enrolled. Data obtained from the electronic health record were collected between July 2011 and March 2016. The primary outcome was the change in required medication laboratory assessments 12 months after clinic enrollment. Paired t-tests were applied to continuous variables and McNemar's tests to categorical variables. Statistical analysis was performed using SAS version 9.4. P-values less than 0.05 were considered statistically significant.
RESULTS: The study cohort included 216 patients with a median age of 20 years (IQR 18, 23), 60.2% being male, and a median of 5 medication classes (IQR 2, 7) utilized per patient upon clinic enrollment. Comprehensive medication reconciliation was performed for 142 patients 12 months after clinic enrollment, with 100 of these patients requiring laboratory assessment of at least one mediation at both enrollment and follow-up. During this period the mean number of medication classes utilized per patient increased by 0.43 (SD 1.55; $p = 0.0013$). The number of required medication laboratory assessments per patient also increased by 0.64 (SD 2.16; $p = 0.0006$). The change in percentage of required medication laboratory assessments performed after comprehensive medication reconciliation increased by 2.89 (SD 36.8; $p = 0.434$).
CONCLUSION: Medication laboratory monitoring improved, but not significantly, 12 months after patient enrollment in a clinic for medically complex adolescents staffed with a pharmacist. The direct impact of the pharmacist on mediation laboratory monitoring requires further investigation.

264. Evaluation of medication-related risk factors and pediatric hospital readmissions Tara Warren Miller, Pharm.D., BCPPS[1], Kathryn Limke, Pharm.D.[2], Richard Robertson, Pharm.D.[2], Courtney Cash, Pharm.D.[2], *Hanna Phan, Pharm.D., FCCP*[3]; [1]University of Virginia Children's Hospital, Charlottesville, VA [2]University of Arizona College of Pharmacy, Tucson, AZ [3]University of Arizona, Colleges of Pharmacy and Medicine, Tucson, AZ
INTRODUCTION: Age, length of stay, ethnicity, public insurance, and complex chronic conditions have been identified as risk factors for readmission in pediatrics. Factors specific to discharge medications have not been well defined.
RESEARCH QUESTION OR HYPOTHESIS: What are possible discharge medication-specific factors associated with 90-day pediatric hospital readmission, including total number, dosing frequency, and off-label medication use?
STUDY DESIGN: Retrospective chart review.
METHODS: This was a evaluation of general medicine pediatric patients admitted to a tertiary academic medical center during a three-month period. Exclusion criteria included age >18 years, admissions <24 h, admission to NICU or for chemotherapy only. Data collection included patient demographics (including complex chronic conditions), discharge prescription information, original length of stay, and readmission within 90 days of discharge. Data analyses completed on STATA 11.0, included Mann Whitney U and Chi square (Fisher Exact) and univariate and multivariate logistic regression analyses, with alpha priori of 0.05.
RESULTS: A total of 702 admissions were included in the study with 86 patients (12.3%) readmitted within 90 days of discharge.

Based on univariate analyses significant differences between groups (readmission within 90 days vs. no readmission within 90 days) included: sex (female>male, $p = 0.034$), greater original length of hospital stay ($p < 0.001$), higher number of medications at discharge ($p < 0.001$), higher number of complex chronic conditions ($p < 0.001$), at least one medication dosed three times a day ($p < 0.001$), at least one high risk medication on discharge ($p < 0.001$), higher proportion of off-label medications on discharge ($p = 0.0025$), and third party payer (Medicaid) ($p = 0.045$). In multivariate analysis, male sex (OR 0.57, 95% CI: 0.34–0.96), number of medications at discharge (OR 1.19, 95% CI: 1.11–1.27), and number of complex chronic conditions (OR 1.27, 95% CI: 1.02–1.58) were associated with readmission within 90 days.

CONCLUSION: Discharge medication related factors are associated with 90-day pediatric readmission and future studies to evaluate possible interventions related to this factor should be considered.

265. Perspectives of rural and non-rural Arizona community pharmacists on pediatric dosing and recommendations Jackie Hu, Pharm.D.[1], Grace Lin, Pharm.D.[1], Elizabeth Hall-Lipsy, JD, MPH[2], *Hanna Phan, Pharm.D., FCCP*[3]; [1]University of Arizona College of Pharmacy, Tucson, AZ [2]Pharmacy Practice & Science, University of Arizona College of Pharmacy, Tucson, AZ [3]University of Arizona, Colleges of Pharmacy and Medicine, Tucson, AZ

INTRODUCTION: Community rural settings, such as those seen in Arizona, present unique practice challenges (e.g., potentially limited pediatric drug information resources). Data regarding perceptions of community pharmacists, in rural vs. non-rural settings, with regards to recommending, verifying, and providing caregiver education on medication use in the pediatric population is currently lacking.

RESEARCH QUESTION OR HYPOTHESIS: Are there differences in community pharmacists' comfort level in caring for pediatric patients between rural and non-rural settings?

STUDY DESIGN: Survey Study.

METHODS: A 33-item survey tool was distributed electronically to pharmacists registered with the Arizona State Board of Pharmacy. Community pharmacists (i.e., practicing at a chain or independent community pharmacy) were included in the study. The survey tool, developed based on the previous published studies, collected data regarding: 1) experience with dispensing pediatric medications, 2) confidence level in managing pediatric drug therapy, and 3) demographics. Rural urban commuting area (RUCA) coding was used to classify subjects into rural (i.e., community of 50,000 people or smaller) and non-rural (i.e., urban and suburban) groups. Data analyses, completed on STATA, included Wilcoxon rank sum and Chi-squared (Fisher's exact) test with an alpha a-priori of 0.05.

RESULTS: A total of 482 community pharmacists completed the survey with 49 (10.2%) in rural and 433 (89.8%) in non-rural areas. The rural group had significantly higher median age ($p = 0.0004$) and years in practice ($p = 0.0006$), as well as more likely to be past parents ($p = 0.001$) and have a Bachelor's (vs. Pharm.D.) Pharmacy degree ($p = 0.001$). There was no significant difference between groups regarding experience in dispensing pediatric prescription medications; however, the rural group reported greater confidence in calculating and recommending weight-based dosing for prescription and OTC medications ($p = 0.022$ and 0.031, respectively) and identifying a dosing error in pediatric prescriptions ($p = 0.016$).

CONCLUSION: Rural community pharmacists report similar or greater confidence in providing care for children compared to their non-rural counterparts.

266. Evaluation of somatostatin analogs for the prevention of post-operative pancreatic fistulas Jason Kurian, Pharm.D.[1], Laura Hatfield, Pharm.D.[1], *Rachel Kruer, Pharm.D.*[1], Ammar Javed, M.D.[2], Michael Wright, BS[3], Caitlin Beane, PA[4], Kevin Soares, M.D.[2], Matthew Weiss, M.D.[2]; [1]Department of Pharmacy, The Johns Hopkins Hospital, Baltimore, MD [2]Department of Surgery, The Johns Hopkins Hospital, Baltimore, MD [3]The Johns Hopkins University – School of Medicine, Baltimore, MD [4]The Johns Hopkins Hospital, Baltimore, MD

INTRODUCTION: Post-operative pancreatic fistula (POPF) is the most common major complication after pancreatectomy. Somatostatin analogs have been used to reduce the incidence of POPF with mixed results.

RESEARCH QUESTION OR HYPOTHESIS: What is the rate of POPF and clinical outcomes in patients undergoing pancreatectomies who received prophylactic pasireotide or octreotide?

STUDY DESIGN: Retrospective, observational, single-center, matched cohort study.

METHODS: Patients were included if they were >18 years old, underwent a pancreatectomy, and received either pasireotide or octreotide prophylactically. Patients were matched in a 1:1 ratio based upon type of surgery, pancreatic gland texture, and pancreatic duct size. Patients were enrolled in reverse chronological order from January 2012 to December 2016. The primary endpoint was 30-day incidence of POPF. Categorical data was analyzed using Chi-square or Fisher's exact test and continuous data was analyzed using Wilcoxon rank sum test. Analyses were performed using STATA 13.0.

RESULTS: A total of 50 patients were included in the study after matching, with 25 patients in each group. A majority underwent a pancreaticoduodenectomy (96%), had a soft pancreatic gland texture (92%), and dilated pancreatic duct (92%). The 30-day incidence of POPF was 12% ($n = 3$) and 52% ($n = 13$) in the pasireotide and octreotide group respectively ($p = 0.005$). No significant differences were observed between the two groups in terms of maximum QTc, maximum blood glucose, delayed gastric emptying, antiemetic use, 30-day readmission, and 30-day mortality. Patients in the pasireotide group had a shorter length of stay (9 days vs. 12 days, $p = 0.002$) and required a shorter duration of prophylaxis (6 days vs. 8 days, $p = 0.0001$). The multivariate logistic regression demonstrated significantly lower rates of POPF in the pasireotide group after adjusting for age, body mass index, and intraoperative blood loss (OR: 11.9, 95% CI: 2.3–60.5, $p = 0.003$).

CONCLUSION: When compared with octreotide, despite a shorter duration of prophylaxis, the use of pasireotide was associated with a significant reduction in the incidence of POPF.

267. Perioperative administration of tranexamic acid in total hip and total knee arthroplasty: a retrospective analysis *Anasemon Aioub, Pharm.D.*[1], Kyala Pascual, RN[2], Luigi Brunetti, Pharm.D., MPH[3], Christopher Adams, Pharm.D.[4]; [1]Ernest Mario School of Pharmacy, Rutgers, The State University of New Jersey, Piscataway Township, NJ [2]Nursing, Robert Wood Johnson University Hospital – Somerset, Somerville, NJ [3]Department of Pharmacy, Robert Wood Johnson University Hospital Somerset, Somerville, NJ [4]Ernest Mario School of Pharmacy, Rutgers, The State University of New Jersey, Piscataway, NJ

INTRODUCTION: Total hip and total knee arthroplasties (THA and TKA) cause significant blood loss, often resulting in the need for allogeneic blood transfusions to correct postoperative anemia. Tranexamic acid (TXA) is an antifibrinolytic used to reduce operative blood loss.

RESEARCH QUESTION OR HYPOTHESIS: Perioperative TXA administration reduces blood loss after THA and TKA, consequently reducing allogeneic blood transfusion requirements, without increasing postoperative complications.

STUDY DESIGN: This retrospective cohort study was conducted by chart review at an academic community medical center.

METHODS: Our study included patients 18 years and older who underwent THA or TKA. The control group included patients who underwent surgery in 2012, before implementation of a TXA protocol in 2013. The study group included patients who underwent surgery in 2014 and received two perioperative doses of intravenous TXA. Doses were chosen at the discretion of the anesthesiologist, up to 1 gram. The primary outcome was a drop in hemoglobin of >3 mg/dL within 48 h of surgery. Secondary outcomes included postoperative decline in hematocrit within 48 h of surgery and the incidence of blood transfusion during hospital admission.
RESULTS: Of the 221 patients who received TXA, 32.1% experienced drops in hemoglobin >3 mg/dL from baseline versus 72.4% of the 279 patients in the control group ($p < 0.01$). There was an 11.5% absolute reduction in the incidence of transfusions in the treatment group compared to the control group (3.6% and 15.1%, respectively; $p < 0.01$). The mean decrease in hematocrit was less in the treatment group (8.0%; 95% CI, 7.6% to 8.4%) than in the control group (10.6%; 95% CI, 10.2% to 11.0%; $p < 0.01$). The incidence of deep vein thrombosis and pulmonary embolism was similar in both groups.
CONCLUSION: Use of TXA during THA and TKA was associated with significantly fewer patients experiencing decreases in hemoglobin >3 mg/dL from baseline and fewer blood transfusions, without negatively impacting safety.

Pharmacoeconomics/Outcomes

268. A cost-minimization analysis of dalbavancin compared to conventional therapy for the outpatient treatment of skin and skin-structure infections *Neil Turco, Pharm.D.*[1], Sandra Kane-Gill, Pharm.D., MS, FCCM, FCCP[2], Frank D'Amico, Ph.D.[3], Louise-Marie Oleksiuk, Pharm.D.[4], Aaron Pickering, Pharm.D., BCPS[5]; [1]Department of Medical Education-Family Medicine, UPMC St. Margaret, Pitt, PA [2]University of Pittsburgh School of Pharmacy, Pittsburgh, PA [3]Department of Biostatistics, UPMC St. Margaret, Pittsburgh, PA [4]Department of Pharmacy, UPMC Shadyside, Pittsburgh, PA [5]Department of Pharmacy, UPMC – St. Margaret, Pittsburgh, PA
INTRODUCTION: Skin and skin-structure infections (SSSI) are common infectious diseases (ID) that often require intravenous antibiotics. Dalbavancin is a novel lipoglycopeptide antibiotic administered once that is FDA approved for the treatment of SSSI. No literature is available on the cost-comparability relative to conventional therapy.
RESEARCH QUESTION OR HYPOTHESIS: A cost minimization analysis of outpatient treatment for SSSI using dalbavancin compared to conventional therapy.
STUDY DESIGN: Retrospective cohort study.
METHODS: This retrospective chart review examined adult patients admitted from January 2015 to August 2016 to a community teaching hospital for SSSI who were discharged on IV antibiotic therapy, either dalbavancin or conventional therapy, and received infusions at a hospital-based ID clinic. In-hospital baseline demographics as well as outpatient clinical variables and outcomes were assessed. The primary outcome was the total ID related cost of care per patient, which encompassed antibiotics, drug administration, and ID related hospital readmissions or emergency department (ED) visits within 60 days of treatment, adjudicated by an ID physician. Clinical cure was defined as absence of ID related hospital readmission/ED visit within 60 days of treatment.
RESULTS: 158 patients were included: 64 received dalbavancin and 94 received conventional therapy. The total ID related cost of care per patient was greater with dalbavancin (mean $4,560.69, median $4,281.74) versus conventional (mean $1,667.54, median $78.54), $p < 0.01$. In the subset of patients treated with daptomycin, the total ID related cost per patient (mean $5,217.69, median $6,471.48) was comparable to dalbavancin (mean $4,560.69, median $4,281.74). Consistent with the literature, clinical cure was not statistically significantly different between dalbavancin and conventional, 93.8% versus 86.2%, respectively, $p>0.05$.
CONCLUSION: Dalbavancin was more costly than conventional therapy for the outpatient treatment of SSSI when all ID related costs were included. This greater overall cost was likely driven by the higher acquisition cost of dalbavancin. Dalbavancin may be comparable to the daily use of daptomycin for SSSI.

269. Cost-effectiveness of pneumococcal vaccination program for Hong Kong elderly patients at hospital discharge Wing-yin Cheung, BPharm, *Joyce You, Pharm.D., BCPS*; School of Pharmacy, The Chinese University of Hong Kong, Shatin, Hong Kong
INTRODUCTION: Hong Kong government vaccination subsidy schemes provide financial support to elderly to receive 23-valent pneumococcal polysaccharide vaccine, yet the vaccine coverage rate was low (34%). Inpatient vaccination program was reported to improve pneumococcal vaccine coverage in elderly patients at discharge.
RESEARCH QUESTION OR HYPOTHESIS: We aimed to analyze the cost-effectiveness of a pneumococcal vaccination program (PVP) for elderly patients in the Hong Kong hospital setting.
STUDY DESIGN: Decision-analytic modelling from perspective of public healthcare provider.
METHODS: A 10-year Markov model was designed to simulate the outcomes of PVP versus no vaccination program (control group) in elderly patients ready for hospital discharge. Model outcomes included direct medical costs, pneumococcal pneumonia infection rate, invasive pneumococcal disease (IPD) infection rate, mortality rate and quality-adjusted life year loss (QALY loss). Model inputs were derived from the literature and sensitivity analyses were conducted to examine robustness of base-case results.
RESULTS: In the base-case analysis, PVP reduced cost (USD 402 vs. USD 480), QALY loss (0.0470 vs. 0.0577), pneumonia infection rate (0.2615 vs. 0.3214), IPD infection rate (0.00050 vs. 0.00062) and mortality rate (0.00669 vs. 0.00823). One-way sensitivity analysis showed the base-case results to be robust and found no threshold value in all model inputs. Probabilistic sensitivity analysis showed the PVP to be cost-effective in 100% of 10,000 Monte Carlo simulations.
CONCLUSION: PVP for elderly patients at hospital discharge appears to reduce cost, pneumococcal infection rate, mortality rate and QALY loss in Hong Kong.

271. Comparison of incidence and severity of hypoglycemia between two computerized insulin management algorithms in a multi-hospital system *Chelsea Spencer, Pharm.D.*[1], Dyan Cherry, Pharm.D.[2]; [1]HonorHealth Scottsdale Medical Centers, Scottsdale, AZ [2]HonorHealth Osborn Medical Center, Scottsdale, AZ
INTRODUCTION: Computerized insulin protocols are superior to paper calculations. There are few studies comparing computerized protocols. The ideal way to manage inpatient hyperglycemia is not clearly defined in national guidelines.
RESEARCH QUESTION OR HYPOTHESIS: The objective of this study is to compare the safety of two algorithms in a multi-hospital system.
STUDY DESIGN: Retrospective chart review of insulin management algorithms with a pre-cohort proprietary algorithm comparing to a post-cohort commercially purchased program.
METHODS: Cases for each cohort were identified through blood glucose $\leq$70 mg/dL. Events were included if they had active orders for insulin, age $\geq$18 years, and received treatment for hypoglycemia. Cost and utilization analyses of basal insulin and hypoglycemia treatment was completed. Categorical data was analyzed using Chi-square test. An independent measures *t*-test was used to compare cohorts for differences in sample size. A $p \leq 0.05$ was considered significant. All statistical tests were conducted by a statistician.

RESULTS: There were 411 hypoglycemic events of 64,541 (0.6%) in the pre-cohort, with 53 severe events or a BG ≤50 mg/dL (0.08%). In comparison, 666 hypoglycemic events occurred in the post-cohort of 55,728 (1.2%). Of which 78 were severe (0.14%). There was a significant difference in the incidence of hypoglycemia, $\chi^2 = 102.502$, $p < 0.001$. The incidence of severe hypoglycemia was significantly different, $\chi^2 = 8.654$, $p < 0.05$. The amount of insulin glargine utilized increased by 118,960 units. The cost for hypoglycemia treatment increased by ~$10,000, which was highly affected by a 10-fold increase in glucagon usage.
CONCLUSION: There was a statistically significant difference in the incidence and severity of hypoglycemia. The commercially available algorithm had more hypoglycemic events than the proprietary, in-house algorithm. Utilization of of insulin glargine and hypoglycemia treatment agents increased. In addition, the cost to the health-system increased and did not include the cost of the software.

Pharmacoepidemiology

272. Do the types and routes of proton pump inhibitor treatments affect Clostridium difficile in ICU patient? *Peia Lee, Pharm.D. Candidate*[1], David S. Fike, Ph.D.[1], Ronald Hall, Pharm.D.[2], Steven Pass, Pharm.D.[3], Carlos Alvarez, Pharm.D., M.Sc., BCPS[1]; [1]School of Pharmacy, Texas Tech University Health Sciences Center, Dallas, TX [2]Texas Tech Health Sciences Center, Dallas, TX [3]VA North Texas Healthcare System, Texas Tech University Health Sciences Center, Dallas, TX
INTRODUCTION: The use of proton pump inhibitors (PPI) in intensive care unit (ICU) patients has been associated with *Clostridium difficile* infection (CDI). CDI has been shown to increase the risk of death, length of stay, and hospital costs.
RESEARCH QUESTION OR HYPOTHESIS: Are the types and routes of PPI exposure in the ICU associated with CDI?
STUDY DESIGN: Retrospective cohort study of ICU patients from 2001 to 2008 in the Multiparameter Intelligent Monitoring in Intensive Care II database (MIMIC II).
METHODS: Patient data was extracted from the MIMIC II that includes ICU patient records from a tertiary care hospital. Patients >18 years old, admitted to the medical, surgical, and cardiac ICUs were included in the study. Types of PPI exposures were defined as omeprazole, esomeprazole, lansoprazole, and pantoprazole. Routes of PPI administration were either oral or intravenous that were received during the patient's hospital stay. Patients who received histamine receptor antagonists (H2RA) were the control arm. CDI was identified using ICD-9 diagnostic code 008.45. Multiple logistic regression analysis was used to calculate odds ratios (OR) adjusting for patient age, comorbidities, feeding tube placement, gastrointestinal surgical procedures, hospital length of stay, and methotrexate exposure.
RESULTS: 16,820 ICU patients were included in the study. The mean age was 63 (SD ± 17) years old and 56.7% were male. The mean hospital length of stay was 10.2 days (SD ± 11). CDI occurred in 2.4% of patients during their ICU stay. Pantoprazole was the most commonly prescribed PPI (50%) followed by lansoprazole (10%). CDI occurred more frequently in patients receiving PPIs than H2RAs (3% vs. 0.8%, $p < 0.001$). CDI prevalence was increased with IV (95% CI = 1.69–3.39, OR 2.4) and PO (95% CI = 1.59–3.27, OR 2.3) PPI use compared to H2RAs.
CONCLUSION: Both IV and PO PPI use in the ICU were independently associated with CDI.

273. Comparison of hospital resource utilization parameters in patients with nonvalvular atrial fibrillation anticoagulated with rivaroxaban versus warfarin: a retrospective cohort study *Barkha Jain, Pharm.D. Candidate*[1], Luigi Brunetti, Pharm.D., MPH[2]; [1]Department of Pharmacy Practice and Administration, Ernest Mario School of Pharmacy, Rutgers, The State University of New Jersey, Piscataway, NJ [2]Department of Pharmacy, Robert Wood Johnson University Hospital Somerset, Somerville, NJ
INTRODUCTION: The economic burden of the treatment of nonvalvular atrial fibrillation (NVAF) is mainly driven by hospitalization costs. The choice of anticoagulation therapy in NVAF patients may affect hospital resource utilization.
RESEARCH QUESTION OR HYPOTHESIS: Anticoagulation with rivaroxaban versus warfarin may be associated with reduced hospital resource utilization in NVAF patients.
STUDY DESIGN: Retrospective cohort study.
METHODS: All consecutive patients discharged from the medical center with a diagnosis of NVAF and anticoagulated with rivaroxaban or warfarin between January 2012 and May 2015 were included. The primary endpoint was difference in median inpatient length of stay (LOS) between rivaroxaban and warfarin treated patients. The secondary endpoints included hospital charges, all-cause 30-day hospital readmission rates, and anticoagulant-related readmission within 30 days. Data were analyzed using descriptive statistics. Binary outcomes were analyzed using Chi Square and continuous variables using independent *t*-test or Mann–Whitney *U* test depending on distribution. Linear and multivariable logistic regressions were constructed to adjust for potential confounding. A multivariable logistic regression was constructed to identify predictors of rivaroxaban prescription.
RESULTS: The study included 620 patients (281 in the rivaroxaban cohort and 339 in the warfarin cohort). Baseline characteristics were similar with respect to female gender, race, and Charlson Comorbidity Index (CCI). Rivaroxaban-treated patients had a significantly shorter median LOS by 3 days (5 days versus 2 days, warfarin versus rivaroxaban, respectively; $p = 0.003$). Rivaroxaban use was also associated with a significant reduction of $20,347.99 in median patient charges ($p = 0.001$). No significant difference in readmission rates was observed between groups after adjusting for CCI and chronic obstructive pulmonary disease (COPD) (rivaroxaban 11.7% versus warfarin 15.6%; OR = 0.78; 95% CI 0.49–1.26; $p = 0.309$). Anticoagulant-related readmission was similar between groups (rivaroxaban 1.8% versus warfarin 2.9%; OR = 0.60; 95% CI 0.20–1.77; $p = 0.350$). COPD and advanced age were predictors of warfarin use.
CONCLUSION: Anticoagulation with rivaroxaban compared to warfarin may reduce hospital LOS and patient charges in NVAF patients.

Pharmacogenomics/Pharmacogenetics

275. Potential genetic association of APOA2, FTO, FADS1, LIPC, and LPL with body mass index measurements among the general population Sandy Ninh, Pharm.D. Candidate[1], Mariko Nakano, Ph.D.[2], Charles Sailey, M.D.[2], *Marina Kawaguchi-Suzuki, Pharm.D., Ph.D.*[1]; [1]School of Pharmacy, Pacific University, Hillsboro, OR [2]Department of Research and Development, Molecular Testing Labs, Vancouver, WA
INTRODUCTION: Both lipid synthesis and metabolism biologically contribute to body composition. APOA2, FTO, FADS1, LIPC, and LPL genes play a role in these functions, and polymorphisms have been identified in humans. Single nucleotide polymorphisms (SNPs) present in these genes may be important factors to explain differences in BMI measurements among the general population.
RESEARCH QUESTION OR HYPOTHESIS: SNPs in APOA2, FTO, FADS1, LIPC, or LPL genes are associated with BMI measurements in the general population who participated in genetic self-testing.
STUDY DESIGN: This was a retrospective study to investigate potential association of genetic polymorphisms with BMI information collected from a self-testing database.
METHODS: DNA samples and demographic information were submitted to a commercial laboratory for self-testing. De-identified genetic and demographic data were collected from the laboratory's database. Genotypes were available on seven SNPs (rs5082,

rs8050136, rs9939609, rs16945088, rs174547, rs1800588, and rs328) located in APOA2, FTO, FADS1, LIPC, and LPL genes. The outcome of interest was the effect on BMI. Statistical analyses were performed with SPSS version 24.0 (IBM corporation, Armonk, NY). Nominal significance was set at p-value <0.05; statistical significance was defined as p-value <0.007 with Bonferroni-correction.
RESULTS: Genotype and demographic information were searched from 408 participants (80.4% Caucasians, 4.7% Hispanic/Latino, 3.7% Mixed Race, 3.4% African Americans, 3.4% Other, 3.2% Asian, 0.9% Hawaiian/Pacific Islander, 0.2% American Indian/Native Alaskan). Among Caucasians, an association was found between APOA2 rs5082 genotype and BMI (p = 0.01). For the combined analysis of all ethnicity groups, the association remained significant (recessive model: p = 0.003); BMI measurements were 26 ± 6, 27 ± 6, and 29 ± 8 (mean ± SD) for the AA, AG, and GG genotypes respectively.
CONCLUSION: This study showed APOA2 rs5082 was associated with BMI measurements. The homozygous variants are more likely to have a higher BMI than those with the wildtype or heterozygous genotypes.

276E. Utilization of a CYP2C19 genotype-guided antiplatelet treatment algorithm over time in patients undergoing percutaneous coronary intervention *Alexandra Cervantes, Pharm.D. Candidate*[1], Vindhya B. Sriramoju, M.D.[2], Nicholas Varunok, M.D. Candidate[2], Kasey Hamrick, Pharm.D.[1], George A. Stouffer, M.D.[2], Craig Lee, Pharm.D., Ph.D., FCCP[1]; [1]Division of Pharmacotherapy and Experimental Therapeutics, UNC Eshelman School of Pharmacy, Chapel Hill, NC [2]Division of Cardiology, UNC School of Medicine, Chapel Hill, NC
Presented at American College of Clinical Pharmacy Virtual Poster Symposium, May 17, 2017.

277. The effect of genetic variants on warfarin dosing to achieve optimal therapeutic outcome *Loulia Bader, B*(Pharm)[1], Ahmed Mahfouz, R.Ph., CDE, BCPS, CACP[2], Mohamed Kasem, B (Pharm)[2], Shaban Mohammed, R.Ph., BSc Pharm Hons, PEBCanada, BCPS[2], Sumaya AlYafei, Pharm.D.[2], Osama Abd El Samad, B (Pharm)[2], Rasha El Enany, B(Pharm)[2], Ezz Edin Elsoaly, M.D.[2], Abdel-Naser Elzouki, M.D.[2], Nasser Rizk, M.D., Ph.D.[1], Sherief Khalifa, Ph.D.[1], Mohamed Shahin, Ph.D.[3], Julie A. Johnson, Pharm.D.[3], Hazem Elewa, Ph.D., R.Ph., BCPS[1]; [1]Qatar University, Doha, Qatar [2]Hamad Medical Corporation, Doha, Qatar [3]Department of Pharmacotherapy and Translational Research and Center for Pharmacogenomics, College of Pharmacy, University of Florida, Gainesville, FL
INTRODUCTION: Genetic and non-genetic factors were shown to affect warfarin dosing;however, their effect may vary from one population to the other. No previous studies were conducted on the Qatari population to elucidate these factors.
RESEARCH QUESTION OR HYPOTHESIS: What is the prevalence of *VKORC1*, *CYP2C9*, and *CYP4F2* genetic variants in Qataris? and what is their contribution to warfarin dose variability?
STUDY DESIGN: An observational cross sectional study.
METHODS: We recruited warfarin-treated patients on a stable dose and a therapeutic INR for at least 3 consecutive clinic visits. Saliva samples were collected using Oragene DNA self-collection kit, followed by DNA purification and genotyping via TaqMan Real-Time-PCR assay.
RESULTS: Out of 150 recruited patients, 83 samples were analyzed. Mean age was 65.9 ± 11.9 and atrial fibrillation was the most common indication (77%), followed by aortic valve replacement (10.8%). The minor allele frequency (MAF) of *VKORC1* (−1639G>A) was A 0.44, while the MAF's for the *CYP2C9**2 and *3 and *CYP4F2**3 were T (0.12), C (0.35) and T (0.41), respectively. Carriers of the A allele for VKORC1 (−1639G>A) required significantly lower warfarin doses compared to non-carriers (35.26 mg/week vs. 55.72 mg/week, p < 0.0001). Furthermore, a statistically significant difference was seen in the mean warfarin dose between carriers of the T allele for *CYP2C9**2 and those with the wild type (27 mg/week vs. 45.87 mg/week, p = 0.002). Multiple linear regression showed that age, antiplatelet medications, *VKORC1*(−1639G>A), *CYP2C9**2 & *3 and *CYP4F2**3 are significant predictors of warfarin dose and together they described 41% of warfarin dose variability in Qatari patients.
CONCLUSION: This study revealed that genetic and non-genetic factors explained 41% of warfarin dose variability in Qataris. These factors include *VKORC1*(−1639G>A), *CYP2C9**2, *3 and *CYP4F2**3 as well as age and antiplatelet therapy

278E. Implementation of a pharmacist-led pharmacogenomics service for the Program of All-inclusive care for the elderly (PHARM-GENOME-PACE) *Kevin Bain, Pharm.D., MPH*, Emily Schwartz, Pharm.D., Jacques Turgeon, BPharm, Ph.D.; Science, Education, and Research Department (SERD) Tabula Rasa HealthCare, Moorestown, NJ
Presented at the International Pharmaceutical Federation (FIP), 76th FIP World Congress of Pharmacy and Pharmaceutical Sciences 2016, Buenos Aires, Argentina, August 29, 2016.

279E. Development of an online pharmacogenomics certificate program for practicing pharmacists *Christina L. Aquilante, Pharm.D.*[1], Jodie Malhotra, Pharm.D.[2], Kari Franson, Pharm.D., Ph.D.[2]; [1]Department of Pharmaceutical Sciences, University of Colorado, Aurora, CO [2]Department of Clinical Pharmacy, University of Colorado Skaggs School of Pharmacy, Aurora, CO
Presented at the International Pharmaceutical Federation (FIP) World Congress of Pharmacy and Pharmaceutical Sciences, Seoul, Republic of Korea, September 10-14, 2017.

280E. An intensive clinical pharmacogenomics course for pharmacists in developing countries: the University of Colorado and Children's Cancer Hospital Egypt experience *Christina L. Aquilante, Pharm.D.*[1], Sherif Kamal, R.Ph., MSc[2], Mohamed Nagy, R.Ph., MSc[3], Jodie Malhotra, Pharm.D.[4], Kari Franson, Pharm.D., Ph.D.[4], Manal Zamzam, M.D.[2], Sherif Abouelnaga, M.D.[2]; [1]Department of Pharmaceutical Sciences, University of Colorado, Aurora, CO [2]Children's Cancer Hospital Egypt 57357, Cairo, Egypt [3]Children's Cancer Hospital Egypt 57357, Cairo, Egypt [4]Department of Clinical Pharmacy, University of Colorado Skaggs School of Pharmacy, Aurora, CO
Presented at the 9th Monash University Pharmacy Education Symposium, Prato, Italy, July 9-12, 2017.

281E. Identification of novel genotypes related to tacrolimus pharmacokinetics in early after kidney transplantation *Minji Sohn, M.S.*[1], Myeong Gyu Kim, Ph.D.[2], Nayoung Han, Ph.D.[2], In-Wha Kim, Ph.D.[2], Jungsoo Gim, Ph.D.[3], Sang-il Min, M.D., Ph.D.[4], Jongwon Ha, M.D. Ph.D.[4], Yon Su Kim, M.D., Ph.D.[4], Eun-Young Song, M.D. Ph.D.[4], Jung-Mi Oh, Pharm.D.[2]; [1]College of pharmacy, Seoul national university, College of Pharmacy, Seoul National University, Seoul, Korea, Republic of (South) [2]College of Pharmacy, Seoul National University, Seoul, Korea, Republic of (South) [3]Seoul National University, Seoul, Korea, Republic of (South) [4]Seoul National University Hospital, Seoul, Korea, Republic of (South)
Presented at the Asian Conference on Clinical Pharmacy, Seoul, Korea, July 14-17, 2016.

Pharmacokinetics/Pharmacodynamics/Drug Metabolism/Drug Delivery

282. Accuracy of an abbreviated cockcroft-gault equation for predicting creatinine clearance *Brent Reed, Pharm.D., BCPS-AQ Cardiology*, Emily Heil, Pharm.D., BCPS-AQ ID; Department of Pharmacy Practice and Science, University of Maryland School of Pharmacy, Baltimore, MD

INTRODUCTION: The Cockcroft-Gault (CG) equation, which incorporates patient age, gender, weight, and serum creatinine, is widely used to estimate creatinine clearance (CrCl). The optimal weight to use in the equation remains controversial, especially in overweight patients. An abbreviated, non-weight CG equation may provide a simple and accurate approach to estimating CrCl.

RESEARCH QUESTION OR HYPOTHESIS: To evaluate the impact of various body weights or no weight on the predictive accuracy of the CG equation.

STUDY DESIGN: Retrospective observational analysis of patients at the University of Maryland Medical Center with a measured 24-h urine CrCl between December 2015 and December 2016.

METHODS: Measured CrCl was calculated based on 24-h urine creatinine, and estimated with the CG equation using multiple body weight models (actual, ideal, adjusted, lean, and no weight). Subgroup analysis of underweight and overweight patients was also performed. Pearson correlation was used to compare measured and CG-estimated CrCl using each body weight model, and a Vuong approach was used to compare models. Variables for adjusted models were determined by multiple linear regression. Analyses were performed using SAS version 9.4 (SAS Institute, Cary, NC).

RESULTS: A total of 179 patients had 24-h urine CrCl measured, with a broad representation of actual body weight (mean 88.4 kg $\pm$ 29.8) and serum creatinine values. Correlation between measured CrCl and CG estimates was high for all scenarios (0.86, 0.86, 0.78, 0.85 for actual, ideal, lean and non-weight, respectively). The non-weight and actual weight models provided the closest estimates of measured CrCl ($p < 0.0001$ for both). All models were poorly predictive of CrCl among underweight patients. Among overweight patients, the non-weight model best predicted CrCl.

CONCLUSION: An abbreviated CG equation that excludes weight is a simple and accurate way to estimate CrCl.

283. Clinical Pharmacokinetics (PK) of polatuzumab vedotin (Pola) in combination with rituximab (R), obinutuzumab (G), cyclophosphamide (C), doxorubicin (H) and bendamustine (B) in 1 L or Relapsed/ Refractory (R/R) Non-Hodgkin's Lymphoma (NHL) patients *Priya Agarwal, MS Biostatistics*, Dan Lu, Ph.D., Divya Samineni, Ph.D., Randy Dere, MS, Hao Ding, MS, Jamie Hirata, Ph.D., Sandhya Girish, Ph.D., Chunze Li, Ph.D., Dale Miles, Ph.D.; Genentech Inch., South San Francisco, CA

INTRODUCTION: Pola is an anti-CD79b targeted antibody conjugated to cytotoxic MMAE via a protease cleavable peptide linker. Pola in combination with chemoimmunotherapy is being investigated in NHL.

RESEARCH QUESTION OR HYPOTHESIS: Is the exposure of Pola altered among combinations with standard of care chemoimmunotherapy in various NHL disease indications?

STUDY DESIGN: Pola at 1.8 mg/kg was given q3w in combination with R or G, plus B or CHP in three studies; GO27834 [R/G + Pola in (R/R) NHL, (N = 207)], GO29044 [R/G + CHP + Pola in 1L DLBCL, (N = 71)], and GO29365 [R/G + B + Pola in R/R DLBCL/FL, (N = 141)]

METHODS: The PK of Pola analytes [total antibody, conjugate (evaluated as antibody-conjugated MMAE [acMMAE]), and unconjugated MMAE] and plasma/serum PK of combination agents was assessed in the 3 studies. Non-compartmental Analysis of available interim cycle1 PK data [GO27834 (n = 70), GO29044 (n = 53), GO29365 (n = 97)] was used to assess PK exposure including Cmax, AUC, and/or concentration at planned sampling time points. Previous analyses suggest that acMMAE exposure is an important predictor of safety/efficacy. Unconjugated MMAE exposure was evaluated graphically.

RESULTS: Across 3 studies, acMMAE AUC geometric mean (GM) ranged from 1,784 to 2,961 day*ng/mL and GM for unconjugated MMAE concentration at 7 days (approximate Cmax) ranged from 0.36–2.63 ng/mL. Within each relevant study, geometric mean ratio (GMR) for acMMAE AUC was 1.00–1.12 for FL versus DLBCL (GO27834 and GO29365) and 0.94–1.17 for R versus G containing combinations (for each study). When co-administered with CHP (in DLBCL) or B (both FL and DLBCL), acMMAE AUC GMR was 0.86 (study GO29044 vs. GO27834) and 1.21 (GO29365 vs. GO27834), respectively.

CONCLUSION: No clinically meaningful difference in acMMAE AUC was observed between DLBCL versus FL, for R versus G, or with/ without co-administration of CHP or B. Therefore, Pola exposure was not markedly altered in combinations with chemoimmunotherapy across the NHL diseases studied.

284. Carboxylesterase-2 activity may play a critical role in the activation of dabigatran etexilate *Feng Chen, Ph.D.*, Robert Parker, Pharm.D., Steven Laizure, Pharm.D.; Department of Clinical Pharmacy, University of Tennessee Health Science Center, Memphis, TN

INTRODUCTION: Dabigatran etexilate (DABE) is a prodrug sequentially metabolized by carboxylesterae-2 (CES2) and carboxylesterase-1 (CES1) to form the active, thrombin inhibitor. Used clinically for thromboembolism prophylaxis in a fixed-dose regimen there is a fivefold variation in the active dabigatran metabolite (DAB) plasma concentrations in patients.

RESEARCH QUESTION OR HYPOTHESIS: Determine how CES1 and CES2 enzyme activity influence formation of the active DAB metabolite from DABE and potentially contributes to the wide variability in active metabolite exposure in patients.

STUDY DESIGN: In vitro enzyme studies performed in human intestinal microsomes (HIM), hepatic S9 fractions (HLS9), and human recombinant CES1 and CES2.

METHODS: DABE was incubated in tissue and concentrations of DABE, its intermediate metabolites, and DAB determined by liquid chromatography-mass spectrometry. Sequential hydrolysis in HIM and HLS9 and reverse sequential hydrolysis in HLS9 and then HIM were assessed. The enzyme kinetics of DAB formation from DABE was determined in recombinant CES1 and CES2, and the effect of rivastigmine, an inhibitor of CES2, determined on DAB formation from DABE.

RESULTS: HIM catalyzed metabolism of DABE's carbamate group producing the M2 metabolite, and HLS9 catalyzed the hydrolysis of the ethyl ester group of M2 producing DAB with complete metabolism of DABE to DAB by sequential hydrolysis. Reverse sequential hydrolysis (HLS9 first and HIM second) resulted in incomplete metabolism of DABE to DAB with high concentrations of the M1 metabolite remaining. Metabolism of the M1 metabolite to DAB by recombinant CES2 (K_m 19.7 $\pm$ 3.0 μM; V_{max} 3.15 $\pm$ 0.19 nmol/min/mg protein) was far less efficient than metabolism of the M2 metabolite to DAB by CES1 (K_m 87.6 $\pm$ 6.1 μM; V_{max} 5,311 $\pm$ 258 nmol/min/mg protein). The formation of DAB from DABE by sequential hydrolysis was potently inhibited by rivastigmine.

CONCLUSION: These results suggest that interpatient variability in CES2 activity could play a critical role in determining active metabolite exposure.

285. Variability in serum trough infliximab levels among pediatric patients *Ryan Funk, Pharm.D., Ph.D.*[1], Mara Becker, M.D., MSCE[2], Valentina Shakhnovich, M.D.[3]; [1]Department of Pharmacy

Practice, University of Kansas, Kansas City, KS [2]Department of Pediatrics, Division of Rheumatology, Children's Mercy Kansas City, Kansas City, MO [3]Division of Pediatric Gastroenterology, Hepatology and Nutrition, Children's Mercy Kansas City, Kansas City, MO

INTRODUCTION: Variation in infliximab (IFX) exposure represents a potentially important contributor to variation in response among pediatric patients with autoimmune illness. This work seeks to characterize the variation in IFX exposure and identify factors contributing to variability.

RESEARCH QUESTION OR HYPOTHESIS: Infliximab pharmacokinetics are variable amongst pediatric patients resulting in variation in drug exposure and response.

STUDY DESIGN: Cross-sectional study of pediatric patients (n = 97) receiving infliximab (IFX) at Children's Mercy Kansas City.

METHODS: Serum trough samples were collected from patients on stable IFX dosing and IFX and anti-IFX antibodies were detected using a NF-ĸβ luciferase gene-reporter assay (ARUP Laboratories). Patient clinical and laboratory information was collected, including albumin, C-reactive protein (CRP), and erythrocyte sedimentation rate (ESR) as measures of inflammation. Statistical analysis included Wilcoxon rank-sum testing and Spearman's rank correlation testing.

RESULTS: Detectable serum trough concentrations ranged greater than 33-fold and anti-IFX antibodies were detected in 3 patients. All patients with anti-IFX antibodies had undetectable levels of IFX. Rheumatology patients had significantly higher IFX trough levels compared to gastroenterology patients (35.6 [16.8,40] vs. 12.3[5.6,22.5] μg/mL, $p < 0.0001$). Higher troughs were associated with use of higher IFX doses (9.8[8.3,11.2] vs. 7.7 [6.2,9.4] mg/kg, $p = 0.0003$) at shorter dosing intervals (4[4,4.8] vs. 6[4,8] weeks, $p < 0.0001$) in rheumatology patients. For all patients, increased IFX levels were associated with higher IFX doses ($\rho = 0.46$, $p < 0.0001$) and a shorter dosing interval ($\rho = -0.55$, $p < 0.0001$). After normalization of IFX levels for dose and dosing interval, variables associated with increased IFX exposure included female gender ($p = 0.04$) and reduced measures of inflammation, including: CRP ($\rho = -0.33$, $p = 0.002$), ESR ($\rho = -0.19$, $p = 0.07$), and albumin ($\rho = 0.28$, $p = 0.007$).

CONCLUSION: Trough IFX levels are highly variable in pediatric patients and are associated with dose, frequency, gender and inflammation. Anti-IFX antibody formation is rare (3%) and was only seen in children who had undetectable IFX trough levels.

287. Stability of 4F-PCC after co-administration with crystalloid solutions Eva Herzog, M.D.[1], Peter Niebl, M.D.[1], Andrea Beyerle, M.D.[1], Martina Treutlein, M.D.[1], Michael Albers, M.D.[1], Laurel Omert, M.D.[2], *Christopher Hood, Pharm.D.*[2]; [1]CSL Behring, Marburg, Germany [2]CSL Behring, King of Prussia, PA

INTRODUCTION: Current four-factor prothrombin complex concentrate (4F-PCC) prescribing information provides limited data regarding compatibility with commonly prescribed solutions. Guidance is needed for pharmacists/nurses administering 4F-PCC regarding flushing any remaining product in intravenous tubing as well as y-site co-administration of other solutions.

RESEARCH QUESTION OR HYPOTHESIS: To mimic clinical practice, we evaluated stability of 4F-PCC active ingredients when mixed with commonly co-administered crystalloid solutions or stored in an infusion bag.

STUDY DESIGN: *In vitro* analysis.

METHODS: Activity of factors II, VII, IX and X, and inhibitory proteins C, S and ATIII were assessed using COBAS CIII (Roche) in 4F-PCC alone, or mixed with lactated Ringer's (LR) or normal saline (NS) after being run through a catheter system under controlled, aseptic conditions. 4F-PCC stability was also assessed after storage in IntraVial Container (Baxter) for 3 h or 24 h. 4F-PCC mixed with sterile water for injection (SWFI) and directly aliquoted 4F-PCC served as control. Each run was conducted three times with mean values calculated.

RESULTS: 4F-PCC coagulation factor activity and inhibitor levels were unaffected by co-administration with LR, NS or SWFI. Stability was not influenced following storage of 4F-PCC in infusion bags up to 24 h.

	FII	FVII	FIX	FX	Protein C	Protein S	ATIII
Aliquoted 4F-PCC (control)	23.18	12.82	25.06	29.68	28.09	20.55	0.36
4F-PCC	23.14	12.59	25.42	29.37	27.62	21.92	0.36
4F-PCC + LR	21.69	12.59	25.19	28.94	28.33	22.15	0.35
4F-PCC + NS	22.53	13.27	25.71	29.58	27.55	21.31	0.35
4F-PCC + SWFI	22.34	12.12	24.87	28.75	27.40	19.52	0.33
4F-PCC (3 h storage)	22.85	13.25	25.23	29.16	27.96	19.91	0.36
4F-PCC (24 h storage)	23.16	14.30	25.33	28.99	27.40	19.53	0.35

Data are mean (IU/mL), unless otherwise stated.

CONCLUSION: 4F-PCC protein activity levels remained unaffected following infusion-line co-administration with commonly used crystalloid solutions. Prescribing information indicates that 4F-PCC must be used within 4 h; this study supports 4 h storage in infusion bags.

288. Pharmacokinetics and pharmacodynamics of ticagrelor in subjects on hemodialysis and subjects with normal renal function *Renli Teng, Ph.D.*[1], Sharen Muldowney, BSN[1], Yonggang Zhao, Ph.D.[2], Jolene Berg, M.D.[3], Jonathan Lu, M.D., Ph.D.[4], Naeem D. Khan, M.D.[1]; [1]AstraZeneca, Wilmington, DE [2]Skyview Research, Philadelphia, PA [3]DaVita Clinical Research, Minneapolis, MN [4]Formerly of AstraZeneca, Wilmington, DE

INTRODUCTION: Pharmacokinetics (PK) and pharmacodynamics (PD) of ticagrelor (an oral $P2Y_{12}$ receptor antagonist) in hemodialysis subjects are yet to be established.

RESEARCH QUESTION OR HYPOTHESIS: To compare PK, PD, and safety of ticagrelor in hemodialysis versus healthy subjects with normal renal function.

STUDY DESIGN: Randomized, open-label, parallel-group, crossover study (NCT02022748).

METHODS: Hemodialysis subjects were randomized to receive a single ticagrelor 90-mg dose administered either 1 day post-hemodialysis or just before hemodialysis, with crossover to the other regimen after ≥7-day wash-out. Healthy subjects (creatinine clearance ≥90 mL/min) received a single ticagrelor 90-mg dose. PK and PD ($P2Y_{12}$ reaction units [PRU], inhibition of platelet aggregation [IPA]) parameters, and safety were evaluated.

RESULTS: Twenty-seven subjects (14 hemodialysis [mean age 50.6 years; 85.7% men], 13 healthy subjects [mean age 43.8 years; 76.9% men]) received the study drug. Geometric mean C_{max} of ticagrelor was 51%–61% higher in hemodialysis subjects (post-hemodialysis: 560.3 ng/mL, pre-hemodialysis: 598.4 ng/mL) than in healthy subjects (370.8 ng/mL). Geometric mean $AUC_{0-\infty}$ was 38%–49% higher in hemodialysis than healthy subjects (3015.1, 3256.1, 2188.8 ng*h/mL, respectively). C_{max} and $AUC_{0-\infty}$ of the active metabolite, AR-C124910XX, were 13%–36% higher in hemodialysis versus healthy subjects. Mean IPA-time curves over 24 h post-dose were almost indistinguishable for all three treatments. Mean PRU decreased from baseline for all three treatments; the greatest reduction occurred in healthy subjects 2 h post-dose. Adverse events occurred in seven subjects, distributed across all three treatments, with investigator-reported, potentially treatment-related adverse events in one hemodialysis subject (comprising dizziness, bronchospasm, and nausea).

CONCLUSION: Differences in C_{max} and $AUC_{0-\infty}$ between hemodialysis and healthy subjects are considered of minimal clinical relevance; therefore, no ticagrelor dose adjustment is required in subjects on hemodialysis. PD responses were similar in

hemodialysis versus healthy subjects. Timing of hemodialysis has little impact on ticagrelor PK, or effect of ticagrelor on IPA.

289. Some commonly prescribed drugs inhibit the metabolism of dabigatran etexilate to its active metabolite *Julie Farrar, B.S.*, Feng Chen, Ph.D., Steven Laizure, Pharm.D., Robert Parker, Pharm.D.; Department of Clinical Pharmacy, University of Tennessee Health Science Center, Memphis, TN

INTRODUCTION: Dabigatran etexilate (DABE) is a double prodrug requiring carboxylesterase-mediated hydrolysis of its carbamate and ethyl ester groups to form the active metabolite that inhibits thrombin. Hydrolysis of the carbamate group by CES2 produces the M2 metabolite, and hydrolysis of the ethyl ester by CES1 produces the M1 metabolite. The active metabolite is formed only when both the carbamate and ethyl ester are hydrolyzed. We have identified some commonly prescribed drugs that inhibit carboxylesterase enzymes.

RESEARCH QUESTION OR HYPOTHESIS: How does the inhibition of CES1 and CES2 affect the formation of dabigatran (DAB), the active metabolite, from DABE?

STUDY DESIGN: In vitro metabolism studies conducted in human recombinant CES1 and CES2, and in human intestinal microsomes (HIM) and human hepatic S9 fractions (HLS9).

METHODS: The inhibitory effects of 11 commonly prescribed drugs on CES1 and CES2 hydrolysis were characterized in CES1 and CES2 recombinant enzymes. Subsequent sequential incubation studies in HIM and HLS9 were performed to assess the effect on the metabolism of DABE to the active DAB metabolite. DABE and its M1, M2, and active DAB metabolite were analyzed by liquid chromatography-mass spectroscopy.

RESULTS: Among the 11 drugs only aripiprazole and nelfinavir reduced both CES1 and CES2 hydrolysis by >50%, sofosbuvir reduced CES1 hydrolysis by >50%, and carvedilol, fenofibrate, loperamide, pioglitazone, and rivastigmine reduced CES2 hydrolysis by >50%. Inhibition of either CES1 or CES2 reduced the formation of DAB from DABE when sequentially incubated in HIM and then HLS9, and the most potent inhibition of DAB formation occurred with the CES2 inhibitors rivastigmine and loperamide.

CONCLUSION: The inhibition of CES1 and CES2 is a potential mechanism of drug-drug interactions in patients taking DABE, which potentially could reduce the exposure to the DAB active metabolite leading to an increase in stroke risk.

290. The influence of body composition on intravenous immune globulin half-life in patients with primary immunodeficiency Helene Chapy, Pharm.D., Ph.D.[1], Leonid Kagan, Ph.D.[1], Amy Na, Pharm.D. Candidate[2], Rebecca Moore, RN[3], Ronald Nahass, M.D., MHCM[3], *Luigi Brunetti, Pharm.D., MPH*[2]; [1]Department of Pharmaceutics, Rutgers, The State University of New Jersey, Piscataway, NJ [2]Pharmacy Practice and Administration, Rutgers, The State University of New Jersey, Piscataway, NJ [3]ID CARE, Hillsborough, NJ

INTRODUCTION: Intravenous immune globulin G (IVIG) is an important treatment modality for patients with primary immunodeficiency and myriad of other diseases. There is an ongoing debate regarding the most appropriate dosing regimens for immune globulin G (IgG) formulations in extremes of body weight. This debate is fueled primarily on observational studies rather than well designed prospective studies providing mechanistic evidence. We sought to clarify this question by a prospective assessment of pharmacokinetics by weight and body composition analysis.

RESEARCH QUESTION OR HYPOTHESIS: Changes in serum concentrations of IgG post IVIG administration are dependent on body composition.

STUDY DESIGN: Prospective pilot pharmacokinetic study.

METHODS: Patients receiving IVIG as a part of their current pharmacotherapy had serum IgG measurements taken immediately before and after administration of IVIG on two consecutive treatments (approximately 1 month apart). Another measurement was taken at 2 weeks post infusion. In addition, body composition was measured using bioelectrical impedance analysis (BIA). The correlation between the half-life and the difference between peak and trough concentration (change in IgG concentration after IGIV administration) versus various measures of body habitus (weight, body mass index, and fat mass) were assessed using Spearman's Rho.

RESULTS: A total of 8 subjects with primary immunodeficiency were included in this pilot study and the mean weight normalized IVIG dose administered was 413 mg/kg (dose/actual body weight) monthly. The mean age was 63 years and 6/8 subjects were female. The median BMI was 26.8 kg/m^2 (range 20.5 kg/m^2–34.4 kg/m^2). The mean change in serum IgG concentration post IVIG administration was 7.18 $\pm$ 3.9 g/L. IVIG half-life was negatively correlated with body fat percentage ($r_S = -0.71$; $p = 0.047$; half-life range, 17.8 to 138.6 days) and age ($r_S = -0.74$; $p = 0.037$).

CONCLUSION: Pharmacokinetic parameters may vary depending on body composition. Further study is warranted.

291. valuation of vancomycin dosing in obese patients at a community hospital *Ayesha Khan, Pharm.D., BCPS*, Christy Varughese, Pharm.D., BCPS; Rush University Medical Center, Chicago, IL

INTRODUCTION: The IDSA recommends vancomycin maintenance dosing of 15–20 mg/kg of total body weight every 8–12 h for most patients. Optimized dosing to achieve target trough levels in the obese population has yet to be determined, and there are variations in practice for appropriate dosing weight (total vs. ideal vs. adjusted body weight). With obesity in the United States on the rise, further studies are needed to guide dosing.

RESEARCH QUESTION OR HYPOTHESIS: This study evaluated the frequency at which our institution's approach to vancomycin dosing reached target serum concentration in obese patients, and utilized a linear dose adjustment model to predict optimal dosing for troughs not at goal.

STUDY DESIGN: Retrospective chart review.

METHODS: Adult patients weighing >100 kg and having a documented vancomycin trough and serum creatinine were reviewed. Age, gender, weight, creatinine clearance, vancomycin dosing regimen, and first steady state vancomycin trough were collected. Linear pharmacokinetics was utilized in predicting estimated dosing needed to attain goal troughs when not first achieved. Basic statistical values (min, max, range, median, percent) using Microsoft Excel® were calculated, and Pearson correlation (r) was used to assess actual and predicted dosing regimens to attain goal trough concentration.

RESULTS: Fifty-four patients were included in study analysis. Thirteen percent of the time, initial steady state trough concentrations were between 15–20 μg/dL. Patients had subtherapeutic troughs (<10 μg/dL) and supratherapeutic troughs (>20 μg/dL) 20% and 26% of the time respectively. A correlation of $r = 0.53$ between actual and predicted dosing regimens (mg/kg/day) was observed. A median 10 mg/kg/day increase in the total daily dose was needed to achieve a predicted trough between 15–20 μg/dL.

CONCLUSION: Current institutional dosing of vancomycin did not frequently result in attainment of a therapeutic first steady-state trough in patients weighing >100 kg. Linear kinetic estimations predict a higher total dosing model would more frequently result in achieving target serum concentrations.

292. Increased vancomycin dosing requirements in sickle cell disease due to hyperfiltration-dependent and independent pathways *Jin Han, Pharm.D., Ph.D.*[1], Xu Zhang, Ph.D.[2], Jennifer Oderinde, NA[2], Santosh Saraf, M.D.[3], Michel Gowhari, DO[3], Joharah Hassan, M.D.[2], Shivi Jain, M.D.[2], Victor Gordeuk, M.D.[2], Robert Molokie, M.D.[2]; [1]Department of Pharmacy Practice, College of Pharmacy, University of Illinois at Chicago, Chicago, IL [2]University of Illinois at Chicago, Chicago, IL [3]Section of Hematology/Oncology, Department of Medicine, University of Illinois at Chicago, Chicago, IL

INTRODUCTION: Glomerular hyperfiltration is common among patients with sickle cell disease (SCD), likely driven by increased renal blood flow and glomerular hyperperfusion. In other conditions, hyperfiltration is associated with increased renal clearance of drugs, especially antibiotics,but evidence in SCD patients is lacking.

RESEARCH QUESTION OR HYPOTHESIS: Vancomycin, an antibiotic primarily excreted via glomerular filtration, is commonly used to treat gram-positive pathogens. In this study, we utilized vancomycin as a model to investigate if patients with SCD had altered drug dosing requirements.

STUDY DESIGN: Retrospective chart review of patients with SCD and age, gender, weight, and race-matched non-SCD patients as the control group.

METHODS: Using a pharmacy reporting system, we identified 104 SCD patients and 104 control patients with a creatinine clearance (CrCl) $\geq$ 80 mL/min, who were treated with intravenous vancomycin in an academic medical center and had a vancomycin trough level drawn at steady state. Vancomycin doses, trough level at steady state, and other clinical variables were collected through retrospective chart review.

RESULTS: The SCD patients with HgbSS genotype have higher CrCl ($p = 0.018$) and eGFR ($p = 0.002$) compared to the control group. The vancomycin trough level at steady state was comparable between the two groups (8.8 vs. 8.9 mg/L); however, the median vancomycin dose at the trough level were approximately 20% higher in the HgbSS patients (0.043 vs. 0.036 gram/kg/day). A pathway analysis using structural equation modelling showed that both hyperfiltration-depedent and independent pathways contributed to the higher vancomycin dosing requirements. A gene expression analysis demonstrated that genes involved in drug metabolism were enriched by 2.1 fold in the genes differentially expressed in SCD ($p = 0.0032$).

CONCLUSION: SCD patients had higher vancomycin dosing requirement to reach comparable drug levels in non-SCD patients. The higher dosing requirement for vancomycin in SCD may be in part due to glomerular hyperfiltration and in part due to increased drug metabolism.

Psychiatry

293. A qualitative examination of the complexities of bipolar disorder treatment *Francesca Napolitano, Pharm D*[1], Carina Araujo-Lane, BA[2], Alisa Busch, M.D., MS[3], Frank Wharam, MB, BCh, BAO, MPH[2], Dennis Ross-Degnan, ScD[2], Christine Lu, MSc, Ph.D.[2], Phyllis Foxworth, BS[4], Jeanne Madden, Ph.D.[1]; [1]School of Pharmacy, Northeastern University, Boston, MA [2]Department of Population Medicine, Harvard Medical School and Harvard Pilgrim Health Care Institute, Boston, MA [3]McLean Hospital and Harvard Medical School, Belmont, MA [4]Depression and Bipolar Support Alliance, Chicago, IL

INTRODUCTION: Bipolar Disorder (BD) is a chronic mental health condition affecting 2–4% of Americans. BD is associated with poor social and psychological functioning, work impairment, and low health-related quality of life. Commercial insurance benefits increasingly feature high beneficiary cost-sharing, which can hinder access to treatment for chronic conditions. Within a unique mixed-methods PCORI-funded study of the impact of benefit designs on individuals living with BD, we sought respondents' experiences navigating treatment. This is the first qualitative study aimed at informing clinicians and policy-makers about the complexities of BD treatment.

RESEARCH QUESTION OR HYPOTHESIS: BD is a complex condition, with a high frequency of challenging symptoms, other concurrent health problems, and polypharmacy.

STUDY DESIGN: We conducted in-depth telephone interviews from May 2016 to April 2017 with 40 commercially-insured respondents across the US, including individuals with BD aged 18 to 64 or their caregivers.

METHODS: We coded transcripts and conducted thematic analyses using NVivo. We classified respondent-reported medications, medication regimens, and other health problems in descriptive tables, and highlighted interview excerpts pertaining to the burden of treatment and connections among BD, medication use, and other health problems.

RESULTS: Respondents reported an average use of five prescription medications and three health problems requiring treatment in addition to BD. The most common psychotropic medications utilized were antipsychotics, anticonvulsants, and antidepressants, and the most common somatic medications included thyroid replacements, asthma/COPD medications, and antilipidemic medications. Metabolic and endocrine comorbidities were the most common health problems reported. Respondents emphasized both the importance of BD medications and their negative impacts, including adverse effects that often necessitate additional care.

CONCLUSION: Individuals living with BD confront challenging healthcare needs including multiple medications and concurrent health problems. Individuals with BD express awareness of the trade-offs involved in maintaining mental wellness amid possible adverse consequences of treatment.

295. A phase 1 study comparing pharmacokinetic and safety profiles of three different dose intervals of aripiprazole lauroxil and subsequent population pharmacokinetic modeling *Angela Wehr, Ph.D.*[1], Marjie Hard, Ph.D.[2], Peter Weiden, M.D.[3], Lisa von Moltke, M.D.[1]; [1]Clinical Research, Alkermes, Waltham, MA [2]Nuventra Pharma Sciences, Durham, NC [3]Medical Affairs, Alkermes, Waltham, MA

INTRODUCTION: Aripiprazole lauroxil (AL) is an FDA-approved long-acting injectable antipsychotic for the treatment of schizophrenia.

RESEARCH QUESTION OR HYPOTHESIS: To evaluate the pharmacokinetics (PK), safety and tolerability of AL (1,064 mg) for a dose interval of every 8 weeks (q8 wk), which was recently approved by the FDA.

STUDY DESIGN: A phase 1, 44-week, open-label PK and safety study of AL (Clinicaltrials.gov: NCT02320032) was used to inform a 2-month population PK (2MPopPK) model.

METHODS: Patients with schizophrenia ($n = 139$) were randomized to one of three doses/dose intervals of AL: 441 mg every 4 weeks (q4wk), 882 mg every 6 weeks (q6 wk), or 1,064 mg q8 wk, with a total of 7, 5, or 4 intramuscular injections administered over the course of 24 weeks, respectively. Patients continued on their maintenance oral antipsychotics. PK and safety assessments occurred during the 24-week study period, and continued for an additional 20 weeks' follow up after the last AL injection. Plasma concentrations obtained from the phase 1 study were analyzed using non-compartmental methods. The data were combined with data from four prior studies ($n = 576$) to develop the 2MPopPK model.

RESULTS: Administration of AL 1,064 mg q8 wk provided continuous exposure to aripiprazole and yielded aripiprazole concentrations that were within the range associated with clinically effective and well-tolerated doses of currently approved AL. The overall safety profile of AL 1,064 mg q8 wk was comparable with the 882 mg q6 wk and 441 mg q4wk groups. The most common adverse event (AE) for all groups was injection-site pain. Common AEs ($\geq$5%) were dyskinesia, back pain, and neck pain. The 2MPopPK model showed that median steady-state concentrations

of aripiprazole for the q8 wk regimen were comparable with the 882 mg q6 wk and 662 mg q4wk regimens.
CONCLUSION: The 1,064 mg q8 wk dose resulted in aripiprazole concentrations within the established AL therapeutic window and may be suitable for a 2-month dose interval. The safety profile of AL 1,064 mg q8 wk was consistent with currently approved doses/dose intervals.

296. A lipidomic analysis of skeletal muscle in subjects on atypical antipsychotics *Kyle Burghardt, Pharm.D.*[1], Berhane Seyoum, M.D., MPH[2], Abdullah Mallisho, M.D.[2], Renu Kowluru, Ph.D.[2], Zhengping Yi, Ph.D.[3]; [1]Eugene Applebaum College of Pharmacy and Health Sciences Department of Pharmacy Practice, Wayne State University, Detroit, MI [2]School of Medicine, Wayne State University, Detroit, MI [3]Eugene Applebaum College of Pharmacy and Health Sciences Department of Pharmaceutical Science, Wayne State University, Detroit, MI
INTRODUCTION: The atypical antipsychotics cause insulin resistance directly by decreasing peripheral glucose uptake prior to and following weight gain. The tissue-specific, molecular mechanism by which this occurs is poorly understood. The skeletal muscle is the primary tissue for glucose uptake and its dysregulation is implicated in insulin resistance. Alterations in skeletal muscle lipid composition could be contributing to this harmful side effect.
RESEARCH QUESTION OR HYPOTHESIS: Is skeletal muscle lipid dysregulation associated with atypical antipsychotic-induced insulin resistance?
STUDY DESIGN: Cross-sectional.
METHODS: Subjects were included if they had bipolar disorder and were currently treated with an atypical antipsychotic or mood stabilizer for 3 or more months. Subjects were excluded if they had diabetes before starting their antipsychotic. Insulin resistance was calculated from fasting blood samples and the oral glucose tolerance test. Lipidomic analysis of Free Fatty Acids were performed on skeletal muscle biopsies by the WSU Lipidomic Core. False Discover Rate (FDR) corrected p-values less than 0.05 were considered statistically significant for *t*-test and ANOVA.
RESULTS: A total of 10 muscle biopsies were included in the preliminary analyses. The average age of the subjects was 43.1 ± 13.0, 50% were female, 58% were Caucasian and 50% were on an atypical antipsychotic (4 of 5 on quetiapine). Statistically significant associations were identified between antipsychotic treatment and several lipidomic features including palmitic acid. Further significant differences for palmitic acid were observed when separating antipsychotic-treated subjects by insulin sensitivity and comparing with mood stabilizer subjects.
CONCLUSION: We identified skeletal muscle lipids that were associated with antipsychotic treatment and insulin resistance. Future work includes performing analyses in an increased sample size and in additional lipidomic classes (currently underway). The identification of tissue-specific lipid dysregulation could aid in better understanding how atypical antipsychotics cause insulin resistance so that these dysregulations can be targeted through precision medicine or novel therapeutic strategies.

Pulmonary

298. External validation of three risk-stratification rules in patients with pulmonary embolism and cancer *Erin Weeda, Pharm.D., BCPS*[1], Elaine Nguyen, Pharm.D., MPH, BCPS[2], Craig Coleman, Pharm.D.[3], Christine Kohn, Pharm.D.[4]; [1]College of Pharmacy, Medical University of South Carolina College of Pharmacy, Charleston, SC [2]School of Pharmacy, Idaho State University, Meridian, ID [3]School of Pharmacy, University of Connecticut, Storrs, CT [4]University of Saint Joseph, Hartford, CT
INTRODUCTION: Numerous risk-stratification rules exist to predict post-pulmonary embolism (PE) mortality; however, few were designed for use in cancer patients. In the EPIPHANY registry, adapted versions of three commonly used rules (i.e., the Hestia criteria, Pulmonary Embolism Severity Index [PESI] and simplified PESI [sPESI]) were shown to have high sensitivity for prognosticating mortality in patients with PE and cancer. These adapted rules have yet to be externally validated.
RESEARCH QUESTION OR HYPOTHESIS: To evaluate the performance of an adapted Hestia criteria, PESI and sPESI for predicting 30-day post-PE mortality in patients with cancer.
STUDY DESIGN: Retrospective, observational study of consecutive, adult, objectively confirmed PE patients with active cancer.
METHODS: We identified patients presenting with PE and cancer to our institution from 11/2010–1/2014. We calculated the proportion of patients categorized as low- or high-risk by three risk-stratification rules (the adapted Hestia criteria, PESI and sPESI) and determined each rules' accuracy for predicting 30-day all-cause mortality.
RESULTS: A total of 124 patients with PE and active cancer (mean age 66 years, 46% with concurrent deep vein thrombosis and 49% with metastatic disease) were included. Mortality at 30-days occurred in 25 (20%) patients. The adapted Hestia criteria categorized 23 (19%) patients as low-risk for mortality and exhibited a sensitivity of 88% (95% confidence interval [CI] = 68–97), a specificity of 20% (95% CI = 13–30) and a c-statistic of 0.54 (95% CI = 0.42–0.66). A total of 38 (31%) and 30 (24%) patients were identified as low-risk by the adapted PESI and sPESI; with both displaying sensitivities of 92%. Specificities were 36% (95% CI = 27–47) and 28% (95% CI = 20–38) for PESI and sPESI, respectively; while the c-statistic was 0.82 (95% CI = 0.72–0.91) and 0.64 (95% CI = 0.52–0.75).
CONCLUSION: In this external validation, an adapted Hestia, PESI and sPESI displayed high sensitivity but low specificity for 30-day post-PE mortality in cancer patients; findings consistent with those from the EPIPHANY registry.

299. Prothionamide-containing regimen induced hypothyroidism among multidrug-resistant tuberculosis patients Yu-Chun Hwang, MS, *Yu-Jia Wang, BS*; Department of Pharmacy, Wan Fang Hospital, Taipei Medical University, Taipei, Taiwan
INTRODUCTION: Multidrug-resistant tuberculosis (M.D.R-TB) is an emerging public health problem worldwide. Strict adherence to the regimen is necessary to achieve good cure rate. Prothionamide is prescribed as part of a regimen, has great potential to cause hypothyroidism, which may influence adherence to regimen with consequent risk of treatment failure.
RESEARCH QUESTION OR HYPOTHESIS: This study is aimed, firstly, to identify the incidence and related factors of hypothyroidism, and secondly, to evaluate the effects of different treatment strategies for hypothyroidism among M.D.R-TB patients.
STUDY DESIGN: A retrospective case-control study.
METHODS: Patients with diagnosis of M.D.R-TB from May, 2007 to Jan, 2016 were eligible for review. Patient characteristics were collected from electronic chart. Based on serum TSH level after receiving prothionamide, patients were divided into two groups. Cases were defined as patients with Hypothyroidism (TSH > 10 mIU/L), while controls had normal TSH level. Patient characteristics and outcomes were compared using independent *t*-test and chi-square test for continuous and categorical data, respectively. Statistical significance was considered at $p < 0.05$.
RESULTS: A total of 123 patients were included. 39 (32%) patients were identified as hypothyroidism. There were no significant differences between two groups in gender, age, and chronic diseases. HBV carrier in case group (15.4%) is higher than control group (3.6%) ($p = 0.03$). Regimen included prothionamide and para-aminosalicylic acid had significantly higher incidence of Hypothyroidism than prothionamide (adjusted hazard ratio, 2.146; 95% CI, 1.07–4.27) ($p = 0.03$). Patients with levothyroxine

therapy for hypothyroidism had a higher percentage and shorter time to recover to normal TSH level than Non-levothyroxine therapy (79% vs. 29%).
CONCLUSION: Prothionamide-containing regimen induced hypothyroidism is more common than previously recognized, particularly in those who received prothionamide and para-aminosalicylic acid. We suggest monitoring TSH levels at 1st, 3rd, 6th month, and then every 3 months after the start of prothionamide. If hypothyroidism does occur, starting levothyroxine therapy and monitoring thyroid function monthly is desirable.

Rheumatology

301E. Similar pharmacokinetics, safety and tolerability of the adalimumab biosimilar candidate BI 695501 administered subcutaneously via prefilled syringe (PFS) or autoinjector (AI) (VOLTAIRE®-AI) *Bernd Liedert, Ph.D.*[1], Viktoria Moschetti, M.D.[2], Nuala Peter, MSc[3], Ivo Sonderegger, Ph.D.[4], Sabrina Wiebe, MS[3], Steven Ramael, M.D.[5]; [1]Clinical Development Biosimilars, TA Biosimilars, Boehringer Ingelheim Pharma GmbH & Co. KG, Ingelheim, Germany [2]Clinical Operations, Boehringer Ingelheim Pharma GmbH & Co. KG, Ingelheim, Germany [3]Boehringer Ingelheim Pharma GmbH & Co. KG, Biberach, Germany [4]Boehringer Ingelheim Pharma GmbH & Co. KG, Ingelheim, Germany [5]Clinical Research Clinical Pharmacology Unit Antwerpen, SGS Life Science Services, Antwerp, Belgium
Presented at eular 2017 (Annual European Congress of Rheumatology), Madrid, Spain, June 14-17, 2017.

302E. Similar efficacy and safety of biosimilar candidate BI 695501 and adalimumab originator reference product in patients with moderate to severe active rheumatoid arthritis: 24 week results from a Phase III clinical study (VOLTAIRE®-RA) *Ivo Sonderegger, Ph.D.*[1], Stanley Cohen, M.D.[2], Alberto Alonso-Ruiz, M.D.[3], Piotr Klimiuk, M.D.[4], Eric Lee, M.D.[5], Nuala Peter, MSc[6], Deepak Assundani, Ph.D.[7]; [1]Boehringer Ingelheim Pharma GmbH & Co. KG., Ingelheim, Germany [2]U. Texas Southwestern, Dallas, TX [3]Hospital de Cruces, Barakaldo, Spain [4]Gabinet Internistyczno-Reumatologiczny, Bialystok, Poland [5]Inland Rheumatology Clinical Trials Inc., Upland, CA [6]Boehringer Ingelheim Pharma GmbH & Co. KG, Biberach, Germany [7]Boehringer Ingelheim Pharma GmbH & Co. KG, Ingelheim, Germany
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Substance Abuse/Toxicology

303E. Interventions for promoting reintegration on quality of life and substance use behavior of adolescents and young adults in Bangalore *Jagadeesh Puvvula, Pharm.D.*; Department of Epidemiology, University of Nebraska Medical Center, Omaha, NE
Presented at the Public Health research conference at UNMC, Omaha, NE, Apr, 2017.

304. Web-based survey of non-medical use of prescription medications, illicit drugs, and other substances by adolescents in Nevada: completion rates using mobile technology *Krystal KC Riccio, Pharm.D., BCACP, CDE*[1], Jeffrey Talbot, Ph.D.[2], David Rawlins, Ph.D.[3], Carol Boyd, Ph.D., MSN, RN, FAAN[4]; [1]College of Pharmacy; Research Center on Substance Abuse and Depression, Roseman University of Health Sciences, Henderson, NV [2]College of Pharmacy, Director of Research Center on Substance Abuse and Depression, Roseman University of Health Sciences, Research Center on Substance Abuse and Depression, Henderson, NV [3]College of Pharmacy, Roseman University of Health Sciences, Henderson, NV [4]School of Nursing, University of Michigan, Ann Arbor, MI
INTRODUCTION: This study tests the response rate for a web-based survey designed to assess the self-reported beliefs, attitudes, and behaviors associated with nonmedical use of prescription medications and other illegal substances. Traditional paper-based surveys assessing youth risk have low completion rates, which may impact the sampling and durability of the results.
RESEARCH QUESTION OR HYPOTHESIS: Does a web-based substance abuse survey have improved completion rates compared to traditional paper-based surveys and does the completion rate vary by type of device utilized?
STUDY DESIGN: anonymous cross-sectional study using a web-based survey administered to students within a high school
METHODS: Authors designed the Secondary Student Life Survey: Nevada (SSLS:NV), a web-based survey that employs skip and display logic, to assess student beliefs, attitudes, and use-trends surrounding illegal substances, including: tobacco; alcohol; seven classes of prescription drugs; and illicit drugs. Participants were recruited from 9th–12th grade, parental consent and student assent were obtained, and the SSLS:NV was self-administered within a single class period on personal mobile phones or provided tablets and computers. Testing sessions were monitored by the research team from Roseman University.
RESULTS: A total of 1,000 students were invited to participate. Over 99% of parents consented to have their student participate, 99.5% of students assented to take the survey, and 91% completed the survey. The average completion time was 21.6 min. The completion rate by type of device was 82% when using mobile phones and 93% when using tablets or computers.
CONCLUSION: The use of web-based technology improved completion rates compared to traditional paper surveys and these completion rates were affected by the type of device utilized. Higher completion rates were recorded with tablets and computers compared with personal mobile phones. Although personal mobile phone recorded a lower completion rate, this rate remains much higher than reported rates for traditional paper-based surveys with similar topical content in adolescent populations.

305. Perceptions and prevalence surrounding adolescent substance abuse: a cross-sectional study of the nonmedical use of prescription medications by high school students in Nevada *Krystal KC Riccio, Pharm.D., BCACP, CDE*[1], Jeffrey Talbot, Ph.D.[2], David Rawlins, Ph.D.[3], Carol Boyd, Ph.D., MSN, RN, FAAN[4]; [1]College of Pharmacy; Research Center on Substance Abuse and Depression, Roseman University of Health Sciences, Henderson, NV [2]College of Pharmacy, Director of Research Center on Substance Abuse and Depression, Roseman University of Health Sciences, Research Center on Substance Abuse and Depression, Henderson, NV [3]College of Pharmacy, Roseman University of Health Sciences, Henderson, NV [4]School of Nursing, University of Michigan, Ann Arbor, MI
INTRODUCTION: The main objective of this pilot study was to assess the self-reported perceptions of risk, ease of access, and usage trends associated with nonmedical use of prescription medications (NUPM).
RESEARCH QUESTION OR HYPOTHESIS: Low perceived risk substances will be associated with higher rates of use.
STUDY DESIGN: anonymous cross-sectional web-based survey administered to adolescents within a public high school
METHODS: Authors designed the Secondary Student Life Survey: Nevada (SSLS:NV) to assess student beliefs, attitudes, and use-trends surrounding NUPM. Participants were recruited from a high school within Nevada, parental consent and student assent were obtained, and the SSLS:NV was self-administered within a single class period on an electronic device.

RESULTS: A total of 900 students completed the survey with 41% reporting being prescribed at least 1 of 4 classes of controlled medication (sleep, anxiety, stimulant, or pain) in their lifetime. The percentage of students reporting NUPM in the past year, with medications prescribed to them, by drug class was 12% sleep, 18% anxiety, 8% stimulant, and 9% pain; of those respondents, the percent of students reporting their NUPM "to get high" was 64% sleep, 50% anxiety, 40% stimulant, and 37% pain. The percentage of respondents reporting lifetime NUPM, not prescribed to them, by drug class was 8% sleep, 7% anxiety, 4% stimulant, and 14% pain medications. The percentage of students reporting only slight or no risk associated with NUPM by drug class was 37% sleep, 31% anxiety, 25% stimulant, and 32% pain medications.
CONCLUSION: A large portion of students were prescribed controlled substances, with a number of them self-reporting misuse of their prescription medications. Further, a considerable number of students self-reported NUPM with drugs not prescribed to them, which was highest with pain and sleep medications. The highest use rates were seen with substances that a higher percentage of students perceived to have slight or no risk and easier accessibility.

306E. Retrospective evaluation of clinical outcomes in patients receiving extended release injectable naltrexone Lyndsay Golden, B.S.[1], Heather Goodwin, M.S.[1], Jessica Moreno, Pharm.D., BCPP[1], Sarah Wakeman, M.D., FASAM[2], *Alexa Carlson, Pharm.D., BCPS*[1]; [1]Northeastern University – Bouvé School of Pharmacy, Boston, MA [2]Massachusetts General Hospital, Boston, MA
Presented at Northeastern University Research, Innovation, and Scholarship Expo (RISE), Boston, MA, April 13, 2017.

Transplant/Immunology

309. Association of cytochrome P450 3A4*1-beta genotype and tacrolimus pharmacokinetics in stable African American and Caucasian renal transplant patients *Shirley Chen, Pharm.D. Candidate*[1], Kathleen Tornatore, Pharm.D., FCCP, FAST[2], Daniel Brazeau, Ph.D.[3], Jacob Warner, DO[4], Rocco Venuto, M.D.[5]; [1]University at Buffalo School of Pharmacy and Pharmaceutical Sciences, Buffalo, NY [2]University at Buffalo School of Pharmacy and Pharmaceutical Sciences, Translational Pharmacology Research Core, NYS Center of Excellence in Bioinformatics and Life Sciences, Buffalo, NY [3]University of New England College of Pharmacy, Portland, ME [4]University of New England College of Osteopathic Medicine, Portland, ME [5]Eric County Medical Center, Division of Nephrology; University at Buffalo School of Medicine and Biomedical Sciences, Department of Medicine, Buffalo, NY
INTRODUCTION: African American (AA) renal transplant recipients(RTR) require higher tacrolimus doses and exhibit reduced bioavailability compared to Caucasians. Racial differences in tacrolimus pharmacokinetics may be attributed to interpatient variability in activity of cytochrome P450-3A5 and P450-3A4*1B isoenzymes. Investigations regarding *CYP3A4*1B* (*rs2740574*)genotype and tacrolimus pharmacokinetics in AA and Caucasian RTR have not been reported.
RESEARCH QUESTION OR HYPOTHESIS: This study investigated the association of *CYP3A4*1B* genotype and tacrolimus PK in stable AA and Caucasian RTR.
STUDY DESIGN: Cross-sectional pharmacokinetic and pharmacogenomic single-center study.
METHODS: Stable RTR received mycophenolate sodium and tacrolimus at steady state, with target troughs of 4–9 ng/mL. Tacrolimus pharmacokinetics was determined during a 12-h study in 33 AA and 32 Caucasian RTR, >6 months post-transplant, and included: trough ($C_{12\ h}$), $C_{12\ h}$/Dose, area under the concentration time curve ($AUC_{0\text{-}12}$), $AUC_{0\text{-}12}$/Dose and clearance (CL). Patients were categorized as wild-type [W/T] (*CYP3A4*1/*1*), heterozygous (*CYP3A4*1/*1B*), or homozygous variant (*CYP3A4*1B/*1B*). Analysis of variance and nonparametric analysis were conducted using Microsoft Excel and SAS Version 9.4.
RESULTS: AA patients with *CYP3A4*1B/*1B* required 1.5-fold higher tacrolimus dose to achieve $AUC_{0\text{-}12}$ and $C_{12\ h}$ comparable to RTR with *CYP3A4*1/*1* who were primarily Caucasians. Reduced $AUC_{0\text{-}12}$/Dose ($p = 0.02$) and faster clearance ($p = 0.005$) were observed in RTR with *CYP3A4*1B*/*1B*.

Tacrolimus Pharmacokinetics Mean (SD)	*CYP3A4*1/*1* [W/T] N = 35 [5 AA; 30 C]	*CYP3A4*1/*1B* N = 16 [14 AA; 2 C]	*CYP3A4*1B/*1B* N = 14 AA
Dose (mg)	2.69 (1.32)†	3.91 (1.57)†	4.46 (1.97)†
$C_{12\text{-}h}$ (ng/mL)	6.89 (1.71)	8.18 (2.13)	6.97 (1.51)
$C_{12\ h}$/Dose (ng/mL/mg)	3.12 (1.71)†	2.41 (0.96)†	1.90 (0.99)†
$AUC_{0\text{-}12}$ (ng.hr/mL)	119.43 (27.45)	137.64 (38.34)	129.10 (31.90)
$AUC_{0\text{-}12}$/Dose (ng h/mL/mg)	52.81 (25.47)†	40.87 (17.45)†	34.37 (15.55)†
CL (L/hr)	22.94 (9.13)†	29.41 (13.54)†	36.19 (18.12)†

C, Caucasians
†p-value <0.02.

CONCLUSION: Race differences in tacrolimus pharmacokinetics were observed with associations to *CYP3A4*1B* genotype. These novel data that link tacrolimus PK with *CYP3A4*1B* provide new insight into dosage requirements during maintenance immunosuppression.

310. Association of stromal cell derived factor 1 and platelet factor 4 genetic polymorphisms with post-transplant thrombocytopenia in kidney allograft recipients *Youngil Chang, MS. Pharm.D.*[1], Mahsa Haghgooyan, Pharm.D.[2], Tariq Shah, M.D.[3], David Min, Pharm.D.[4]; [1]Mendez National Institute of Transplantation Foundation, Mendez National Institute of Transplantation Foundation, Los Angeles, CA [2]Western University of Health Sciences, Pomona, CA [3]the Multi-Organ Transplant Center, St Vincent Medical Center, Los Angeles, CA [4]Western University of Health Sciences, College of Pharmacy and National Institute of Transplantation, Los Angeles, CO
INTRODUCTION: Posttransplant thrombocytopenia is associated with increased risk of bleeding and other complications after kidney transplantation. The Stromal Cell Derived Factor 1 (SDF1) and Platelet Factor 4 (PF4) are known to be involved in the production or destruction of platelets. This research aims to investigate prevalence of posttransplant thrombocytopenia and its association with genetic polymorphisms of SDF1 and PF4 genes. It is hypothesized that genomic polymorphisms of SDF1 and PF4 are associated with incidence of posttransplant thrombocytopenia.
RESEARCH QUESTION OR HYPOTHESIS: It is hypothesized that genetic polymorphisms of SDF1 and PF4 are associated with post-transplant thrombocytopenia in kidney allograft recipients.
STUDY DESIGN: Retrospective.
METHODS: Total of 305 kidney transplant patients at the St. Vincent Medical Center, CA between 2008 and 2012 are included and analyzed. Our post-transplant thrombocytopenia is defined as 30% reduction of platelet counts from the baseline at the first week after kidney transplantation. Single nucleotide polymorphisms of SDF1 (rs1801157, rs2297630) and PF4 (rs1435520, rs1429637, rs442155) are determined by the real time PCR with sequence specific primers. Chi square test with odd ratio were done with a p value <0.05 of statistical significance.
RESULTS: A total of 65 patients developed post-transplant thrombocytopenia (21%) after the kidney transplantation. From the demographic analysis, simultaneous kidney pancreas transplantation, deceased donor, and use of thymoglobulin are significantly associated with post-transplant thrombocytopenia. Among genetic polymorphisms of SDF1, AA genotypes of rs2297630 (A/G) is significantly associated with post-transplant thrombocytopenia (OR = 1.950, C.I. = [1.059–3.588], p = 0.030). Other polymorphisms are not significantly different between the two groups.

CONCLUSION: This study suggests that the presence of AA genotype of SDF1 (rs2297630) is associated with the increased risk of post-transplant thrombocytopenia among kidney allograft recipients.

311. Clinical outcomes of LCP-Tacrolimus (Envarsus, once daily) versus tacrolimus IR (twice daily) in *de novo* kidney transplant recipients in the United States *Katie McMurry, Pharm.D.*[1], Jennifer Hagopian, Pharm.D., BCPS[1], Clarice Carthon, Pharm.D., BCPS[1], Daniel Brennan, M.D., FACP[2], Timothy Horwedel, Pharm.D., BCPS[2]; [1]Barnes-Jewish Hospital, St. Louis, MO [2]Washington University School of Medicine, St. Louis, MO
INTRODUCTION: LCP-Tacrolimus (Envarsus, LCP-Tac) is an extended-release daily preparation of tacrolimus with a lower peak concentration and greater bioavailability compared to tacrolimus immediate release (Tac-IR). LCP-Tac is the preparation of choice at our center for *de novo* use due to the favorable kinetics, administration, and adverse effect profile.
RESEARCH QUESTION OR HYPOTHESIS: How does LCP-Tac compare to Tac-IR in regards to efficacy and safety in adult *de novo* kidney transplant recipients in a real-world setting?
STUDY DESIGN: This was a naturalistic, retrospective review of kidney transplant recipients ≥ 18 years old transplanted between 7/1/2015 and 1/1/2017 at Barnes-Jewish Hospital.
METHODS: Recipients were grouped based on tacrolimus formulation initiated *de novo* post-transplant. Primary measure was graft failure at 90 days. Secondary outcomes included average dose on each postoperative day (POD 2–4) and incidence of adverse effects.
RESULTS: 299 patients met criteria, of which 152 received LCP-Tac and 147 received Tac-IR. Baseline characteristics were similar. There was no difference in 90-day outcomes including graft failure (2.6% vs. 2%, p>0.999), GFR (61 vs. 59 mL/min/m^2, p = 0.267), death (2% vs. 1.4%, p>0.999) or rejection (7.5% vs. 8.6%, p = 0.833) between LCP-Tac and Tac-IR, respectively. LCP-Tac achieved higher trough levels than Tac-IR on POD2 (3.6 vs. 2.1, p < 0.001) and POD3 (5.3 vs. 3.8, p < 0.001). Higher doses of Tac-IR were needed to achieve lower trough levels compared to LCP-Tac on POD3 (6.5 mg vs. 5.6 mg, p < 0.001) and POD4 (7.4 mg vs. 6.0 mg, p < 0.001). Fewer patients in the LCP-Tac arm experienced tremor (35.2% vs. 64.8%), p = 0.001) and new-onset or worsening dyslipidemia (30.2% vs. 69.8%, p = 0.001) than Tac-IR.
CONCLUSION: There was no difference in graft disposition at 90 days between LCP-Tac and Tac-IR. Therapeutic troughs were achieved earlier with LCP-Tac and required lower doses. Fewer adverse events were experienced with LCP-Tac, which makes this a favorable choice for *de novo* use after transplant.

312E. Prevalence of venous thromboembolic events in ILD lung transplant patients treated with Sirolimus *Georgina Waldman, Pharm.D.*[1], Mark Mariski, Pharm.D.[2], Ashley Feist, Pharm.D.[3], Linda Awdishu, Pharm.D.[4], Kamyar Afshar, DO[2], Gordon Yung, M.D.[2]; [1]Department of Pharmacy, UC San Diego Health, San Diego, CA [2]UC San Diego Health, San Diego, CA [3]University of California San Diego, San Diego, CA [4]University of California San Diego Skaggs School of Pharmacy and Pharmaceutical Sciences, La Jolla, CA
Presented at ISHLT 37th Annual Meeting and Scientific Sessions, San Diego, CA, April 5-8, 2017.

313E. Use of ciprofloxacin for urinary tract infection prophylaxis in post-renal transplant patients with ureteral stent placement *Payal Kakadiya, Pharm.D.*[1], Gaurav Gupta, M.D.[2], Spencer LeCorchick, Pharm.D., BCPS[1]; [1]Department of Pharmacy, VCU Health, Richmond, VA [2]Department of Internal Medicine – Transplant Nephrology, VCU Health, Richmond, VA
Presented at the 2017 American Transplant Congress, Chicago, IL, April 29 – May 3, 2017.

Women's Health

314. Assessment of pharmacological guideline implementation for tertiary ASCVD prevention in women veterans *Nai-Hsuan Li, Pharm.D.*[1], Jacklyn Bradley, Pharm.D.[1], Hyma Gogineni, MS, Pharm.D., TTS[2], Linda Ferry, M.D.[2]; [1]School of Pharmacy, Western University of Health Sciences, Pomona, CA [2]VA Loma Linda Healthcare System (VALLHS), Loma Linda, CA
INTRODUCTION: Tertiary prevention of atherosclerotic cardiovascular disease (ASCVD) can prevent future ASCVD events. Veterans are at high risk of developing ASCVD, with women veterans having an increased risk due to less than adequate screening and evaluation. The primary objective of this study is to assess the pharmacological guideline implementation in women veterans for tertiary ASCVD prevention. The secondary objective is to determine if differences in guideline implementation exist between Veterans Affairs Loma Linda Health Care System (VALLHCS) and its community-based outpatient clinics (CBOCs).
RESEARCH QUESTION OR HYPOTHESIS: Are women veterans at VALLHCS with known ASCVD optimally treated for tertiary ASCVD prevention with pharmacological interventions as indicated by national clinical guidelines?
STUDY DESIGN: A retrospective chart review of women veterans with documented ASCVD who received primary care services at VALLHCS and CBOCs between 2013 and 2015.
METHODS: Guideline implementation was assessed by the use of diagnoses-specific medication treatment checklists, created for this study, for MI/CAD, TIA/CVA and/or PAD in accordance with national clinical guidelines. The checklists assessed the following categories: blood pressure control, diabetes management, antithrombotic therapy, and statin therapy.
RESULTS: The study assessed 95 patients demonstrating 61% in the MI/CAD group, 63% in the TIA/CVA group, and 43% in the PAD group satisfied all categories per diagnoses-specific checklist. Inadequate implementation of statin therapy was the major deficit for optimal guideline implementation, with only 68% in the MI/CAD group, 72% in the TIA/CVA, and 71% in the PAD group receiving optimal statin therapy. Differences in guideline implementation between VALLHCS and CBOCs was not statistically significant among the three groups (p>0.05).
CONCLUSION: This study establishes the implementation of national clinical guidelines in women veterans and found that guidelines for hypertension, diabetes, and antithrombotic therapy were well implemented. It was identified that the 2013 ACC/AHA statin guidelines were the least implemented, a finding supported in current literature.

315. Oral emergency contraception access and patient counseling: Are there differences between metropolitan and nonmetropolitan pharmacies in Georgia? *Rebecca Stone, Pharm.D., BCACP, BCPS*[1], Dennia Ernest, Pharm.D. Candidate[2], Brielle Scutt, Pharm.D. Candidate[2], Stella Hur, Pharm.D. Candidate[2], Sally Rafie, Pharm.D., BCPS[3]; [1]Department of Clinical and Administrative Pharmacy, University of Georgia, Athens, GA [2]College of Pharmacy, University of Georgia, Athens, GA [3]University of California, San Diego Skaggs School of Pharmacy and Pharmaceutical Sciences, La Jolla, CA
INTRODUCTION: Oral emergency contraception (EC) is available as OTC or prescription levonorgestrel (LNG) and prescription ulipristal acetate (UPA). Studies indicate pharmacies may not have LNG available in the OTC aisle, are unlikely to stock UPA EC, and frequently provide incorrect EC access and counseling information.
RESEARCH QUESTION OR HYPOTHESIS: Are there differences in oral EC access and patient counseling accuracy when comparing metropolitan (M) versus nonmetropolitan (NM) pharmacies in Georgia?

STUDY DESIGN: Prospective, randomized, telephone-based survey.
METHODS: Georgia State Board of Pharmacy provided a list of retail pharmacies, 25% were randomly selected, stratified across the NCHS Urban-Rural County Classification Scheme. Researchers posed as adult females inquiring about EC via a structured script. Data collection was documented with a standardized tool, including description of available EC, efficacy window, and counseling points. Statistical analyses completed with SPSS.
RESULTS: Researchers called 600 pharmacies: 515 (67% M vs. 33% NM) were reached and included. When asked "do you have something I can use after sex to not get pregnant?," most pharmacists responded "Yes" and identified LNG (78% M vs. 72% NM, $p = 0.107$). Of these, metropolitan pharmacies more often indicated LNG was in stock (82% vs. 64%, $p < 0.001$) and readily available on the OTC aisle (54% vs. 43%, $p = 0.047$). Metropolitan pharmacies less often described an incorrect (<72 h) efficacy window (11% vs. 21%, $p = 0.032$). Few pharmacists identified UPA when asked for an alternative (4% M vs. 1% NM, $p = 0.114$) or stocked it (1% M vs. 0% NM, $p = 0.584$). Counseling for ongoing contraception (1% M vs. 2% NM, $p = 0.233$) and STI prevention (0% vs. 0%) was rare.
CONCLUSION: Women continue to face barriers accessing and receiving accurate EC counseling. Approximately 25% of Georgia pharmacies reported no EC was available. Pharmacies carrying EC, especially nonmetropolitan, often did not have LNG or UPA readily available, provided incorrect efficacy window counseling, and no STI or ongoing contraception counseling.

316. Assessment of contraceptive curricula in U.S. pharmacy programs *Crystal Rim, Pharm.D. Candidate*[1], Shareen El-Ibiary, Pharm.D., FCCP, BCPS[1], Sally Rafie, Pharm.D., BCPS[2], Laura Borgelt, Pharm.D., FCCP, BCPS[3]; [1]Department of Pharmacy Practice, Midwestern University, College of Pharmacy-Glendale, Glendale, AZ [2]University of California, San Diego Skaggs School of Pharmacy and Pharmaceutical Sciences, La Jolla, CA [3]Departments of Clinical Pharmacy and Family Medicine, University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO
INTRODUCTION: Pharmacists are providing hormonal contraceptives without prescription in selected states, and adequate contraceptive education in pharmacy curricula is crucial to effectively deliver this service. Limited data exist regarding evaluation and description of contraceptive content focusing on hormonal contraception within pharmacy curricula.
RESEARCH QUESTION OR HYPOTHESIS: To characterize contraceptive curricula taught in U.S. pharmacy programs and assess the need for standardized contraceptive curriculum development.
STUDY DESIGN: A cross-sectional, descriptive survey was used to collect and analyze data. Descriptive statistics were utilized.
METHODS: In December 2016 to January 2017, a validated 26-item survey assessing teaching methods (e.g. patient cases, role play, standardized patient interviews), hours taught, topic content and opinion of adequate contraceptive education provided by the program using a 5-point Likert-scale (1-strongly disagree, 5-strongly agree) was administered by telephone or e-mail to instructors/qualified administrators from 139 pharmacy schools.
RESULTS: Response rate was 40% (n = 56). Average number of hours taught [standard deviation] and percent of programs covering topics were as follows, respectively: non-hormonal over-the-counter contraception (1.97-h[1.65],96%), emergency contraception (0.9-h[0.52],100%), hormonal contraception (2.99-h[2.25],100%), long-acting reversible hormonal contraception (0.78-h[0.54],96%) and non-hormonal reversible contraception (0.5-h[0.49],93%). Patient cases were used most to supplement didactics in all topics while patient interviews were used less (25% hormonal contraception and 7% emergency contraception). About 70% percent of programs agreed or strongly agreed that adequate contraceptive education was provided (mean Likert score: 3.74[1.0]), with 11% requiring IPPE activities related to contraception and 31% offering APPE rotations in women's health. A majority (74%) indicated interest in a standardized contraceptive curriculum.
CONCLUSION: Contraceptive education is broadly covered in didactics. A limited number of schools offer experiential opportunities in contraception or women's health though a majority of programs indicate curricula are adequate. Further assessment and development of curricula standards may be warranted to assess quality and adequacy of contraceptive education in pharmacy curricula.

317. Evaluation of reported contents in prescription and over-the-counter prenatal vitamins *Laura Borgelt, Pharm.D., FCCP, BCPS*[1], Kelsey Desalvo, M.D.[2], Carol Stamm, M.D.[3]; [1]Departments of Clinical Pharmacy and Family Medicine, University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO [2]University of Colorado Anschutz Medical Campus, Aurora, CO [3]School of Medicine, University of Colorado Anschutz Medical Campus, Aurora, CO
INTRODUCTION: A prenatal supplement containing folic acid and iron is recommended for every pregnant woman. The Institute of Medicine (IOM) published guidelines on amount of micronutrients pregnant women should consume; however, over 90% of reproductive age women have deficient intake and may require supplementation. Women are faced with the decision about what prenatal vitamin (PNV) to purchase and whether it should be prescription (Rx) or over-the-counter (OTC). There is limited knowledge about potential variability of vitamin content in PNVs and critical evaluation of options is essential for optimal preconception planning and prenatal health.
RESEARCH QUESTION OR HYPOTHESIS: Reported amounts of 24 vitamins and minerals in OTC and Rx PNVs are similar and meet IOM recommended daily amounts (RDA) and upper limits (UL) for intake.
STUDY DESIGN: Observational, quantitative study based on convenience sampling.
METHODS: Nutrition fact labels on OTC and Rx PNVs products identified online, in grocery stores, and pharmacies. Mean reported vitamin amounts in OTC and Rx products were compared. Vitamin amounts were compared to the IOM's RDAs/ULs and categorized as reporting adequate or insufficient amounts of vitamins.
RESULTS: 163 OTC and 88 Rx PNVs were evaluated. OTC products have significantly more of each vitamin compared to Rx products with few exceptions including: iron, folic acid, copper and vitamin B6. Based on IOM RDA, most OTC and Rx PNVs contain sufficient amounts of folic acid, iron, vitamin B6, riboflavin, vitamin B12, and thiamin. However, a majority of Rx and OTC PNVs report insufficient amounts of calcium, choline, copper, iodine, magnesium, manganese, molybdenum, selenium, vitamin D, and vitamin K.
CONCLUSION: There is large reported variability between Rx and OTC PNV options, with Rx options more likely than OTCs to report inadequate amounts of vitamins per IOM guidelines with the exception of folic acid and iron. These findings greatly impact PNV recommendations.

318. Tools to improve pharmacy access to contraception for adolescents: a Delphi study *Ashley Vincent, Pharm.D.*[1], Tracey Wilkinson, M.D., MPH[2], Sally Rafie, Pharm.D., BCPS[3], Rebekah Williams, M.D., MS[2], Jennifer Campi, Pharm.D.[1], Carolyn Meagher, BA[2], Mary Ott, M.D., MA[2]; [1]Purdue University College of Pharmacy, Indianapolis, IN [2]Indiana University School of Medicine, Indianapolis, IN [3]University of California, San Diego Skaggs School of Pharmacy and Pharmaceutical Sciences, La Jolla, CA
INTRODUCTION: Several states have legislation that increases access to contraception via pharmacists. Pharmacists may screen

and counsel on contraceptive methods, then prescribe and dispense directly to patients. Most state laws restrict this service to adults and selected adolescents with prior contraceptive use, despite adolescents having high unmet contraceptive needs. Implementation of this service by community pharmacists has been slow. The Delphi Method is a technique aimed at generating consensus through gathering expert opinions via an iterative process.
RESEARCH QUESTION OR HYPOTHESIS: The use of a Delphi Method process will allow for development of standardized youth-friendly tools to facilitate pharmacist prescribing of contraceptives to adolescents.
STUDY DESIGN: Open-access; expert panel review by invitation; Delphi Method.
METHODS: Starting with materials from state pharmacist prescribing protocols and national reproductive health organizations, a self-screener was adapted, pharmacist prescribing process created, and patient education materials were revised. A modified Delphi approach was used with input from experts in community pharmacy, adolescent medicine, gynecology, patient-centered design, and youth. Experts reviewed and provided feedback on all materials anonymously via Qualtrics software. Following each round of review, responses were compiled and materials were updated. Items were redistributed to experts for further comment for three iterations. The goal was to reach consensus.
RESULTS: Reviewer feedback focused on: (1) organizing the pharmacist prescribing process into a visual algorithm with attention to workflow at a community pharmacy and pharmacist expectations; (2) attention to language that was concise and medically accurate; (3) creating a single set of materials that could be used for all patients, but was sensitive to the unique needs of youth; and (4) assuring that materials had visual appeal and were understandable to typical patients.
CONCLUSION: Use of a Delphi process produced materials that are medically accurate, patient-centered, and responsive to the workflow issues in community pharmacies.

320. Electronic alert and direct messaging do not effectively prompt documented discussion of teratogenic medication risk or contraception changes in women of childbearing age prescribed potential teratogens at an urban academic family health center
Nozomi Sakai, B.S.[1], Lisa Schlar, M.D.[2], *Stephanie Ballard, Pharm.D., BCPS*[3]; [1]University of Pittsburgh School of Medicine, Pittsburgh, PA [2]UPMC Shadyside Family Medicine Residency, Pittsburgh, PR [3]UPMC Shadyside Department of Pharmacy, Pittsburgh, PA
INTRODUCTION: Teratogenic med exposure occurs in approximately 6% of US pregnancies. The best practice alert for teratogenicity (BPAT) warns providers at the time of prescription and offers information, orders, and templated text documenting teratogen counseling and discussion of risk.
RESEARCH QUESTION OR HYPOTHESIS: This study describes teratogen prescription and frequency of documented risk discussions in women of childbearing age in the setting of an electronic alert targeting teratogenicity at an urban academic family health center.
STUDY DESIGN: Descriptive single-center retrospective baseline chart review between January 2015 and May 2016; direct provider messaging, repeated chart review.
METHODS: A report of BPAT firing was used to identify encounters for women aged 15–45 prescribed a category D or X medicine. Women with surgical sterilization/hysterectomy, postmenopausal and trans women were excluded. Chart review collected patient demographics, contraception, and risk discussion documentation. Contraception classified based on adherence lapse risk as low (barrier, withdrawal, none, unknown), moderate (hormonal), and high effectiveness (implant, IUD, vasectomy.) For patients with ongoing exposure and no risk discussion, the physician was contacted and the chart was reviewed 2 months later for intervention (risk discussion, teratogen stopped, or contraception change.)
RESULTS: 193 prescriptive encounters were analyzed. The mean age was 32 years, and 62% were black. The top four medications were lisinopril (N = 52), paroxetine (N = 42), tetracyclines (N = 37), and topiramate (N = 19), accounting for 78% of encounters. Over half (53%, N = 102) had low-effectiveness contraception, with 18% (N = 34) using high-effectiveness methods. Risk discussion occurred in 18% of encounters. In sexually active patients with low-effectiveness contraception, 33% (26/77) had an intervention after the BPAT. Of 66 messages sent to PCPs, 13 (20%) charts showed subsequent physician intervention.
CONCLUSION: Both the BPAT and a message to the physician were ineffective in prompting teratogenic medicine risk discussion or contraception changes. Next steps include modifications to the BPAT to reduce user dismissals.

Advances in International Clinical Pharmacy Practice, Education, or Training Education/Training

321. US-Egypt global pharmacy education collaborative in a pharmacotherapy course
Ebtesam Ahmed, Pharm.D, M.S.[1], Sharon See, Pharm.D.[2], Mona F Schalaan, Ph.D.[3]; [1]Clinical Health Professions, St. John's University College of Pharmacy and Health Sciences, Queens, NY [2]Clinical Pharmacy Practice Department, St. John's University College of Pharmacy and Health Sciences, Jamaica, NY [3]Clinical Pharmacy and Pharmacy practice Department, Faculty of Pharmacy, Misr International University, Cairo, Egypt
SERVICE OR PROGRAM: A memorandum of agreement was established between St. John's University (SJU) College of Pharmacy in New York and Misr International University (MIU) College of Pharmacy in Cairo, Egypt with a focus on inviting visiting professors from SJU to teach in pharmacotherapy courses to enhance MIU educational programs according to ACPE standards and improve clinical pharmacy practice in Egypt.
JUSTIFICATION/DOCUMENTATION: In September 2016, two SJU professors visited MIU to teach clinical modules over 2 weeks. Each taught 5 infectious disease or internal medicine topics to 4th or 5th year BS pharmacy students. An open-ended questionnaire was developed and administered to MIU students following the program to identify students' perceptions and satisfaction of the SJU visiting professor and program.
ADAPTABILITY: Sixty-eight percent of students completed the questionnaire. (545 out of 800). The average student age was 21 years old and 72% were female. Eighty-four percent of the students reported there was a high value in attending the program and 89 percent rated the program quality as positive. Before the program, 66% of participants felt they had good understanding of the topics. Student understanding of material increased to 90% after attending the clinical modules.
SIGNIFICANCE: Students who participated in the clinical modules rated this program positively and valued learning about clinical pharmacy practice in the United States. This program raised student awareness regarding the importance of pharmacists in advancing clinical pharmacy practice in Egypt. This SJU-MIU collaboration is ongoing in order to foster clinical pharmacy education in Egypt.

322. Introducing the pharmacy SNOW (strategies for new opportunities worldwide) symposium for advancing pharmacy practice globally
Jodie Malhotra, Pharm.D.[1], Kari Franson, Pharm.D., Ph.D.[1], Ralph Altiere, Ph.D.[2]; [1]Department of Clinical Pharmacy, University of Colorado Skaggs School of Pharmacy, Aurora, CO [2]University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO

SERVICE OR PROGRAM: The University of Colorado created Pharmacy SNOW symposium to bring pharmacy practitioners and educators together to share knowledge and best practices for the advancement of pharmacy practice in order to address health disparities across the world. The symposium was held in December 2016 in Denver, Colorado, USA. The primary themes of the conference: 1. Promoting your value interprofessionally; 2. Expanding pharmacy practice to optimize patient wellness, and 3. Education to improve practice. Pharmacy educators and practitioners were invited to present their work on existing global challenges and strategies related to disparities to improve health in underserved populations. There was also an open call for round table discussions and posters that addressed the primary themes of the conference.
JUSTIFICATION/DOCUMENTATION: There were 46 registrants with 10 representing countries outside the United States (US). A large percentage of US registrants presented on their activities in other countries to enhance pharmacy practice. A network developed between the international and US based participants from Medecins sans Frontieres. Participants' assessment that the symposium met their educational needs was excellent (3.9/4.0) and many described their favorite aspect to be networking with pharmacists whose expertise was worldwide.
ADAPTABILITY: The SNOW Symposium is designed to bring together pharmacists from around the world. Knowledge gained from the SNOW Symposium can be adapted to meet the needs of pharmacy practice worldwide.
SIGNIFICANCE: The symposium created an opportunity for pharmacists with an interest in global / public health to network and be inspired by the work that others are doing. Based on the success of this inaugural symposium, plans for the next SNOW Symposium (January 2019) are underway.

323. International advanced pharmacy practice experience research elective pilot in Kampala, Uganda *Amy Tran, Pharm.D. Candidate*[1], Winnie Nambatya, MPharm[2], Melanie Nicol, Pharm.D., Ph.D.[1]; [1]College of Pharmacy, University of Minnesota, Minneapolis, MN [2]Department of Pharmacy, Makerere University, Kampala, Uganda
SERVICE OR PROGRAM: This international APPE research elective in Kampala, Uganda was a 5-week (3 weeks in-country) experience for one PD4 student. The goals of this pilot were to promote student understanding of pharmacy's role in international research and to develop capacity for local pharmacists' involvement in pharmaceutical research in a resource-limited setting. This experience was supported by the University of Minnesota Center for Global Health and Social Responsibility.
JUSTIFICATION/DOCUMENTATION: The student pharmacist gained research experience by assisting with study design, developing protocols and data collection tools, preparing IRB applications, and analyzing existing data related to collaborative clinical pharmacy research projects. Additionally, the student participated in medication reconciliation and clinical rounds in the neurosurgery ward at Mulago Hospital with oversight of a Ugandan pharmacist. This experience led to working with the Ugandan pharmacist on the development of a research protocol and IRB submission aimed at improving dosing practices on the ward. To experience the integration of research and clinical care in a resource-limited setting, the student also participated in daily rounds of an ongoing clinical trial in cryptococcal meningitis patients. The student attended weekly Continuous Professional Development sessions hosted by Mulago Hospital for Ugandan pharmacy interns, and at one session presented an update on the clinical management of cryptococcal meningitis.
ADAPTABILITY: This international experience can be replicated at other institutions by establishing partnerships with local practitioners. Support from local institutions such as universities or NGOs can assist with capacity building for research infrastructure.
SIGNIFICANCE: The integration of research with clinical pharmacy practice makes this APPE unique from most existing opportunities for pharmacy students. This pilot APPE elective provides early international exposure to learners in addition to fostering collaboration between professionals, institutions, and healthcare systems to promote the Ugandan pharmacy workforce; facilitate shared training and knowledge; and empower local practitioners to be clinical researchers.

Health Services Research

324. Advancing clinical practice in western Kenya through the Moi teaching and referral hospital clinical pharmacy center of excellence *Sonak Pastakia, Pharm.D., MPH, Ph.D.*[1], Monica Miller, Pharm.D., MSC[2], Benson Njuguna, BPharm[3], Ellen Schellhase, Pharm.D.[4], Wilson Aruasa, MBChB, MMed[5], Rakhi Karwa, Pharm.D.[6], Imran Manji, BPharm[3], Tina Tran, Pharm.D.[6], Gabriel Kigen, BPharm, Ph.D.[7]; [1]Department of Pharmacy Practice, Purdue University College of Pharmacy / Purdue Kenya Partnership, Eldoret, Kenya [2]Purdue University College of Pharmacy, West Lafayette, IN [3]Department of Pharmacy, Academic Model Providing Access to Healthcare (AMPATH), Eldoret, Kenya [4]Department of Pharmacy Practice, Purdue University College of Pharmacy, West Lafayette, IN [5]Moi Teaching and Referral Hospital, Eldoret, Kenya [6]Department of Pharmacy Practice, Purdue University College of Pharmacy, Eldoret, Kenya [7]Pharmacology, Moi University, Eldoret, Kenya
SERVICE OR PROGRAM: The Purdue Kenya Partnership (PKP), in conjunction with the Academic Model Providing Access to Healthcare (AMPATH), has established an 11-year partnership in western Kenya to improve health outcomes for over 4.5 million people. We have collaborated with the Moi Teaching and Referral Hospital (MTRH), a national referral hospital, to create the first ever Clinical Pharmacy Center of Excellence in sub-Saharan Africa which prioritizes activities in three key pillars – Care, Teaching, and Research, with significant success.
JUSTIFICATION/DOCUMENTATION: MTRH, AMPATH, and PKP have collaborated to create programs that deliver antiretroviral medication to 95,117 HIV patients, fulfilled over 1,000,000 non-HIV medication prescriptions, provide community-based care for a rural population of over 20,000, provide inpatient clinical pharmacy services, and anticoagulation services for 2,423 patients. Additionally, we have layered on experiential clinical training programs for 265 North America Doctor of Pharmacy candidates, and 64 Kenyan interns. We have received over $700,000 in research funding and published 48 peer-reviewed articles, 2 book chapters, and presented over 150 posters at national and international conferences.
ADAPTABILITY: Our description aims to encourage other programs to uphold the tripartite tenets of engagement in all healthcare partnerships between high- and low-income countries. By prioritizing the care needs of underserved populations in any setting, adequate platforms can be constructed to promote the traditional interests of academic institutions while seamlessly integrating care, training, and research.
SIGNIFICANCE: This experience description is meant to serve as an example of sustained partnership between an academic institution and an international community partner. Our novel, adaptive approach of creating community appropriate high quality care coupled with setting focused training models and implementation driven research programs has led to a shift in pharmacy practice in Kenya and creation of a Clinical Pharmacy Center of Excellence.

325. Patterns of medication use among patients in an interprofessional clinic in villa mella (Paraiso) dominican republic *Christina Andrade, Pharm.D.*; US Public Health Service, San Antonio, TX
SERVICE OR PROGRAM: The Humanitarian Outreach Medical Brigade Effort (HOMBRE) travels to the Dominican Republic every 6 months to provide interdisciplinary medical and pharmaceutical services to residents of Villa Mella in Paraiso, Santo Domingo. Patient interviews and past research have revealed difficulties in obtaining care and adherence to chronic medications. The study aim was to discover patterns of medication use and identify reasons for difficulty in obtaining medications including but not limited to cost, location of pharmacy, and appropriate legal documentation.
JUSTIFICATION/DOCUMENTATION: A cross-sectional, 16-question survey was administered by brigade staff for 4 days in the July 2016 HOMBRE clinic. Patients greater than 18 years of age were invited to complete a survey after care had been delivered.
ADAPTABILITY: Of the 97 surveys completed, 48% of patients paid out of pocket while 40% had government or private insurance, and 7% relied on the brigade for their medications. On the survey, 32% of participants indicated that they were unable to obtain medications throughout the year and of those, 89% were unable to do so because of cost. Overall, 32% of respondents claimed to have taken an antibiotic within the last month with 34% of those taking it for ┬general health ╚. If a medication or treatment was recommended, 78% of patients obtained medications at an independent pharmacy or government-subsidized botica.
SIGNIFICANCE: Results validate brigade providers perceptions of the nature of healthcare within the community. It is clear the brigade serves to supplement care, rather than act as the sole provider for patients in Paraiso. Except for a small percentage, patients are able to access pharmaceutical services. Notably, 89% of those unable to access care list cost as the primary barrier. The use of antibiotic for the purpose of ┬general health ╚ requires further inquiry about the benefit of establishing an antimicrobial stewardship in the community.

Clinical Pharmacy Forum
Adult Medicine

326. Development and implementation of a pharmacist-driven concentrated insulin conversion service and policy *Rachel Ieuter, Pharm.D., BCPS*[1], Elizabeth Greenhalgh, Pharm.D., BCPS[2], Denise Kolanczyk, Pharm.D., BCPS-AQ Cardiology[1], Evelina Lin, Pharm.D., BCPS[2], Candy Ng, Pharm.D., BCPS[3]; [1]Midwestern University Chicago College of Pharmacy, Downers Grove, IL [2]Loyola University Medical Center, Maywood, IL [3]Department of Pharmacy, Loyola University Medical Center, Maywood, IL
SERVICE OR PROGRAM: In January 2017, Loyola University Medical Center implemented a Pharmacist-Driven Concentrated Insulin Conversion Service and Policy. Concentrated insulin products are not on our institution's formulary and are not permitted for inpatient use. Physicians may order the consult service to request that a pharmacist conduct medication reconciliation of the home concentrated insulin regimen and recommend an alternative regimen with formulary insulin agents.
JUSTIFICATION/DOCUMENTATION: Concentrated insulins are now available in concentrations of 200, 300, or 500 units/mL. Since implementation of our concentrated insulin policy in January 2015, multiple patient safety events related to prescribing error were reported. Some instances resulted in administering doses five times less than the correct dose with consequential hyperglycemia. To reduce dosage conversion errors and prevent patient harm, our institution elected to exclusively supply insulin as its standard concentration of 100 units/mL. Pharmacists document dose recommendations by writing a consult note using a standardized note template in the electronic medical record. Pharmacists are required to contact the prescriber regarding recommendations or clarification(s) about a patient's clinical condition or care plan. Evaluation of the service is ongoing.
ADAPTABILITY: This service is applicable to institutions that avoid in-house utilization of concentrated insulins. Pharmacists should work closely with endocrinologists to create and implement this type of service. For a successful implementation, all pharmacists should receive training through a competency that describes the service and assesses knowledge and problem-solving via multiple patient scenarios. This may be repeated annually. The service should be communicated to providers through email, in-services, and/or other means before full implementation.
SIGNIFICANCE: The Pharmacist-Driven Concentrated Insulin Conversion Service provides an opportunity to proactively collaborate with other health care team members to optimize insulin therapy in a safe and effective manner. This unique service seeks to further highlight the role of clinical pharmacists in preventing potential insulin-related adverse events.

Ambulatory Care

327. Integration of transitions of care pharmacist services within an accredited pulmonary rehabilitation clinic *Paul Boylan, Pharm.D.*[1], Ken Trinh, Pharm.D.[2], James Helms, Jr, Pharm.D.[3], Regine Ghoubrial-Waibel, Pharm.D.[3], Joan Mege, Pharm.D.[3]; [1]Department of Clinical and Administrative Sciences, Larkin University College of Pharmacy, Miami, FL [2]Department of Pharmacy, St. Vincent Indianapolis Hospital, Indianapolis, IN [3]Pharmacy Department, Reading Hospital, West Reading, PA
SERVICE OR PROGRAM: Pharmacists were integrated into a Joint Commission-accredited Pulmonary Rehabilitation program at a tertiary community teaching hospital. The pharmacists were responsible for updating the patient's medication list and providing comprehensive education. Each patient within the clinic was required to visit the pharmacist once throughout their series of rehabilitation appointments. The pharmacist consults lasted between 30 and 60 min. The most frequently encountered disease states included chronic obstructive pulmonary disease (COPD), asthma, and pulmonary fibrosis.
JUSTIFICATION/DOCUMENTATION: In order for Pulmonary Rehabilitation programs to be accredited by The Joint Commission (TJC), they must demonstrate integration of interprofessional elements and collaboration. Typical team members include pulmonologists, nurses, and respiratory therapists. Pharmacists are not explicitly listed on TJC standards, but are welcome to collaborate with the interprofessional team. As a result, pharmacists are uniquely poised to identify gaps in care, such as omissions of short-acting inhalers or medication non-adherence. Information gathered from the encounters was documented using a template and posted in the electronic medical record.
ADAPTABILITY: TJC accredits a variety of programs including pulmonary, cardiac, orthopedic, and stroke. Interprofessionalism is a required component for each program. Thus, there are multiple opportunities that pharmacists may be integrated into TJC-accredited clinics, based on institution-specific needs. Participants in this program included clinical pharmacy specialists, pharmacy residents, and fourth year pharmacy students.
SIGNIFICANCE: Integration of pharmacists into an accreditted Pulmonary Rehabilitation clinic fostered a spirit of interprofessionalism and created an opportunity to validate the medication list throughout transitions of care. Additional opportunities for consideration include pharmacist-administered questionnaires to determine patient comprehension of respiratory self-care, as well as staging COPD and asthma. Future research will determine if patients are significantly more adherent to their respiratory pharmacotherapy or less likely to be admitted for exacerbations of lung disease.

328. Comprehensive medication management within a care coordination program for a health-system employee group
Susan Conway, Pharm.D.[1], Kendall Powers, Pharm.D.[2], Erica Smith, Pharm.D.[3]; [1]Department of Clinical and Administrative Sciences, University of Oklahoma College of Pharmacy, Oklahoma City, OK [2]Comprehensive Medication Management, INTEGRIS Baptist Medical Center, Oklahoma City, OK [3]Comprehensive Medication Management, INTEGRIS Southwest Medical Center, Oklahoma City, OK
SERVICE OR PROGRAM: A comprehensive medication management (CMM) service was developed for an existing care coordination program for our self-insured health-system employee group. The care coordination program provides bi-annual health coaching calls and waived copayments for medications for patients with asthma, diabetes, hypertension, and hyperlipidemia. One full-time pharmacist was funded by Human Resources effective January 2017. Pharmacists offer initial/annual CMM consultations for care coordination patients and longitudinal CMM visits for patients not at treatment goals. CMM services are provided at centralized locations as face-to-face encounters, and videoconferencing technology is used for rural employees. Initial CMM appointments include medication reconciliation; evaluation of drug regimens for adherence, indication, drug interactions, adverse drug effects, effectiveness, and affordability; medication education; and prescriber recommendations for optimizing pharmacotherapy. Longitudinal CMM visits focus on drug titration, intensive education, and close monitoring.
JUSTIFICATION/DOCUMENTATION: Our health-system's per-member, per-month drug costs were increasing significantly. CMM services were initiated to improve therapeutic outcomes and promote safe, cost-effective medication use. Initially, evidence of success is being measured by medication-related problems identified and addressed (average 2.4 per patient) and physician recommendation acceptance rate (88%). Clinical outcome measures include blood pressure, A1c, and medication adherence.
ADAPTABILITY: The CMM service could be adapted for any employee/insurance group seeking improved medication management. The services could be provided in either a centralized location or embedded within the physicians' practice. The initial/annual CMM encounter is applicable to any patient population, especially those on multiple chronic medications.
SIGNIFICANCE: Most literature demonstrating the value of ambulatory care pharmacists is specific for disease state management (DSM). Outcomes for broader services of medication therapy management (MTM) generally provided by community pharmacists have found inconsistent benefits. CMM is an emerging field that blends the best of DSM and MTM with clinically-trained pharmacists integrated within health-systems or physician networks providing broad pharmacotherapy services.

329. Comprehensive medication management within primary care office of patient-centered medical home model
Susan Conway, Pharm.D.[1], Erica Smith, Pharm.D.[2]; [1]Department of Clinical and Administrative Sciences, University of Oklahoma College of Pharmacy, Oklahoma City, OK [2]Comprehensive Medication Management, INTEGRIS Southwest Medical Center, Oklahoma City, OK
SERVICE OR PROGRAM: A comprehensive medication management (CMM) service was piloted with 2 part-time clinical pharmacists embedded in 2 patient-centered medical home (PCMH) clinics. The scope of services included initial CMM consultations and longitudinal targeted medication management (TMM). Primary care physicians directly referred patients to the clinical pharmacists who provided face-to-face appointments within the physicians' office. Initial CMM visits include medication reconciliation; evaluation of drug regimens for adherence, indication, drug interactions, adverse drug effects, effectiveness, and affordability; and medication education. TMM visits focused on drug titration, intensive education, and close monitoring for the referred disease state. The clinical pharmacists implemented medication therapy changes through a collaborative practice agreement and routed all progress notes to the physician for co-signature.
JUSTIFICATION/DOCUMENTATION: The CMM service provided medication management support to busy primary care practices. Over a 15 month duration, there were 261 initial CMM consultations and 280 TMM follow-ups. The most common reasons for referral was diabetes management, medication reconciliation, medication education, polypharmacy, and medication costs. Overall, the clinical pharmacists identified and addressed 1232 medication-related problems and adverse drug events (average 2.3 per CMM/TMM visit). Of the 47 patients receiving diabetes TMM, there was an average HgbA1c improvement of 1%.
ADAPTABILITY: This CMM model could be applied to any pharmacist embedded within a physician practice. This model could also be adapted for clinical pharmacists working in a central location with a larger physician network. To adapt the program to one's setting, an analysis of the practice and population should be performed to determine which patients would most benefit from CMM/TMM services and how to refer them.
SIGNIFICANCE: As PCMH and accountable care organization models expand, there is substantial opportunity for clinical pharmacists to integrate within primary care teams. CMM services can assist physicians with impacting the majority of quality metrics in the pay-for-performance environment.

330. Development of an interprofessional transitions of care service for chronic obstructive pulmonary disease management
Edward Portillo, Pharm.D.[1], Ellina Seckel, Pharm.D., BCACP[2], Andrew Wilcox, Pharm.D.[3]; [1]School of Pharmacy, University of Wisconsin-Madison School of Pharmacy, Madison, WI [2]William S. Middleton VA Hospital, madison, WI [3]William S. Middleton VA Hospital, Madison, WI
SERVICE OR PROGRAM: This evaluation reviews the COPD CARE (COPD Access to Reduce Exacerbations) service, which uniquely positioned clinical pharmacists as prescribers during patient care transitions to reduce 30-day COPD readmissions.The COPD CARE service occurred at the William S. Memorial Veterans Affairs Hospital, and consisted of a post-discharge patient encounter conducted jointly by a clinical pharmacist and nurse in collaboration with the primary care provider. The service was implemented on October 1, 2015 and evaluated through March 1, 2016. All patients receiving primary care through the project site outpatient clinic with recent COPD admission were included in the evaluation. Patients were excluded if they received care from a pulmonologist.Pharmacists provided COPD chronic disease state management and inhaler technique review to guide prescribing, and developed a patient-specific COPD action plan. Clinical outcomes included a review of access to care as well as 30-day COPD composite readmission rates (hospital and ED readmissions) for service participants as compared to a control group that received usual care.
JUSTIFICATION/DOCUMENTATION: Access to timely in-clinic follow-up care within 30 days of discharge significantly improved for those participating in the COPD CARE service versus control (73.6% vs. 35.1% respectively, $p = 0.025$). The 30-day readmission rate was 0% for patients in the COPD CARE service compared to 18.9% for patients receiving standard of care ($p = 0.083$), with a significant reduction in total number of ED and hospital readmissions between the two groups ($p = 0.047$). There were 19 patients in the intervention arm and 38 patients in the control arm.
ADAPTABILITY: The COPD CARE service structure can be easily adapted to health systems across the country. Pharmacists are uniquely positioned to serve in collaboration with interprofessional teams, especially during care transitions for COPD management.

SIGNIFICANCE: This service uniquely positions pharmacists as independent prescribers serving within an interprofessional team to deliver high quality COPD care during care transitions.

331. Development and implementation of a collaborative care diabetes program in an ambulatory care setting Jinwen Li, Pharm.D., BCACP[1], *Tracy Lin, Pharm.D., BCACP*[2], Alen Pajazetovic, Pharm.D., BCACP[3], Alexis Ryon, Pharm.D., BCACP[4], Deborah Thomas, R.Ph., BCACP[5]; [1]Cigna Medical Group, Peoria, AZ [2]Cigna Medical Group, Mesa, AZ [3]Cigna Medical Group, Phoenix, AZ [4]Cigna Medical Group, Glendale, AZ [5]Cigna Medical Group, Tempe, AZ

SERVICE OR PROGRAM: In 2015, Cigna Medical Group (CMG), a primary care-based, multi-specialty medical group recognized as a patient-centered medical home, implemented a telephone-based diabetes program across 19 healthcare centers. Eight clinical pharmacists entered into collaborative practice agreements (CPAs) with primary care physicians (PCPs) in their assigned centers to facilitate care delivery within a team-based care setting. Patients with A1c > 9.0% were referred to clinical pharmacists for medication management. Pharmacists contacted referred patients to evaluate their diabetes management status, develop and implement individualized care plans, and adjust medications as needed.

JUSTIFICATION/DOCUMENTATION: An effort to decrease the number of patients with poor diabetes control (defined by the Healthcare Effectiveness Data and Information Set [HEDIS] as A1c > 9.0%) was the justification for implementing this program. Upon receiving a referral from the PCP, clinical pharmacists scheduled weekly appointments with patients to adjust medications and provide counseling. Standardized notes detailing patients' progress toward their individualized goals were placed in the Electronic Health Record (EHR) and sent to the PCP for review after each visit. This led to an average A1c reduction of 1.6% in the 273 patients who completed ≥1 follow-up A1c labs during the program.

ADAPTABILITY: Pharmacists in primary care settings can implement this program if a CPA is secured. Although the CMG model focuses on diabetes, it may be expanded to other chronic health conditions. Telephonic outreach allows for flexibility in scheduling and broader geographic coverage. Pharmacist access to the EHR enables medication adjustments, lab ordering, direct referrals from PCPs, and communication with PCPs regarding patient progress.

SIGNIFICANCE: Through frequent patient-centered visits, clinical pharmacists at CMG were able to engage 786 high risk diabetes patients. The use of this practice model allows ambulatory care pharmacists to develop clinical skills, reduce the workload of PCPs, and become more involved in optimizing patient care.

332. 2017 Updates on the accomplishments and initiatives of the ACCP ambulatory care practice and research network (PRN) *James C. Lee, Pharm.D., BCACP*[1], Nicholas Cox, Pharm.D.[2], Sweta Patel, Pharm.D., BCPS[3], Kelly A. Lempicki, Pharm.D., BCPS[4], Allison Helmer, Pharm.D., BCACP[5]; [1]University of Illinois at Chicago College of Pharmacy, Chicago, IL [2]University of Utah Health Care, Salt Lake City, UT [3]Department of Pharmacy Practice, Mercer University College of Pharmacy, Atlanta, GA [4]Department of Pharmacy Practice, Midwestern University Chicago College of Pharmacy, Downers Grove, IL [5]Department of Pharmacy Practice, Auburn University Harrison School of Pharmacy, Mobile, AL

SERVICE OR PROGRAM: The Ambulatory Care PRN is an active body of clinical pharmacists contributing to ACCP and the PRN through leadership and committee involvement while also serving in ambulatory care pharmacy. Members are currently queried biannually regarding individual professional accomplishments such as promotions, awards, funding, and scholarly activities.

JUSTIFICATION/DOCUMENTATION: To evaluate the initiatives and achievements of the ACCP Ambulatory Care PRN and its membership, an electronic survey was developed to characterize the year-to-year progress of member contributions to clinical practice, service, teaching, and research.

ADAPTABILITY: Data obtained through this survey and web-based communications have been compared to previous years. A record of contributions and accomplishments are continuously documented and reported via the *ACCP PRN Report*.

SIGNIFICANCE: The Ambulatory Care PRN consists of over 2,300 members, with practice settings and services provided by the PRN membership continuing to diversify. PRN committees continue to promote initiatives related to advocacy, practice support, and PRN membership outreach and networking. Advocacy efforts include a letter writing campaign and development of a Professional Cares Tool Kit. The PRN continues to support increased member participation in professional, scholarly, and clinical development through PRN-sponsored grant funding. Initiatives aimed at increasing utilization of PRN professional resources and expanding PRN collaboration and knowledge were advanced with the development of a new edition of the *ACCP Ambulatory Care Pharmacist's Survival Guide*, deployment of Google Forms to network PRN members with similar research interests, and development of two webinars.The Ambulatory Care PRN continues to show positive growth in membership depth, committee contributions, and membership support. The opportunities provided and accomplishments achieved through the PRN remain of high value to the PRN and College. The PRN continues to strive to provide a wide range of advocacy, educational, and innovation opportunities with the objective of advancing pharmacist development, ambulatory care clinical practice, and patient care provision.

333E. Implementation of a Direct Oral Anticoagulation (DOAC) monitoring service at a large academic medical center as part of a pharmacist-managed antithrombosis clinic *Ellen M Uppuluri, Pharm.D.*[1], Nancy L Shapiro, Pharm.D.[2]; [1]Department of Pharmacy Practice, University of Illinois at Chicago College of Pharmacy, Chicago, IL [2]University of Illinois at Chicago College of Pharmacy, Chicago, IL

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334. Implementation of a comprehensive population management model to improve anticoagulation clinic efficiency of monitoring the safety and efficacy of direct oral anticoagulants (DOACs) Jeffery Kibert, II, Pharm.D., BCPS[1], *Karen Joy Vinluan, Pharm.D.*[1], Kristyn Pardo, Pharm.D., BCPS, CACP[1], Mary Anderson, Pharm.D., CACP[1], Jessica Lucas, BCACP, CACP[1], David Parra, Pharm.D., FCCP, BCPS[2], Amy Sipe, Pharm.D.[3], Arthur Allen, Pharm.D., CACP[4], Linda Chia, Pharm.D., BCPS[2], Patrick Spoutz, Pharm.D., BCPS[3]; [1]Department of Pharmacy, North Florida/South Georgia VA Medical Center, Gainesville, FL [2]Veterans Integrated Service Network 8, Pharmacy Benefits Management, Bay Pines, FL [3]Department of Pharmacy, Kansas City VA Medical Center, Kansas City, MO [4]Department of Pharmacy, Salt Lake City VA Medical Center, Salt Lake City, UT

SERVICE OR PROGRAM: The Anticoagulation Service at the North Florida/ South Georgia Veterans Health System recently transitioned monitoring of patients receiving direct oral anticoagulants (DOACs) from a reactive treatment model to a proactive population management model, powered by a DOAC Population Management Dashboard. The dashboard identifies patients who

meet parameters indicating an intervention may be required to ensure safe and effective anticoagulation therapy. The dashboard utilizes data obtained during standard patient care practices. Monitored parameters are updated daily and include laboratory data, drug-drug interactions, dose-indication and dose-disease state appropriateness, bleeding history, and refill history. Anticoagulation providers triage the generated list and make interventions as indicated.
JUSTIFICATION/DOCUMENTATION: Previous monitoring of DOACs relied on scheduling periodic appointments often resulting in duplicate labwork and a low number of interventions for resources invested. Utilization of the dashboard has the potential to improve the ratio of interventions for time invested and reduce duplicate lab draws. Additionally, when compared to the traditional single-point-in-time evaluation, the dashboard allows daily evaluation of available data to identify potential issues as they develop. This up-to-date report of patient parameters may prevent missed or delayed opportunities for intervention that occurred between appointments during the original monitoring process.
ADAPTABILITY: This practice would be adaptable to any healthcare system with ability to pool data on patients receiving DOACs and assistance from analytics personnel. The change in practice model requires support from all institutional stakeholders to include the pharmacy service, anticoagulation clinic, physicians, and concurrence from appropriate health system committees.
SIGNIFICANCE: The DOAC Dashboard allows continual monitoring of patient parameters, potential adverse effects, and medication adherence for a quicker response when a patient requires intervention. It is anticipated that shifting to a population management model for the management of DOACs will improve patient safety and clinic access as well as fiscal and clinical efficiency.

336. Pharmacist-led collaborative diabetes management program in a private primary care practice *Seema Patel, Pharm.D.*, Claire Premus, Pharm.D., Robert Rossi, Jr, Pharm.D.; CityLife Neighborhood Clinics, Philadelphia, PA
SERVICE OR PROGRAM: In privately owned primary care clinics in urban Philadelphia, patients are given access to a care team instead of a primary care provider (PCP). Each team includes a clinical pharmacist. The pharmacists collectively created a diabetes collaborative practice agreement (CPA). The CPA allows pharmacists to receive physician referrals containing a plan of care for patients with HgA1c >9% and to independently titrate medications. Members are seen initially for a comprehensive diabetes education appointment followed by weekly/monthly follow-ups. Blood sugar logs and glucometers are used to determine medication adjustments.
JUSTIFICATION/DOCUMENTATION: Patients with HgA1c >9% require frequent management and close follow-up to achieve HgA1c and blood glucose goals. Accessibility of integrated pharmacists in primary care settings allow for close monitoring and increased collaboration with patients. A referral from a PCP to the pharmacist for diabetes education and medication management is created in the electronic medical record (EMR). Pharmacist-led appointments are scheduled and details of the visit are documented in an encounter in the EMR. PCPs are notified by pharmacists within 72 h in the EMR of any medication changes.
ADAPTABILITY: A pharmacist-led diabetes service can be implemented in any primary care clinic where diabetes is managed. As the prevalence of diabetes increases, patients can benefit from a team based approach to management. To implement the program, a written CPA needs to be developed and agreed upon by pharmacists and PCPs. The pharmacists can reduce provider burden by closely monitoring patients for medication titration and helping to meet managed care metrics.
SIGNIFICANCE: As healthcare moves towards a team-based approach, pharmacists have an opportunity to develop targeted services and programs that improve patient health and quality metrics. Pharmacist-led services provide a unique approach by allowing collaboration with physicians and patients to develop an effective plan of care while ensuring medication safety and adherence.

337. Implementation of a pharmacist-led pre-exposure HIV prophylaxis (PrEP) Clinic *Michelle Miller, Pharm.D., BCACP*[1], Nicole Nisly, M.D.[2]; [1]University of Iowa Hospitals and Clinics, Coralville, IA [2]University of Iowa Hospitals, Coralville, IA
SERVICE OR PROGRAM: The purpose of the PrEP Clinic is to streamline the prescribing and monitoring of Truvada® in patients at risk for HIV with goals to increase awareness and utilization and increase access to primary care providers (PCPs). Patients are consulted to the clinic by their PCP for continued monitoring or initiation of PrEP. The clinic visits, labs and sexually transmitted infection (STI) screening are done at the same clinic location. Patients have follow-up every three months to assess sexual risk, adherence, repeat labs, STI screening and prescription renewal. Implementation of internally validated self-collection of oral and/or rectal swabs for *N. gonorrhoeae* and *C. trachomatis* is a unique aspect of the clinic.
JUSTIFICATION/DOCUMENTATION: Clinical pharmacists are well positioned to help alleviate access issues, especially in patients requiring frequent follow-up visits and lab monitoring. A standard note template is utilized and includes patient responses to a sexual health questionnaire. Various data points are collected longitudinally on each patient including HIV and STI results, kidney function and adherence. From 12/13/16 to 5/27/17 31 patients have been consulted, and 27 started/continued PrEP. All HIV screening results have been negative to date. There have been two patients with positive STI screening.
ADAPTABILITY: Our clinic model is widely adaptable to clinical pharmacists in a variety of settings including primary care or infectious disease clinics as well as the community pharmacy setting who work closely with local primary care providers. This model can also be easily extended to other medications requiring close follow-up and monitoring.
SIGNIFICANCE: Prescribing and monitoring of Truvada for PreP by a pharmacist can increase utilization of a potentially life-saving therapy by eliminating the burden of close follow-up and monitoring for the provider. This in turn can be revenue generating by increasing access to the provider for more potentially complex clinic patients.

338. Increasing access to care for rural Veterans by leveraging clinical pharmacy specialist providers *Heather Ourth, Pharm.D.*[1], Julie Groppi, Pharm.D.[1], Michael Tran, Pharm.D., BCPS[2], Kimberly Quicci-Roberts, M.S.[1], Virginia Torrise, Pharm.D.[3], Anthony Morreale, Pharm.D., MBA[1]; [1]Pharmacy Benefits Management Clinical Pharmacy Practice Office, Department of Veterans Affairs, Washington, DC [2]VA Great Lakes Health Care System (VISN 12) Clinical Pharmacy Practice Office (CPPO), Department of Veterans Affairs, Chicago, IL [3]Pharmacy Benefits Managment, Department of Veterans Affairs, Washington, DC
SERVICE OR PROGRAM: Increasing access to care for rural veterans through integration of clinical pharmacy specialist (CPS) providers is the focus of a 5-year collaborative project between VA's Clinical Pharmacy Practice Office (CPPO) and the Office of Rural Health (ORH). The project funds over 200 new CPS positions in rural outpatient clinics across 60 VA healthcare facilities. Half of the CPS will practice in a primary care setting with the others focused on mental health or pain management. Care delivered by these CPS providers will focus on comprehensive

medication management services through innovative virtual care delivery modalities as well as traditional face-to-face visits.
JUSTIFICATION/DOCUMENTATION: Nearly 3 million veterans enrolled VA healthcare live in rural areas where access to care can be a challenge. Optimizing CPS to provide direct patient care affords greater access to medication and disease management services. These veterans also struggle to receive specialty care services that include access to mental health, pain management and hepatitis C care. The CPS are skilled practitioners able to bridge the gaps in care seen in the rural veteran population.
ADAPTABILITY: The integration of CPS providers is easily expanded to a variety of settings to increase access to care in both rural and non-rural areas. CPS providers may be integrated into other patient care areas based on the needs of the healthcare organization.
SIGNIFICANCE: The integration of CPS providers serves to optimize patient care and increase access to care in high demand areas. As of early June 2017, 81 CPS FTEE have been hired and the rest are anticipated to be on board by July 31, 2017. These CPS have provided 32,800 direct patient care encounters for nearly 17,000 patients since the beginning of the project in October 2016.

339. Developing a fidelity assessment system for comprehensive medication management service *Caitlin K. Frail, Pharm.D., MS, BCACP*[1], Carrie Blanchard, Pharm.D.[2], Melanie Livet, Ph.D.[3], Caryn Ward, Ph.D.[4], Todd D. Sorensen, Pharm.D.[1], Mary Roth McClurg, Pharm.D., MHS[2]; [1]Pharmaceutical Care and Health Systems, University of Minnesota College of Pharmacy, Minneapolis, MN [2]UNC Eshelman School of Pharmacy, Chapel Hill, NC [3]UNC-Chapel Hill, Eshelman School of Pharmacy – CMOPP, Chapel Hill, NC [4]FPG Child Development Institute, UNC-Chapel Hill, National Implementation Research Network, Chapel Hill, NC
SERVICE OR PROGRAM: Measurement of fidelity, the extent to which an intervention is delivered as intended, is important to ensure quality and impact. As part of the Comprehensive Medication Management (CMM) Effectiveness and Implementation Grant, a multifaceted approach was used to measure fidelity to CMM, as defined by the common language of CMM. Fidelity of the CMM practice will be assessed using: (1) a biannually administered self-assessment, (2) a rubric to evaluate written clinical documentation, (3) a written or verbal clarification of elements not apparent in clinical documentation, (4) a practice management self-assessment, and (5) a patient responsiveness survey tool. Refinement and validation of the fidelity assessment system is ongoing.
JUSTIFICATION/DOCUMENTATION: Development of this system was pursued to ensure fidelity to CMM and increase consistency in delivery of CMM by 50 pharmacists across 35 participating sites. Beyond the scope of this project, it was recognized that no such system exists and could be useful in the broader CMM practice and research communities.
ADAPTABILITY: This system of fidelity assessment tools can be applied to future research and/or practitioner quality assurance, evaluation, and training. Individual assessments or groups of assessments can be applied depending on the aspect of practice of interest (e.g. practice management vs. patient care process). Individuals or practices as a whole may be assessed.
SIGNIFICANCE: Fidelity is frequently overlooked in clinical research and/or often poorly described, making it difficult for clinicians and researchers to interpret the actual impact of interventions and to compare findings across studies. No other CMM fidelity assessment system currently exists, and CMM fidelity has only been assessed in reported research in limited ways. A validated fidelity assessment system will be a valuable tool for future practice, training, quality improvement efforts, and research.

Cardiovascular

340. Implementation of a cardiovascular transition of care clinic *Laura Tsu, Pharm.D, BCPS, BCGP*[1], Nicole Murdock, Pharm.D, BCPS[2]; [1]Department of Pharmacy Practice, Chapman University School of Pharmacy, Irvine, CA [2]Department of Pharmacy Practice, Midwestern University-College of Pharmacy, Glendale, AZ
SERVICE OR PROGRAM: This pilot program is pharmacist-run transition of care clinic that is directed at geriatric cardiovascular patients who were recently discharged from the hospital. Pharmacists provide a comprehensive post-discharge medication review, assess and address barriers to medication adherence, and conduct follow-up telephone calls. This clinic takes place in a medical home model within a cardiology clinic. This program was developed and delivered by clinical pharmacy faculty who provided clinical services to patients within the outpatient cardiology clinic and inpatient cardiovascular service.
JUSTIFICATION/DOCUMENTATION: This transition of care clinic is located within a cardiology clinic in a geriatric community, which includes a substantial population of patients with cardiovascular disease. Data from the first 70 patients includes an average of 2.5 medication discrepancies per patient and approximately one-third of patients having a therapeutic recommendation to the cardiologist or primary care physician. The most common barriers to adherence were patients being unaware of medication indication and adverse drug effects.
ADAPTABILITY: Our patient population is well matched to a general population suffering from cardiovascular disease. The average age was 78 years, with equal numbers of males and females. It was a high risk group with an average of 3–4 cardiovascular disorders (range 2–7). Over 50% of patients had greater than one hospitalization with 6 months of the clinic visit.
SIGNIFICANCE: This pilot program utilizing clinical faculty pharmacists represents the evolving role of pharmacy services within the health system. This was a new service for pharmacists in the transition of care process between the hospital and outpatient clinic.

341. Development and implementation of time in Therapeutic Range reports within the Veterans health administration *Michael Tran, Pharm.D., BCPS*[1], David Parra, Pharm.D., FCCP, BCPS[2], Joy Meier, Pharm.D., BCACP, PA[3], Christine Clark, Pharm.D.[4], Anthony Morreale, Pharm.D., MBA[5]; [1]VA Great Lakes Health Care System (VISN 12) Clinical Pharmacy Practice Office (CPPO), Department of Veterans Affairs, Chicago, IL [2]Veterans Integrated Service Network 8, Pharmacy Benefits Management, Bay Pines, FL [3]Sierra Pacific Network (VISN 21), Department of Veterans Affairs, Martinez, CA [4]VA Great Lakes Health Care System (VISN 12), Department of Veterans Affairs, Westchester, IL [5]Pharmacy Benefits Management Clinical Pharmacy Practice Office, Department of Veterans Affairs, Washington, DC
SERVICE OR PROGRAM: A suite of National Time in Therapeutic Range (TTR) Reports was developed to provide readily available information to enhance anticoagulation care throughout Veterans Affairs (VA). Development was led by the National VA Pharmacy Benefits Management (PBM) Clinical Pharmacy Practice Office (CPPO) in collaboration with other program offices and subject matter experts throughout VA. The reports are intended for use at many levels of the organization, from national pharmacy leadership to individual practitioners. In addition to calculating individual patient, facility, network, and national mean TTR, the reports provide actionable patients by identifying those with no INR in the past 42 or 56 days, and those with out of range INRs ($\geq$4.0 or $\leq$1.5) and no INR follow up within 7 days.
JUSTIFICATION/DOCUMENTATION: Evidence shows high TTR is associated with improved outcomes for patients on warfarin. Prior to the development of the national reports, there was no standardized method to measure, track, or compare the quality of anticoagulation control for these patients. Even among medical centers that developed their own reports, differences in

the report definitions precluded straightforward comparisons. Since their release in October 2016, the report hits have averaged 1,712 per month. In fact, national mean TTR has increased from 65.9% (October 2016) to 66.7% (June 2017) since release of the reports.
ADAPTABILITY: TTR is calculated for each eligible warfarin patient and is averaged at the facility, network, and national levels. Development of similar reports is possible for any health care system with access to key data points (e.g. prescription, laboratory, etc.)
SIGNIFICANCE: Anticoagulation providers, which in VA predominantly consist of pharmacists, may now easily identify patients requiring further assessment and intervention. In addition, these reports allow individual users, management, and other stakeholders to monitor the impact of interventions known to improve TTR thereby enhancing anticoagulation care throughout Veterans Affairs (VA).

342. Heart failure transitions of care via distance health technology *Brittany Florczykowski, Pharm.D.*, Ramone Boyd, Pharm.D.; Department of Pharmacy, Cleveland Clinic, Cleveland, OH
SERVICE OR PROGRAM: A heart failure (HF) transitions of care (TOC) program was created at a large academic hospital as an initiative to incorporate distance health technology. This program was added to existing telephone-based nurse care coordination and is now being advanced to a virtual platform. This TOC model utilizes both a nurse care coordinator and clinical pharmacist focusing on the 48 h transition of HF patients after hospital discharge as a bridge to their first post-discharge appointment. The follow-up visits include disease state education, medication education, medication reconciliation, and patient questions.
JUSTIFICATION/DOCUMENTATION: Hospital readmission reduction fuels interest in continued optimization of health and medication regimens in HF patients, however data on how to best prevent readmissions for this population is both controversial and sparse.A single in-home patient education session with a nurse and pharmacist team has been shown to be effective in significantly reducing cumulative unplanned hospitalizations in HF patients at 18 months. Of patients requiring hospitalizations, there was a significantly shorter length of stay. It is our goal to improve patient's medication and disease understanding, transition of care satisfaction, and reduce HF readmissions.
ADAPTABILITY: This program is potentially valuable to multiple institutions and disease states. The principal barrier to adaption is patient access to technology which could be overcome by utilizing various community or health system resources already in place.
SIGNIFICANCE: This type of discharge follow-up allows for pharmacists to be intimately positioned to help ensure a smooth transition home and keep patients engaged with the health care system. It also fosters inpatient pharmacists' communication with outpatient providers to improve patient care. The biggest hurdle to establishing in home visits shown to reduce hospital admissions is the availability of resources to maintain and grow the program however distance health virtual counseling has yet to be evaluated for its effect on HF readmissions.

343. Implementation of a clinical decision support system to guide appropriate medication use and monitoring in hospitalized patients with drug-induced QT interval prolongation *Khoa Truong, Pharm.D., BCPS*[1], Anthony Blackford, Pharm.D.[2], Justin Hoppes, Pharm.D.[1], Adam Odeh, Pharm.D.[1], Tricia Patterson, Pharm.D., BCACP, BC-ADM, CACP[1], Stephanie Schneck, Pharm.D., BCPS, BCACP, CACP[3]; [1]Department of Pharmacy, HonorHealth Scottsdale Shea Medical Center, Scottsdale, AZ [2]HonorHealth, Scottsdale, AZ [3]Department of Pharmacy, HonorHealth Scottsdale Osborn Medical Center, Scottsdale, AZ
SERVICE OR PROGRAM: A clinical decision support system (CDSS) was developed by the clinical pharmacy team. The CDSS included a triggering tool to identify hospitalized patients, during pharmacy order verification, who were at highest risk for QT prolongation. The purpose was to help pharmacists identify patients who would benefit from a thorough medication profile review and assist with clinically meaningful therapeutic interventions. This ultimately will help guide clinical practice toward appropriate pharmacotherapy, medication monitoring and preventing adverse drug reactions.
JUSTIFICATION/DOCUMENTATION: The American Heart Association and the American College of Cardiology Foundation recognize that drug-induced QT prolongation may potentially result in a catastrophic event such as cardiac death secondary to torsade de pointes (TdP) with preceding QT interval prolongation. Medication changes and drug interactions are common in hospitalized patients, but not all interactions are clinically significant. Pharmacists play an essential role in promoting medication safety and the implementation of a CDSS can reduce the risk for drug-induced QT prolongation.
ADAPTABILITY: The development of a medication alert triggering tool within the patients' electronic medical record can be recreated in various hospital settings. Further, it can be adapted by outpatient physician offices to make providers aware of relevant drug interactions and assess the QT prolongation risk.
SIGNIFICANCE: The computer medication alert tool can identify patients with risk of drug-induced QT interval prolongation, therefore, guide pharmacists toward making meaningful interventions. The identification of these patients could lead to measures to modify the risk, such as discontinuation of QT interval-prolonging medications, the use of alternative therapy and managing modifiable risk factors to reduce the likelihood of TdP.

Education/Training

344E. Developing an interprofessional practice experience by integrating pharmacy-led learning experiences into physician assistants didactic coursework *April Porter, Pharm.D.*[1], Paul Gubbins, Pharm.D.[2], Steven Dodge, Doctor of Medicine[3], Roberto Canales, DHSc, MS Public Health and Promotion, BS Physician Assistant Studies[3]; [1]Division of Pharmacy Practice and Administration, University of Missouri Kansas City School of Pharmacy at Missouri State University, Springfield, MO [2]Division of Pharmacy Practice and Administration, University of Missouri – Kansas City School of Pharmacy, Springfield, MO [3]Physician Assistant Studies, Missouri State University, Springfield, MO
Presented at the 2017 AACP Annual Meeting, Pharmacy Education 2017, Nashville, TN, July 15-19, 2017.

345. Development of interprofessional APPE education within primary care-based accountable care organizations: A report from the accountable care research network, services and education (ACORN SEED) *Cynthia Moreau, Pharm.D., BCACP*[1], Alejandro Nieves, MS, Pharm.D. Candidate[2], Stacey Maravent, Pharm.D.[3], Genevieve Hale, Pharm.D., BCPS[3], Tina Joseph, Pharm.D., BCACP[1], Jennifer Steinberg, Pharm.D., BCPS[4]; [1]Department of Pharmacy Practice, Nova Southeastern University College of Pharmacy, Fort Lauderdale, FL [2]College of Pharmacy, Nova Southeastern University, Palm Beach Gardens, FL [3]Department of Pharmacy Practice, Nova Southeastern University College of Pharmacy, Palm Beach Gardens, FL [4]Department of Pharmacy Practice, Nova Southeastern University College of Pharmacy, Davie, FL
SERVICE OR PROGRAM: Nova Southeastern University College of Pharmacy (NSU COP) Accountable Care Organization

Research Network, Services, and Education (ACORN SEED) consists of a team of pharmacy practice faculty partnered with ACOs in the south Florida region. ACORN SEED created an ACO Advanced Pharmacy Practice Experience (APPE) rotation block in which students complete an ambulatory care or outpatient cardiology rotation with a faculty preceptor immediately followed by a rotation at a clinic with a primary care provider as primary preceptor. Student responsibilities include performing medication histories, diet and lifestyle counseling, and medication and device counseling.
JUSTIFICATION/DOCUMENTATION: The American Council of Pharmaceutical Education Standards emphasize that graduating students should be practice- and team-ready and the American Society for Health-System Pharmacists states that curricula at pharmacy schools should prepare students to practice effectively as members of the health care team in ACOs. This can be achieved through experiential rotations that emphasize interdisciplinary care in an outpatient setting. Research demonstrates improved patient outcomes through integration of pharmacy students in interprofessional teams during APPEs. Under the direct supervision of a physician, it is anticipated that pharmacy students can make significant interventions while fostering interprofessional collaboration.
ADAPTABILITY: Student-collected data on tasks completed during physician-precepted rotations will be analyzed for quality improvement of the rotation experience. Additionally, student and physician satisfaction will be evaluated. Future plans include incorporating students into these sites earlier in the curriculum. It is anticipated that this experience can serve as a framework for other colleges to integrate interprofessional education into curricula.
SIGNIFICANCE: Pharmacy students in an ACO APPE rotation block have the opportunity to be involved in a number of activities that are aligned with standards for pharmacy curricula and ACO quality measures. Embedding pharmacy students into an ACO can also foster interprofessional collaboration and help develop clinical skills.

346. Student perceptions of an Interprofessional student-run free clinic *Ashley Higbea, Pharm.D., BCPS*[1], Peia Lee, Pharm.D. Candidate[2], Patti Pagels, M.P.A.S., PA-C[3], Adebola Adesoye, Pharm.D., BCPS[4], Sumanth Reddy, M.D. Candidate[5]; [1]Pharmacy Practice, Texas Tech University Health Science Center School of Pharmacy, Dallas, TX [2]School of Pharmacy, Texas Tech University Health Sciences Center, Dallas, TX [3]Physician Assistant Studies, Department of Family & Community Medicine, UT Southwestern, Dallas, TX [4]Department of Pharmacy Practice, Texas Tech University Health Science Center-School of Pharmacy, Dallas, TX [5]School of Medicine, UT Southwestern, Dallas, TX
SERVICE OR PROGRAM: For years, a medical student-run free clinic has been providing acute care services at a local men's homeless shelter. Recently, physician assistant (PA) and pharmacy students were invited to collaborate. Each clinic day opens with a team huddle, where pharmacy students present a drug review. Each student is paired in an interprofessional format and present patients to preceptors (clinical pharmacist and PA). Medication therapy is evaluated and a plan is discussed with the patient. Students provide documentation, including medication history, in the electronic health record.
JUSTIFICATION/DOCUMENTATION: The Interprofessional Education Collaborative (IPEC) was established to advance efforts for interprofessional learning experiences, and help prepare future health professionals (HP) for enhanced team-based care and improved population health outcomes. Following, American Association of College of Pharmacy recently published requirements for IPE and IPEC Core Competencies as Standard 11. This clinic provides an IPE platform and an assessment. Students complete the validated SPICE-R2 Instrument that assesses students' attitudes toward interprofessional teams. This survey also evaluates other HP students' experiences with newly integrated student pharmacists.
ADAPTABILITY: This collaborated effort includes medical, PA, and pharmacy students across two institutions. We anticipate this can also be applicable with nursing student involvement. We expect interprofessional teams will have positive effects on student's attitudes about IPE and team-based care, and that other HP students will find pharmacy students valuable to the team.
SIGNIFICANCE: This IPE student-run clinic serves to fill a gap of acute care needs for the homeless population until they can see their primary care provider and prevent ER visits for minor ailments. By working together, students use their strengths from each other's profession to educate each other and optimize patient care. The clinic provides an interprofessional learning environment, allowing students to develop clinical, organizational, and leadership skills while instilling a lifelong commitment of service to the community and others in need.

347. Implementing interprofessional service learning through community-based elder care mobile clinics *Jeanna Sewell, Pharm.D., BCACP*[1], Kristen Helms, Pharm.D.[1], Kathy Jo Ellison, Ph.D., RN[2], Jean Dubois, RN, MSN, CRNP[2], Emily Myers, MSW, LCSW, PIP[3]; [1]Department of Pharmacy Practice, Auburn University Harrison School of Pharmacy, Auburn, AL [2]Auburn University School of Nursing, Auburn, AL [3]Auburn University College of Liberal Arts, Auburn, AL
SERVICE OR PROGRAM: Interprofessional community-based mobile clinics were developed to care for older adults in rural areas. Clinics took place at community centers throughout two rural counties. Clinics gave the opportunity for students from 5 disciplines (nursing, nutrition, osteopathic medicine, pharmacy, and social work) to care for underserved patients using an interprofessional model. Services provided include a comprehensive health assessment, education, and referrals.
JUSTIFICATION/DOCUMENTATION: Access to quality healthcare services is positively influenced by interprofessional patient-centered care models. Despite the increasing evidence to support interprofessional collaborations, change within education and practice has been slow. Further, a challenge in the health care environment is addressing the complex needs of older adults. Quality health care for this growing population requires intentional teamwork across disciplines, time, and practice settings. Students in healthcare disciplines can work collaboratively to enhance future care practices while meeting the needs of underserved populations in the community. There were two goals in implementation of clinics: (1) provision of interprofessional activities to prepare students for future practice and (2) screening of underserved patients to identify needs and resources. Changes in student perception of team base care was assessed using validated interprofessional education pre- and post-surveys. Number and types of interventions were also documented
ADAPTABILITY: Practitioners or students may provide beneficial services to underserved patients in any community through interprofessional models while promoting community engagement and service learning. This approach to care can be implemented in a variety of patient care setting, including primary care, acute care, and community-based models.
SIGNIFICANCE: Interprofessional models improve patient care. Students working as an interprofessional team acquire knowledge, skills, and attitudes necessary to optimize care of patients. In addition, pharmacy students are able to identify their unique role within the healthcare team while recognizing the role of others.

Emergency Medicine

348. Evaluation of emergency department intranasal naloxone rescue kit dispensing by patient questionnaire *Kevin Kaucher, Pharm.D.*[1], Kerry Broderick, M.D.[2]; [1]Department of Acute Care Pharmacy, Denver Health Medical Center, Denver, CO [2]Department of Emergency Medicine, Denver Health Medical Center, Denver, CO

SERVICE OR PROGRAM: In August 2016, Denver Health Medical Center Emergency Department began dispensing intranasal naloxone rescue kits (INRK) upon discharge for patients at high-risk of opioid overdose. Patients are identified based on physician, pharmacist, or nurse assessment and patient request. Demographics of those given rescue kits closely mimic current high-risk populations identified by epidemiologic analysis by the Colorado Department of Public Health and Environment. Pharmacists and Pharmacy Interns play and integral part in discharge education.
JUSTIFICATION/DOCUMENTATION: Dispensing records each month are evaluated by pharmacists and patients are called to complete a questionnaire at least 30 days after discharge. A significant number of patients report they've used their INRK on others or had their INRK used on themselves. A small number are now enrolled in Medication Assisted Treatment programs and pharmacists are an important member of the discharge education team based on percentage of times a pharmacist is consulted for discharge education. Patient recollection of appropriate storage and use reflects the preferred method of verbal and hands-on demonstration provided at discharge
ADAPTABILITY: Due to the current opioid epidemic, implementation of similar INRK programs is needed. Pharmacists in the emergency department setting are perfectly positioned to advocate and implement such services in their institutions. Discussion between the Departments of Emergency Medicine and Pharmacy are required to ensure implementation is effective as it relates to the electronic medical record incorporation, appropriate ordering, dispensing, and education to patients is addressed. The adoption of the Affordable Care Act has allowed a significantly greater number of patient's to have a payer source which alleviates cost as a significant barrier.
SIGNIFICANCE: Successful implementation has the potential to save lives and get patient's the resources and assistance they require to reduce their risk of overdose. Pharmacists can play an integral role in developing and evaluating these programs in the emergency department.

349. Pharmacist-managed rivaroxaban for acute venous thromboembolism upon emergency department discharge, with focus on utility of commercial dose pack *Aileen Chu, Pharm.D., BCPS*, Jill Limberg, Pharm.D., BCCCP, Tahnee Marginean, Pharm.D., Electa Stern, Pharm.D.; Department of Pharmacy, Sharp Grossmont Hospital, La Mesa, CA
SERVICE OR PROGRAM: In 2015, a program was initiated to facilitate management of emergency department (ED) patients discharged home on rivaroxaban for acute venous thromboembolism (VTE). ED pharmacists identified patients by prospective profile review and discussed appropriateness of treatment with the physician. Qualifying patients received extensive counseling and a free 30-day supply of medication in the form of a Xarelto Starter Pack™ prior to discharge. The ED pharmacists contacted patients regularly to ensure timely follow-up and adherence to anticoagulation beyond the first month.
JUSTIFICATION/DOCUMENTATION: Sharp Grossmont Hospital ED cares for a large population of uninsured or underfunded patients; therefore, affordability and follow-up are common barriers to home VTE treatment. Patients discharged from a hospital on rivaroxaban have presented to this ED previously for medication access issues or errors in dose transition. Minimizing errors throughout the treatment process would reduce noncompliance and treatment failure.
ADAPTABILITY: This hospital has an on-site outpatient pharmacy that stocks the Starter Pack™, utilizes a trial coupon, and is accessible 24 h a day. In the absence of this resource, we recommend against prescribing the Starter Pack™ if it is not routinely available at local pharmacies. The value of ensuring follow-up and ongoing access to medication is translatable to other high-risk medication regimens and underserved patient populations.
SIGNIFICANCE: Two ED pharmacists with 10 h of daily coverage intervened on 41 patients over a 13-month period. 71% achieved confirmed, uninterrupted anticoagulation beyond the initial month. No patients were readmitted to the hospital system within 90 days for treatment failure. Due to patient and prescriber satisfaction and perceived cost-benefit, the program has become standard practice in this ED and has expanded alongside ED pharmacist coverage hours. Collaboration with existing outpatient warfarin services will soon facilitate follow-up.

Family Medicine

350. Development and implementation of a pharmacist led hospital discharge medication reconciliation process with student pharmacist support *Rachel Lienemann, Pharm.D.*[1], James D. Hoehns, Pharm.D., BCPS, FCCP[2], Matthew J. Witry, Pharm.D.[3], Adam Froyum-Roise, M.D., MPH[1]; [1]Northeast Iowa Medical Education Foundation, Waterloo, IA [2]University of Iowa College of Pharmacy and Northeast Iowa Family Practice Center, Waterloo, IA [3]University of Iowa College of Pharmacy, Iowa City, IA
SERVICE OR PROGRAM: A hospital discharge medication reconciliation note template was created in the Northeast Iowa Family Practice Center (NEIFPC) electronic medical records (EMR). Template elements included hospitalization synopsis, current medications, started/stopped/adjusted inpatient medications, drug therapy recommendations (DTRs) made to the inpatient team and outpatient primary care physician. Pharmacists and students performed bedside rounds and rounded with the NEIFPC inpatient team. Upon patient discharge, pharmacists and students completed the discharge medication reconciliation note (N = 64) in the NEIFPC EMR and reconciled the clinic medication list. Eligible patients included adults admitted to a local community hospital who received care from NEIFPC on an inpatient and outpatient basis during a 6 month period.
JUSTIFICATION/DOCUMENTATION: Medication reconciliation is a key component of Transitional Care Management (TCM) services. TCM billing requires an interactive patient contact within two days following hospital discharge. Discharge summaries are important for this process but are frequently unavailable to NEIFPC clinic staff within the two days. Pharmacy discharge medication reconciliation notes were completed and available within two days of patient discharge for 93% of patients. These were available for post hospital contacts by the Care Coordinator; whereas no hospital discharge summaries were accessible in NEIFPC EMR at that time. The pharmacist/students made DTRs to the primary physician for 37% of patients. Satisfaction surveys were completed by physicians, nurses and the Care Coordinator which demonstrated broad support for the service.
ADAPTABILITY: This service improved the utilization and communication methods of existing pharmacy personnel. The mean time for completion of the template was 13 min. Broad inclusion criteria contribute to its generalizability to other community based hospitals.
SIGNIFICANCE: This service allowed student pharmacists to play a prominent role in medication reconciliation, documentation and recommendations. We believe this is the only described medication reconciliation program which facilitated inpatient pharmacist/student DTRs to the primary physician.

Geriatrics

351. Collaborative drug therapy management in a skilled nursing facility to improve transitions of care in older adults *Shellina R. Scheiner, Pharm.D.*[1], Jennifer M. Olson, M.D.[2], Julia Velner, MSN[2]; [1]College of Pharmacy, Department of Experimental and Clinical Pharmacology, University of Minnesota, Minneapolis, MN [2]Park Nicollet Senior Care Services, Saint Louis Pk, MN
SERVICE OR PROGRAM: A partnership between the University of Minnesota-College of Pharmacy, an integrated health care

system, and a community Skilled Nursing Facility (SNF) was formed. A clinical pharmacist, specializing in geriatrics, practices with a physician/nurse practitioner team in a Transitional Care Unit (TCU) under a Collaborative Drug Management (CDTM) protocol. The CDTM allows the pharmacist to initiate, manage, modify, monitor and discontinue drug therapy. The pharmacist practices on site, performs medication reconciliation upon admission, conducts Comprehensive Medication Management, accompanies the team on patient rounds and provides patient and staff education. The average patient is 80 yrs., with multiple chronic conditions, is 3–14 day post hospitalization and on eighteen medications.
JUSTIFICATION/DOCUMENTATION: Older adults entering Transitions of Care (TOC) are susceptible to adverse drug events due to polypharmacy, frailty and the disjointed nature of the health care system. The clinical pharmacist's expertise is most utilized in the management of Anticoagulants, Antiplatelets, Antibiotics, Cardiovascular agents, Antidiabetics, Antipsychotics and Analgesics.
ADAPTABILITY: Older adults in the TCU have a high level of acuity. SNFs do not have a clinical pharmacist on site. Medication reviews are provided by consultant pharmacists on a periodic basis. Successful models would include clinical pharmacists with experience practicing within a CDTM model, training in geriatrics, and interest in collaborating with teams.
SIGNIFICANCE: This program optimized an Interprofessional patient care delivery model at a SNF-TCU by integrating a clinical pharmacist, practicing under a CDTM model, to improve TOC in older adults and to identify areas where a pharmacist's expertise is most utilized. Learners from pharmacy, medicine and nursing are trained at the site under this model.

352. Closing the loop: the pharmacist's role in deprescribing through transitions of care *Whitney Narramore, Pharm.D., BCACP*[1], Robin Parker, Pharm.D.[1], Eduard Vasilevskis, M.D., MPH[2], Sandra Simmons, Ph.D.[3]; [1]Department of Pharmacy Practice, Lipscomb University College of Pharmacy and Health Sciences, Nashville, TN [2]Department of Medicine, Vanderbilt University Medical Center, Nashville, TN [3]Center for Quality Aging, Vanderbilt University Medical Center, Nashville, TN
SERVICE OR PROGRAM: The Center for Quality Aging at Vanderbilt University Medical Center received NIH-funding for a project utilizing clinical pharmacists and geriatric nurse practitioners to initiate deprescribing in older patients transitioning from inpatient status to a skilled nursing facility (SNF). Patient-centered deprescribing involves the patient and care provider in discussions about goals of care and beliefs about medications and patient willingness to stop or reduce medications. Targeted medications are prioritized based on clinical appropriateness and the potential impact on geriatric syndromes. The deprescribing protocol (Shed-MEDS) includes communications with the inpatient team and SNF care providers. This includes deprescribing rationale, clarification of transfer orders, and continued medication management recommendations. Once patients are discharged home, an updated medication list is sent to their primary care provider as well as their pharmacy of choice. Patients are then contacted to re-assess geriatric syndromes, medication adherence, and address potential knowledge gaps in their understanding of their medications.
JUSTIFICATION/DOCUMENTATION: Polypharmacy is common in older patients. Medication adherence and geriatric syndromes may be significantly impacted by a patient's medication regimen. Practitioners are often unable to conduct comprehensive medication reconciliation and initiate deprescribing recommendations for multiple reasons. Some reasons include time constraints, patient preferences, and multiple providers.
ADAPTABILITY: The Shed-MEDS protocol can be replicated in any healthcare setting that combines patient preferences and team-based care. Effective communication between the various levels of care is necessary to ensure patient and provider decisions are implemented in a safe and sustainable manner.
SIGNIFICANCE: This practice model identifies multiple points of contact necessary to implement a deprescribing plan effectively. While this model focuses its efforts on the geriatric population, our strategies could be extrapolated to any patient population that aims to reduce medication burden and its associated costs. Identification of patient preferences is the cornerstone of a successful deprescribing initiative.

Health Services Research

353. The role of improvement cycles in scaling up delivery of comprehensive medication management (CMM) in primary care settings Melanie Livet, Ph.D.[1], Lindsay Sorge, Pharm.D., MPH, BCACP[2], *Carrie Blanchard, Pharm.D.*[3], Caryn Ward, Ph.D.[4], Todd D. Sorensen, Pharm.D.[2], Mary Roth McClurg, Pharm.D., MHS[3]; [1]UNC-Chapel Hill, Eshelman School of Pharmacy – CMOPP, Chapel Hill, NC [2]Pharmaceutical Care and Health Systems, University of Minnesota College of Pharmacy, Minneapolis, MN [3]UNC Eshelman School of Pharmacy, Chapel Hill, NC [4]FPG Child Development Institute, UNC-Chapel Hill, National Implementation Research Network, Chapel Hill, NC
SERVICE OR PROGRAM: Improvement cycles were used to improve delivery of CMM by 35 primary care clinic teams participating in an ACCP-funded "CMM in Primary Care" project. To prepare for use of the cycles, sites attended monthly training webinars and engaged in two practice cycles. They were also provided with documentation defining the CMM practice and with improvement tools designed to facilitate the planning, implementation, and evaluation of the cycles. The sites then engaged in a series of cycles to improve aspects of their CMM practice over 9 months. Ongoing monthly support was provided through webinars, coaching, and team sharing.
JUSTIFICATION/DOCUMENTATION: While use of CMM is expanding, its implementation is inconsistent, resulting in mixed outcomes. Enhancing the quality and consistency of delivery across settings will result in improved outcomes. Improvement cycles were selected as a strategy to improve current practice through the introduction of purposeful small changes that can be rapidly tested and integrated. For each specific area of improvement identified by sites a goal was set, measurement strategy developed, a problem analysis completed, and PDSA cycles applied to rapidly test changes. Site experience and learnings with improvement cycles were captured via improvement tools completed by sites, coaching logs, and webinar recordings.
ADAPTABILITY: This approach can be applied to any clinical setting seeking to improve current delivery of CMM services. To ensure consistent application of the improvement methodology, it is necessary for those leading implementation who have little improvement experience to have access to ongoing support for the first year.
SIGNIFICANCE: This approach accelerates and advances the integration of clinical pharmacy services into healthcare teams in primary care settings. Data from this project will contribute to our understanding of the challenges and facilitators of improvement cycles and assist in identifying distinct strategies that improve the practice of CMM.

Hematology/Anticoagulation

354. Implementation of patient education software in an anticoagulation clinic to decrease visit times for new patient appointments *Maika Patino, Pharm.D., BCACP*, Peggy Kraus, Pharm.D., CACP, Martin Bishop, Pharm.D., MS, BCACP; Department of Pharmacy, The Johns Hopkins Hospital, Baltimore, MD
SERVICE OR PROGRAM: Emmi® patient education software was implemented for new patients in the Johns Hopkins Hospital Hematology Anticoagulation Clinic to decrease visit times and increase the number of new patient appointments. Patients had to be English-speaking and arrive at least 20 min prior to their

scheduled appointment time. Certified medical assistants enrolled patients into the program and provided a tablet that allowed patients to view a warfarin education video that was developed by the Johns Hopkins Hematology and Cardiology Anticoagulation Clinics. Pharmacists brought patients into the clinic room to complete their orientation.
JUSTIFICATION/DOCUMENTATION: New patient appointments are scheduled for 1 h at 11am and 3 pm. The goal was to decrease visit times by 15 min (25%) so that additional new patient appointments could be created. Data collection sheets were distributed to pharmacists to collect various timestamps (e.g. patient enters room, education is started, education ended, and patient leaves room). Retention of education was measured via a teachback survey. Anonymous surveys were distributed to patients to solicit feedback on the video and their appointment experience.
ADAPTABILITY: Our clinic serves 350 patients with venous thromboembolism. Other clinics may benefit from implementing patient education that allows patients to view videos outside of their appointment in order to enhance their educational experience and decrease time spent in clinic visits educating patients face-to-face.
SIGNIFICANCE: Patients need quick follow-up after diagnosis of thrombosis and initiation of warfarin. This increases the safety and efficacy of anticoagulation. Implementation of this program can be utilized to initiate warfarin education sooner in a standardized manner and decrease the amount of face-to-face education required. A decrease in visit time can allow for additional new patient appointments and reduce wait time for follow-up appointments. The program can also potentially increase patient education retention and satisfaction.

Infectious Diseases

355E. Combination antibiotic therapy for the treatment of severe, necrotizing MRSA pneumonia *Andy Kim, Pharm.D.*, Joy Kehoe, Pharm.D.; Denver Health Medical Center, Denver, CO
Presented at the Critical Care Congress, Honolulu, HI, January 21-25, 2017.

356. Implementation and evaluation of a collaborative community pharmacy-based hepatitis C virus (HCV) screening program with linkage to care *Michael Klepser, Pharm.D.*[1], Donald G. Klepser, Ph.D., M.B.A.[2], Ally Dering-Anderson, Pharm.D.[2], Jacquline Morse, Pharm.D.[3], Peter Gulick, DO[4], Joseph Coyle, MPH[5], Ian Nagy, Pharm.D.[6]; [1]College of Pharmacy, Ferris State University, Kalamazoo, MI [2]College of Pharmacy, University of Nebraska Medical Center, Omaha, NE [3]Pharmacy, Meijer, Grand River, MI [4]College of Osteopathic Medicine, Michigan State university, East Lansing, MI [5]Viral Hepatitis Surveillance and Prevention, Michigan Department of Health and Human Services, Lansing, MI [6]Pharmacy, Meijer, Jenison, MI
SERVICE OR PROGRAM: A community pharmacy-based HCV screening program including education and linkage to care was developed and offered at 8 pharmacies in central Michigan. The program was developed in collaboration with the Michigan Department of Health and Human Services All pharmacists received training on use of point-of-care tests. Adult patients self-identified and were screened for risk factors using standardized forms. Eligible patients were screened for HCV using the OraQuick HCV Rapid Antibody Test. While waiting for test results, patients received education on hepatitis including HCV. All reactive test results were entered into the Michigan Disease Surveillance System. Patients with reactive tests were linked to care with their primary care provider or a study physician for follow-up.
JUSTIFICATION/DOCUMENTATION: It has been estimated that more than 800,000 individuals in the United States are infected with HCV, but unaware of their status. During this pilot project, a total of 24 patients were screened and 1 reactive patient identified. A workflow analysis was conducted and determined that the average total time to complete a screening was 59 min 44 s (±9:23). The average time that pharmacists and technicians spent with each patient was 10 min 23 s and 11 min 20 s, respectively. The average labor costs per patient were $14.16, with pharmacists accounting for $10.86 and technicians $3.30 of the labor cost.
ADAPTABILITY: Pharmacists and pharmacy technicians can be used to offer HCV screening programs in community pharmacies. Partnerships with state and local public health agencies could be leveraged to offset some program costs such as test acquisition and development of educational materials.
SIGNIFICANCE: A community pharmacy-based HCV screening program can help identify individuals unaware of their HCV status. This type of collaborative service can serve to extend the reach of public health to those in medically underserved areas.

357. Implementation of antibiotic timeouts to drive antimicrobial stewardship at non-academic community hospitals *Nancy Bui, Pharm.D.*; Pharmacy, St. Joseph Health, Santa Rosa, CA
SERVICE OR PROGRAM: Under the guidance of an infectious diseases (ID)-trained pharmacist, an antibiotic timeout process was implemented using non-ID trained pharmacists and Advanced Practice Pharmacy Experience students to establish a new model for antimicrobial stewardship at St. Joseph Health Sonoma. Patients with active antibiotic orders for 48–72 h were screened through a daily Meditech report. Students and non-ID trained pharmacists evaluated antibiotic regimens and presented these patients to the ID pharmacist to confirm if their assessments and recommendations corroborated prior to contacting providers independently.
JUSTIFICATION/DOCUMENTATION: CDC reports that up to 50% of antibiotics prescribed is either unnecessary or inappropriate. With the ongoing threat of antimicrobial resistance, regulatory bodies have responded with antimicrobial stewardship standards that include the establishment of an antibiotic timeout process. Non-ID pharmacists and students can be trained to drive this process and act as an extension of an ID pharmacist. From February through June 2017, 704 patients were reviewed and 212 opportunities for optimizing antimicrobial use were identified. Of these, the top four recommendation categories were de-escalations (25%), duration optimization (20%), dose optimization (18%), and antimicrobial discontinuations (18%). Recommendation acceptance rate was 71%.
ADAPTABILITY: St Joseph Health Sonoma consists of Santa Rosa Memorial Hospital (338 beds, trauma II) and Petaluma Valley Hospital (80 beds) which are both non-academic community hospitals. One ID pharmacist is scheduled Monday through Friday. Challenges include pharmacist and student training and competency in providing appropriate assessments of antimicrobial regimens and comfort level in engaging providers in conversations about appropriate antimicrobial use.
SIGNIFICANCE: A successful antimicrobial stewardship program requires a cultural and behavioral shift within institutions. By engaging non-ID pharmacists and students in antibiotic timeouts, more stakeholders are learning how to assess antimicrobial regimens and to educate others about inappropriate use. This creates a ripple effect that will accelerate antimicrobial stewardship efforts institution-wide.

Oncology

358. Clinical pharmacist managed oral chemotherapy clinic at a community based comprehensive cancer center *Christopher Elder, Pharm.D., BCOP*[1], Ginna Tucker, Pharm.D., CPP[1], Sonja Jacobsen, Pharm.D., BCPS[1], Brandy Persson, Pharm.D., BCPS, BCOP[1], Jesse Mack, Pharm.D., BCPS[2], Adam Peele, Pharm.D., BCPS, BCOP[1], Andy Starkey, Pharm.D.[3], Alyson Leonard, Pharm.D.[1]; [1]Pharmacy Department, Cone Health Cancer Center, Greensboro, NC [2]Pharmacy Department, Randolph Cancer Center, Asheboro, NC [3]Pharmacy Department, Wesley Long Outpatient Pharmacy, Greensboro, NC

SERVICE OR PROGRAM: With increasing numbers of approved oral chemotherapy agents, our outpatient cancer center implemented a full-time clinical pharmacist to manage all aspects of oral chemotherapy for patients. This includes patient education, monitoring adherence and toxicities, obtaining financial coverage, decreasing delays, and improving patient/provider satisfaction. The pharmacist reviews every oral chemotherapy prescription for accuracy, dosing, interactions, baseline labs/monitoring before sending to on-site or specialty pharmacy. The clinical pharmacist counsels each patient prior to start of therapy and provides periodic follow-ups for adherence and toxicity assessments. The program was developed initially as a residency pilot project.
JUSTIFICATION/DOCUMENTATION: Since implementation in October 2016, we have shown improvements in patient/provider satisfaction, patient understanding of treatment regimen, and monitoring/follow-up. Prescription delays for external specialty pharmacies have been decreased from 16 days to 10.8 days and from 4.25 days to 3.15 days for on-site dispensing. Documentation of improved patient safety through interventions including: drug interaction identification, recommended dose adjustments, and toxicity management. Fifty patients have been enrolled in manufacturer free drug programs and another 86 patients have been enrolled in co-pay card or foundation grant programs. A financial justification has been demonstrated with a 20% increase in on-site oral chemotherapy prescription capture rates.
ADAPTABILITY: Similar types of pharmacist managed programs can be implemented in various oncology practice settings including large academic institutions with on-site specialty pharmacies or small community centers. Oncology trained pharmacists have the appropriate skill set and using pharmacy residents for project initiation and justification is most beneficial.
SIGNIFICANCE: Oral chemotherapy regimens are complex and costly leading to increased issues of non-adherence in the oncology population. It is crucial to put programs in place to educate, follow-up, and help patients navigate the financial process surrounding oral chemotherapy. Clinical oncology pharmacists have the best skill set to provide these services which will benefit both the patient and health system.

Pediatrics

359. A pharmacist-led medication education group on an inpatient adolescent psychiatry unit: implications for psychotropic medication outcomes and patient knowledge *Charlotte Wagner, BA, Pharm.D. Candidate*[1], Danielle Stutzman, Pharm.D.[2]; [1]University of Colorado, Denver, CO [2]Department of Pharmacy, Children's Hospital Colorado, Aurora, CO
SERVICE OR PROGRAM: Adolescent medication education group (MEG) is a weekly, hour-long, pharmacist-led program on the inpatient adolescent psychiatry unit at Children's Hospital Colorado (CHCO). A psychiatric pharmacist, pharmacy intern, mental health counselor, and psychologist developed the program materials. Using the game of *Jeopardy!*, adolescents answer questions regarding psychotropic medications. Adolescents are expected to complete a worksheet about their current psychotropic medications during group. Prior to discharge, a pharmacist reviews this worksheet and a medication guide with the patient and caregiver.
JUSTIFICATION/DOCUMENTATION: Patients who attend MEGs understand and have more positive attitudes about their medications. Since implementation in January 2017, twenty MEG sessions have occurred with an average of 10 participants per week. Notes are documented in the electronic medical record to describe medication-related issues. A survey is given to adolescents on admission and discharge to evaluate their knowledge of psychotropic medications and their opinion of MEG.
ADAPTABILITY: CHCO is an urban pediatric hospital with an affiliated Pediatric Mental Heath Institute that provides inpatient and outpatient services. A PGY2-trained clinical psychiatric pharmacist provides medication consultation and rounds daily with each inpatient team. MEG was developed through collaboration of psychologists, psychiatrists and the clinical pharmacist. A syllabus outlining the class allows other providers, including pharmacy interns or residents, to lead group. An adolescent mental health center with similar characteristics could implement a successful MEG.
SIGNIFICANCE: Of youth aged 13–18, 20% have a mental health condition. Psychotropic medications play an important role in treatment, however adolescent knowledge about medications is lacking. The benefit of pharmacist-led education on knowledge and satisfaction in adult psychiatric populations and in other pediatric disease states has been proven. Pharmacists' impact on patient knowledge in pediatric psychiatry is not well documented. With the implementation of pediatric psychiatry MEGs, pharmacists can impact patient outcomes and add to the body of research.

360. Implementation of radiology pharmacy for pediatric oncology *Mahmoud Elsherif, Bachelor of Pharmaceutical Sciences*[1], Ahmed Elzeiny, Bachelor of Pharmaceutical Sciences[2], Sarah Mohamed, Bsc[3], Sherif Kamal, Msc[4], Iman Zaki, M.D. Degree in Radiology[5]; [1]Radiology Pharmacy, Children's Cancer Hospital 57357, Cairo, Egypt [2]Pharmacy, Children's Cancer Hospital 57357, Cairo, Egypt [3]children cancer hospital-Egypt 57357, Cairo, Egypt [4]Children Cancer Hospital Egypt 57357, Cairo, Egypt [5]Radiology Department, Children's Cancer Hospital 57357, Cairo, Egypt
SERVICE OR PROGRAM: The Joint Commission defined diagnostic agents as medication since 2004, so Contrast media should be treated according to the standards of medication management and use. Children's Cancer Hospital 57357 started providing advanced pharmaceutical services for all pediatric patients who receive contrast media during their diagnostic examination. Clinical Pharmacist is responsible for applying medication management policies which comply with The Joint Commission International standards for medication management and use.
JUSTIFICATION/DOCUMENTATION: The Joint Commission standards for medication management are applied for all processes of the contrast media, including Procurement and Selection, Storage, Ordering and Transcribing, Preparing, Dispensing, Administration and Monitoring. Pharmaceutical involvement permitted dose standardization of contrast media. Documentation of all processes, including pharmacy clinical Interventions, permits accessibility to all data and facilitate its analysis. Within 18 months, 1510 pharmacy clinical intervention were documented on the Hospital Information System, regarding 48,057 contrast media order.
ADAPTABILITY: Radiology Pharmacy is implemented to serve all patients including both admitted and out patients anytime around 24 h, which makes it available to perform urgent diagnostic procedure once it is indicated. All pharmacists receive regular general training about contrast media especially about new updates and warnings.
SIGNIFICANCE: Clinical Pharmacist took the role of medication order review before administration of contrast media which ensures that patient receives the proper dose of contrast media. Reviewing patient's history for medication allergy, drug-drug interactions and drug-disease interactions – enhances the patient safety and decreases the risk of adverse events. The risk of Contrast Induced Nephropathy (CIN) is decreased by the evaluation of renal function, eGFR calculation prior to contrast media administration and using the minimal dose that produces optimal contrast enhanced images. In a relation to Pharmacoecomonics, using optimal doses decreases the cost of the diagnostic exam and the cost of overcoming the possible adverse drug events.

Peri-Operative Care

361. Quality and economic impact of integrating clinical pharmacists into the care of orthopedic surgery patients *Sara Jordan, Pharm.D., BCPS*, Brian Kramer, Pharm.D.; Grant Medical Center (OhioHealth) Columbus, OH
SERVICE OR PROGRAM: The Clinical Orthopedic Pharmacist service at Grant Medical Center (GMC) was instated February 2016 to support the interdisciplinary team in addressing institutional outcomes opportunities in the total joint arthroplasty (TJA) patient population. The role was developed using the ACCP Standards of Practice for Clinical Pharmacists and the ASHP Pharmacy Advancement Initiative (PAI) principles, positioning the clinical pharmacist to optimize pharmacotherapy across the TJA continuum of care. Service delivery by the covering Orthopedic Clinical Pharmacist includes prospective preoperative medication optimization, inpatient interdisciplinary rounding with the surgical team, targeted interventions to reduce post-operative complications, and discharge medication reconciliation and counseling.
JUSTIFICATION/DOCUMENTATION: The implementation of the Clinical Orthopedic Pharmacist service was associated with significant improvements in TJA post-operative DVT rate (1.25% in FY15 vs. 0.66% FY16 vs. 0.16% FY17YTD) and readmission rate (3.37% vs. 4.23% vs. 1.97%). The institution has met national benchmark goals for patient outcomes and avoided significant reimbursement penalties as a result of these improvements.
ADAPTABILITY: The Clinical Orthopedic Pharmacist service was developed in a step-wise fashion in concert with all interdisciplinary stakeholders in the institution's TJA patient outcomes. After thorough gap analysis and case series reviews, individual pharmacist interventions were matched to team-identified patient care opportunities to target specific quality and financial outcomes of interest. This approach represents a template that clinical pharmacists may readily apply at other institutions providing TJA and to other target populations with specific outcomes goals.
SIGNIFICANCE: TJA institutions are subject to significant external outcomes accountability. We identified opportunities for clinical pharmacists to optimize pharmacotherapy for TJA patients, then developed a service that significantly contributed to improved patient outcomes and institutional revenue capture. Our results support the application of ACCP and ASHP standards to the development of novel clinical pharmacy practice models to improve outcomes in this important surgical population.

362. A process to maximize pharmacist impact on presurgical antimicrobial stewardship *Josi Khokhani, Pharm.D.*, Laura Azuma, Pharm.D.; Inpatient Pharmacy, Centura Health Avista Adventist Hospital, Louisville, CO
SERVICE OR PROGRAM: A preadmission, guideline-derived, pharmacy consult service for selection of presurgical antimicrobial prophylaxis facilitating appropriate antimicrobial choice and efficiency in the preoperative arena.
JUSTIFICATION/DOCUMENTATION: Prior to implementation, surgeons were individually responsible for ordering presurgical antimicrobial prophylaxis. Pre-printed orders included choice of commonly-prescribed antimicrobials and lines for write-in orders. Challenges inherent in this model include incomplete orders, allergy conflicts, incorrect doses, antimicrobial use inconsistent with Surgical Care Improvement Project (SCIP) guidelines, and confusion over surgeon intent when no antibiotic orders were written. These inefficiencies correspond to delays in the preoperative phase of care and inconsistent antimicrobial therapy. This pharmacy consultation service employs a guideline-derived antimicrobial selection and ordering process which is completed in the preadmission phase of care. In the second month following implementation, 85% of surgeries requiring antimicrobial prophylaxis utilized pharmacist consults for antibiotic selection.
ADAPTABILITY: Workflow at our institution includes a pharmacist role with responsibility for obtaining medication histories for admitted patients as well as presurgically for scheduled surgeries. Responsibility for presurgical antimicrobial selection consults is largely integrated into this role, but all pharmacists are required to demonstrate competency. The consult process utilizes existing surgical scheduling forms which define the surgical category, with an option to consult pharmacy for antimicrobial selection.
SIGNIFICANCE: This consult service for presurgical antimicrobial selection promotes SCIP compliance, improved adherence to antimicrobial stewardship guidelines, minimization of delays in the preoperative phase of care, and appropriate dosing through the participation of a clinical pharmacist in the preadmission phase of care. Pharmacist expertise in this arena impacts safety, efficiency and cost-containment even prior to the patient's arrival at the hospital.

Pharmacoeconomics/Outcomes

363. Impact of pharmacy contribution to interprofessional transitions intervention on patient outcomes *Susan Fosnight, R.Ph., BCPS, BCGP*[1], Philip King, Pharm.D.[2], Alison Dittmer, Pharm.D. Candidate[3], Grace Grzybowski, Pharm.D. Candidate[3], Morali Shah, Pharm.D. Candidate[4], Jordan Worthington, Pharm.D. Candidate[3]; [1]Department of Pharmacy, Summa Health, Akron City Hospital/ Northeast Ohio College of Medicine, Akron, OH [2]Summa Health System/Northeast Ohio Medical University, Akron, OH [3]Northeast Ohio Medical University, Rootstown, OH [4]Northeast Ohio Medical University, Rootstown, Ohio, OH
SERVICE OR PROGRAM: An interprofessional transitions intervention was enhanced to include pharmacy assistants and pharmacists to perform medication histories, adherence interviews, comprehensive medication reviews and discharge counseling. The resultant program was initiated on a 32 bed acute care unit for adult patients at a 543 bed teaching hospital.
JUSTIFICATION/DOCUMENTATION: Medication errors are common during transitions. An in-house quality improvement project found an average of three medication history errors per patient. An in-house pilot that embedded a pharmacist into a medicine team resulted in reduced readmissions and length of stay. Based on these positive results, pharmacists were invited to join an interprofessional group to improve transitions. Data was collected for all patients (284) admitted to the target unit for 54 consecutive days after implementation of staffing to perform the pharmacy portion of the intervention. Thirty day readmissions decreased from a baseline of 21%–15.3%. A further decrease to 10.2% occurred when all components of the medication intervention were completed. Length of stay decreased from a baseline of 5.25–4.41 days, further reduced to 3.58 days when all components of the medication intervention were completed. The intervention took a mean time of 41 min for pharmacists and 36 min for pharmacy assistants. An average of 7.5 medication changes per patient were made by pharmacy, with 11.8% of these deemed to potentially avoid serious harm or decrease length of stay.
ADAPTABILITY: This program continues with 1.4 full time equivalent (FTE) pharmacists and 1.4 FTE pharmacy assistants added to perform transition activities. The intervention has now been adapted to another medical unit and to another electronic health record system. Approval for expansion to a wide range of units has been obtained.
SIGNIFICANCE: Medication-related interventions are a critical component of transitions interventions that improve patient outcomes.

Pharmacogenomics/Pharmacogenetics

365. Clinical pharmacy services for patients with genetically identified disease risk *Rebecca A. Pulk, Pharm.D., MS*[1], Gerard A. Greskovic, R.Ph., CACP, CDE[2], Scott Bolesta, Pham.D.[1], Laney K. Jones, Pharm.D, MPH[3], Michael R. Gionfriddo, Pharm.D, Ph.D.[3], Adam H. Buchanan, MSGC, MPH[4], Amy C. Sturm, MSCG, MS[4], Kandamurugu Manickam, M.D.[4], Michael F. Murray, M.D.[4], Eric Wright, Pharm.D., MPH[1], Marc S. Williams, M.D.[5]; [1]Center for Pharmacy Innovation and Outcomes, Geisinger Health System, Forty Fort, PA [2]Pharmacy, Medication Therapy Disease Management, Geisinger Health System, Danville, PA [3]Center for Pharmacy Innovations and Outcomes, Geisinger Health System, Forty Fort, PA [4]Clinical Genomics, Geisinger Health System, Forty Fort, PA [5]Genomic Medicine Institute, Geisinger Health System, Danville, PA

SERVICE OR PROGRAM: Geisinger pharmacists have partnered with the MyCode® return of results team to guide medication use in patients with pathogenic/likely pathogenic variants associated with inherited disease. Pharmacy services include chart review, telemedicine consult, documentation of medication recommendations and referral to Geisinger's Medication Therapy Disease Management pharmacists for 'in-person' clinic visits. This service was initiated at the request of clinical genomics and has developed into the second arm of our precision pharmacy initiative alongside applied pharmacogenomics. Pharmacists involved in this service are credentialed providers within the Geisinger Health System and are required to demonstrate and maintain clinical competency.

JUSTIFICATION/DOCUMENTATION: With the exception of managing pharmacogenomic interactions and targeted chemotherapy, pharmacists have reported limited involvement in genomic medicine implementation. For many inherited conditions, prudent medication management is essential to ensure optimal patient outcomes. We seek to integrate pharmacists into our multidisciplinary team to fill this patient care gap. Herein we describe the evolution of clinical pharmacy services for patients with genetically identified disease risk.To date over 150,000 Geisinger patients have consented to participate in the MyCode® Community Health Initiative. Through a return of results program, pathogenic/likely pathogenic variants found in one or more genes linked to actionable genetic medical conditions are returned to patient-participants. As of June 1, 2017, 317 patients have received 320 results.

ADAPTABILITY: Our goal is to share our experience to demonstrate the importance of pharmacists in the care of patients with actionable genetic risks. We will present a synthesis of the evidence for chemoprophylaxis, treatment and medication avoidance in 30 conditions as well as the factors weighed to determine the level of pharmacist involvement in each condition.

SIGNIFICANCE: As precision medicine evolves and preemptive sequencing becomes more common, pharmacists are key members of the team needed to improve the care and outcomes of patients.

366. Pharmacogenetic (PGx) service incorporating *CYP2D6* genotype to guide opioid prescribing for cancer pain at two academic cancer centers in Florida *Scott Mosley, Pharm.D.*[1], Kevin Hicks, Pharm.D., Ph.D.[2], Kristine Donovan, Ph.D.[3], Thomas George, M.D.[4], Priya Gopalan, M.D., Ph.D.[4], Michael Clare-Salzler, M.D.[5], Jessica Schmit, M.D.[4], Natalie Silver, M.D.[4], Petr Starostik, M.D.[4], Jason Starr, DO[6], Howard McLeod, Pharm.D.[3], Larisa H. Cavallari, Pharm.D.[1]; [1]Department of Pharmacotherapy and Translational Research and Center for Pharmacogenomics, College of Pharmacy, University of Florida, Gainesville, FL [2]DeBartolo Family Personalized Medicine Institute, Moffitt Cancer Center, Tampa, FL [3]Moffitt Cancer Center, Tampa, FL [4]University of Florida, Gainesville, FL [5]Divsion of Endocrinology, Diabetes, and Metabolism; Center for Immunology and Transplantation, University of Florida, Gainesville, FL [6]Gainesville, FL

SERVICE OR PROGRAM: A pharmacist-led collaborative effort including oncologists, supportive care physicians, clinical pathologists, and nurses was clinically implemented to provide *CYP2D6* genotype-guided opioid prescribing for management of cancer pain. Patients with solid tumors reporting a pain score $\geq 4/10$ were consented for genotyping. Buccal cell samples were genotyped at the University of Florida Health Clinical Pathology Laboratory, with results entered into the electronic health record (EHR). Clinical pharmacists provided genotype-guided recommendations for pain management via an electronic consult note. For normal metabolizers (NMs), no change was recommended, whereas the recommendation was to avoid opioids dependent upon CYP2D6 for metabolism for other phenotypes or if drugs that strongly inhibit CYP2D6 activity were concomitantly prescribed. Opioid prescribing decisions were ultimately at the physician's discretion. The PGx clinical service was supported through a funded implementation sciences study investigating the impact of genomic-guided pain management.

JUSTIFICATION/DOCUMENTATION: There is strong evidence that *CYP2D6* genotype influences the pharmacokinetics and clinical response to select opioids (codeine, tramadol, hydrocodone, oxycodone), but there is a paucity of data on the impact of incorporating *CYP2D6* genotype into opioid prescribing decisions. Twenty-one patients have been genotyped to date; 85% were taking oxycodone at baseline, and the mean pain score was 5.2 ± 2.04. The median time until genotype results were reported in the EHR was 9 (IQR: 7–12) days. Four of 21 patients were intermediate metabolizers (IMs); the remainder were NMs.

ADAPTABILITY: Successful implementation required a pharmacist with specialty training in pharmacogenetics and physicians educated on how to incorporate genotype information into prescribing decisions for pain management. A pragmatic trial is underway to examine the effect of genotype-guided management of cancer pain on patient-reported pain outcomes.

SIGNIFICANCE: This study demonstrates that clinical pharmacists can play a significant role in facilitating a genotype-guided approach to select the most appropriate opioids for outpatients with cancer pain.

Case Reports
ADR/Drug Interactions

505. A case report of 4-factor prothrombin complex concentrate (4FPCC) extravasation injury requiring surgical intervention *Billie Bartel, Pharm.D.*, Ashley Hansen, Pharm.D.; Sanford Aberdeen Medical Center, Aberdeen, SD

INTRODUCTION: Extravasation injury after 4FPCC IV infiltration is reviewed. No reports of adverse clinical sequela due to 4FPCC infiltration currently exist.

CASE: Patient received 4FPCC for warfarin reversal. 4FPCC was administered via peripheral forearm IV. IV site swelling was noted near end of infusion. Infusion was stopped, fluid aspirated, arm elevated and alternating hot/cold packs applied. 4FPCC was the only medication given at this IV site.Six hours later, the site appeared purple and bruised. Patient complained of severe pain. Eight hours later, the site was black with surrounding redness and no warmth. The surgeon noted expanding erythema with necrotic areas and ischemia. Elevation and warm compresses continued. Twenty-four hours later the site was sloughing with blister-like appearance. Area was kept moist and covered with nonadherent dressings.Patient required wound care and surgeon follow-up after discharge. Final wound evaluation 3 weeks post-discharge showed 4x5 cm full-thickness skin necrosis, borders with partial necrosis and 1 cm ring of resolving partial-thickness ischemia. Surgical debridement with split-thickness skin graft placement was completed.

DISCUSSION: This is the first reported case of injury secondary to 4FPCC infiltration. 4FPCC is not expected to cause extravasation injury by typical mechanisms of irritation or DNA injury, as

it is a blood product with no known harmful excipients or preservatives. Product pH and osmolality are not likely to cause tissue injury.Extravasation injury may be due to the pharmacologic effects of 4FPCC in the setting of tissue injury. Local clotting cascade initiated by tissue injury may have been further augmented by the concentrated clotting factors from 4FPCC present at the site. Ischemia seen within 24 h may support this hypothesis.
CONCLUSION: 4FPCC is attributed to the extravasation injury seen in this case. Outcomes of 4FPCC infiltration should be reported to aid in further understanding of extravasation risks, necessary precautions, and optimal infiltration management.

506. Quetiapine and eosinophilic pericarditis: case report *Emma Gorman, Pharm.D.*[1], Ashley Woodruff, Pharm.D.[2]; [1]Department of Pharmacy, Buffalo General Medical Center, Buffalo, NY [2]Department of Pharmacy Practice, University at Buffalo School of Pharmacy and Pharmaceutical Sciences, Buffalo, NY
INTRODUCTION: Elevated eosinophils in the blood can lead to pericarditis due to damage of the myocardial tissues by infiltration of eosinophils. Eosinophilia has been reported with use antipsychotics, including quetiapine.
CASE: A 52-year-old Caucasian female was admitted to the hospital after ingesting approximately 1,150 mg of quetiapine. The patient complained of chest pain and an ECG done on arrival showed diffuse ST changes consistent with pericarditis. Laboratory studies on arrival revealed eosinophilia (6.9 eosinophils/100 leukocytes, 6.9%) and a troponin I of 1.05 ng/mL. Cardiology was consulted and a diagnosis of acute pericarditis was made. A urine drug screen done on arrival was positive only for benzodiazepines, which she was prescribed. A review of her outpatient prescription fill history indicated that quetiapine was a relatively new prescription. A history of her laboratory data revealed a normal eosinophil count prior to quetiapine use. She was admitted to the medicine teaching service and treated with a non-steroidal anti-inflammatory medication. Her chest pain abided and she was transferred for a higher level of psychiatry care.
DISCUSSION: Eosinophilia is a recognized cause of pericarditis. Eosinophilia has been reported with quetiapine use but to our knowledge this is the first case report of eosinophilia and pericarditis as a result of quetiapine use. The Naranjo Adverse Drug Reaction Probability Scale indicated a probable reaction with a score of 6.
CONCLUSION: Eosinophils should be monitored in patients newly started on antipsychotics. Additionally, eosinophilia should be considered as a potential cause for pericarditis.

507. Acute hepatotoxicity after high-dose cytarabine for the treatment of relapsed acute myeloid leukemia: a case report *Samuel Fu, Pharm.D. Candidate*[1], Alexander Flannery, Pharm.D., BCCCP, BCPS[2], Melissa Bastin, Pharm.D., BCPS[2]; [1]Department of Pharmacy Practice and Science, University of Kentucky College of Pharmacy, Lexington, KY [2]Department of Pharmacy Services, University of Kentucky HealthCare, Lexington, KY
INTRODUCTION: Cytarabine is considered standard of care induction therapy for patients with acute myeloid leukemia (AML). Hepatotoxicity is not commonly associated with cytarabine. We report a case of severe acute hepatotoxicity following high-dose cytarabine (HiDAC) therapy.
CASE: A 72-year-old female with a past medical history of myelodysplastic syndrome and newly diagnosed AML presented to our institution with bone marrow confirmed blast crisis, residual blasts of 40–50%. Five months prior to admission, the patient received 6 cycles of azacitidine 75 mg/m^2 and 6 out of 10 planned days of decitabine 20 mg/m^2 (34 mg), which was halted early due to neutropenic fever and a tooth infection. Upon admission, "7 + 3" [cytarabine 100 mg/m^2 (170 mg) and idarubicin 12 mg/m^2 (20 mg)] was initiated. No toxicities were observed after completion of this induction regimen, alanine (ALT), asparate (AST) aminotransferases, and total bilirubin (Tbili) remained within normal limits. On hospital day 18, biopsy showed 20–30% blasts and HiDAC 1,566 mg/m^2 (2,600 mg) was initiated on day 22. On day 27, the patient developed altered mental status and jaundice; chemotherapy was discontinued and she was admitted to the intensive care unit for worsening respiratory failure. Laboratory data on day 28 revealed elevated ALT/AST/Tbili (4,638 U/L, >7,000 U/L, 2.8 mg/dL, respectively). The patient then developed sepsis and multi organ failure, and care was withdrawn on day 38.
DISCUSSION: Cytarabine is a widely used chemotherapy for patients with newly diagnosed or relapsed AML. Cytarabine-associated hepatotoxicity is rare, even given as a high-dose treatment (1–3 g/m^2). Only a few cases have been previously reported in the literature for this rare adverse drug reaction. Based on the Naranjo scale, the association of hepatotoxicity and HiDAC was classified as probable. The patient's age and prior chemotherapy exposure may have predisposed her to hepatotoxicity secondary to HiDAC.
CONCLUSION: The possibility of acute hepatotoxicity should be considered in patients receiving cytarabine, specifically in high doses.

Cardiovascular

508E. Successful use of rivaroxaban in inferior vena cava thrombosis provoked by multiple traumatic injuries and surgeries: a case report. *Kazuhiko Kido, Pharm.D., M.S.*[1], Eric Noyes, CNP, M.S.[2], Leonard Gutnik, M.D.[2]; [1]Pharmacy Practice, South Dakota State University College of Pharmacy, Sioux Falls, SD [2]Avera Medical Group Internal Medicine, Avera McKennan Hospital, Sioux Falls, SD
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509. case series: thrombocytopenia improvement with transition of intravenous epoprostenol to intravenous treprostinil *Kirstin Kooda, Pharm.D., BCPS, BCCCP*[1], Jeff Armon, Pharm.D.[2], Narith Ou, Pharm.D.[3]; [1]Department of Pharmacy Services, Mayo Clinic Hospital – Rochester, Rochester, MN [2]Department of Pharmacy, Mayo Clinic, Rochester, MN [3]Mayo Clinic Hospital, Rochester, MN
INTRODUCTION: Thrombocytopenia associated with intravenous prostacyclin therapy for pulmonary arterial hypertension (PAH) is a therapy limiting, adverse event for which optimal management is unknown. It has been reported to occur in 34%–65% of patients exposed to epoprostenol. Patients with PAH and thrombocytopenia are at increased risk of bleeding, and frequent platelet transfusion increase risk of antibody development and may impair transplant suitability in otherwise eligible transplants. As prostacyclins are a life-sustaining therapy for Class III and IV PAH, discontinuation is frequently not an option. We present a case series where transition from intravenous epoprostenol to intravenous treprostinil resolved thrombocytopenia.
CASE: Five patients who transitioned from epoprostenol to treprostinil for the indication of thrombocytopenia from 2003 through 2015 were included. Demographic information, indication for prostacyclins, presence of additional thrombocytopenic medications, individual titrations, final doses of treprostinil, effect on platelets, and duration of platelet response were all gathered. All patients had thrombocytopenia with EPO not explained by other medications. Platelet nadirs ranged from 10,000 to 55,000/mL and occurred 6 days to 4 years after EPO was initiated. Platelet recovery reached in the first 10 days after transition ranged from 40,000/

mL to 475,000/mL and was sustained for the duration of follow up in 4 of the 5 patients, ranging from 2 months to 2 years. Two patients received transplantation within 8 months of transition. The fifth patient passed away 9 days after prostacyclin transition from complications related to liver transplantation.
DISCUSSION: This case series is the first to describe the potential successful treatment of epoprostenol associated thrombocytopenia with transition to treprostinil. It is limited by its retrospective nature, but rigorous assessment of all potential confounding causes of thrombocytopenia was conducted.
CONCLUSION: Patients who experience therapy-limiting thrombocytopenia with epoprostenol may be considered for transition to treprostinil for the purposes of improving platelet recovery.

Critical Care

510. Oral adjunctive midodrine for weaning vasopressor in the medical intensive care unit: a silver bullet? *Deepali Dixit, Pharm.D.*; School of Pharmacy, Rutgers University, Piscataway, NJ
INTRODUCTION: Persistent hypotension after adequate resuscitation and source control for septic shock is common and can be a major obstacle to discharging patients from the intensive care unit (ICU). Failure to wean off intravenous (IV) vasopressors can lead to increased length of stay and ICU-related complications. Recently there has been an increasing interest in using midodrine, an oral alpha-1 receptor agonist to facilitate weaning off IV vasopressors. However, evidence supporting this off-label use of midodrine in the ICU is scarce
CASE: We present a case series of five adult patients who received adjunctive midodrine to facilitate weaning IV vasopressors. All patients were admitted to ICU for septic shock. The median age was 76 years old (80% men). The median APACHE II score was 21. All patients received adequate fluid resuscitation and appropriate antimicrobial therapy. None of the patients received low dose steroids before or after midodrine initiation. Continuous IV vasopressors included norepinephrine and vasopressin. The median duration of IV vasopressor infusions prior to midodrine initiation was 5 days, with a median dose of 15 mcg/min of norepinephrine. Vasopressin was infused at fixed dose of 0.04 units/min. After midodrine initiation, continuous IV vasopressor infusions were weaned off after 12 h. After initiating midodrine the median change in IV vasopressor requirements occurred at 9.5 h with a 10 mcg/min dose reduction. The total ICU length of stay was 7.6 days. The average duration of midodrine use post ICU-discharge was 2 days. Patients received a median midodrine dose of 120 mg per day. No adverse outcomes were documented.
DISCUSSION: Our case series demonstrate that midodrine was safe and effective in weaning off IV vasopressors, leading to transitioning to a non-ICU units. Limitations include retrospective observational study.
CONCLUSION: Midodrine appears to be successful in permitting discontinuation of IV vasopressors in patients recovering from septic shock.

511. Use of cangrelor following percutaneous coronary intervention for $P2Y_{12}$ inhibition during extracorporeal membrane oxygenation and impaired gastrointestinal absorption: a case report *Patrick Reed, Pharm.D.*, William Cahoon, Jr, Pharm.D.; Department of Pharmacy Services, Virginia Commonwealth University Health System, Richmond, VA
INTRODUCTION: Patients receiving drug-eluting stents (DES) should receive dual antiplatelet therapy for one year following percutaneous coronary intervention (PCI). Inadequate absorption of oral antiplatelets can increase risks of stent thrombosis and ischemic events. Cangrelor, an intravenous $P2Y_{12}$ platelet receptor inhibitor, is approved for PCI and has off-label use as antiplatelet bridge to cardiac surgery. Here we present cangrelor use in a patient on venoarterial-extracorporeal membrane oxygenation (VA-ECMO) support with impaired gastrointestinal (GI) absorption.
CASE: A 55-year old male with shortness of breath and chest pain was diagnosed with ST-elevation myocardial infarction at an outside hospital. He was transferred for surgical evaluation, but was emergently placed on VA-ECMO for cardiogenic shock. He subsequently underwent PCI with four DES. Cangrelor was initiated due to suspected ileus and impaired GI absorption. His initial $P2Y_{12}$ assay on cangrelor 0.75 mcg/kg/min was therapeutic. VA-ECMO was decannulated on hospital day 3. Following five days of cangrelor the patient was transitioned to ticagrelor. Due to inadequate $P2Y_{12}$ inhibition, cangrelor was re-initiated for 4 days. With resolution of ileus, the patient was reloaded on ticagrelor resulting in a therapeutic $P2Y_{12}$ assay. The sole bleeding complication reported was a left femoral artery hematoma, but was attributed to VA-ECMO cannulation. The patient did not experience further ischemic events and survived to hospital discharge.
DISCUSSION: To our knowledge this is the first report of cangrelor use for antiplatelet therapy in a patient with impaired GI absorption. There is also minimal evidence for cangrelor use in VA-ECMO. One case report utilized cangrelor doses of 0.75–2.0 mcg/kg/min, but did not measure platelet reactivity assays.
CONCLUSION: Cangrelor may be used for post-PCI $P2Y_{12}$ inhibition in patients with impaired Gl absorption. Furthermore, in this case cangrelor provided adequate $P2Y_{12}$ inhibition during VA-ECMO support. Future studies should confirm the role of cangrelor in patients with impaired GI absorption.

Emergency Medicine

512. Case report of prolonged mental impairment and aggression following repeated intentional overdoses of Perampanel, a new antiepileptic drug *Kevin Kaucher, Pharm.D.*; Department of Acute Care Pharmacy, Denver Health Medical Center, Denver, CO
INTRODUCTION: Perampanel is a recently developed novel antiepileptic that acts as an α-amino-3-hydroxy-5-methyl-4-isoxazolepropionic acid antagonist. Side effects include somnolence, dizziness, and headache, as well as a black box warning for aggressive behavior. This case report describes the clinical course of the 2nd case of perampanel overdose reported in the literature.
CASE: A 41 year-old male was found agitated and screaming at home holding an empty bottle of perampanel. He was suspected to have ingested the whole bottle, totaling 240 mg. Upon arrival in the ED, he continued to be agitated and verbally abusive with hyperreflexia, myoclonus, and hypertonia. Vitals were notable for mild hypertension and tachycardia. Laboratory abnormalities included acidosis, leukocytosis, thrombocytosis, and increased creatine kinase. After receiving several benzodiazepine doses, the patient was intubated and admitted to the intensive care unit, where he was treated with supportive care measures. His encephalopathy resolved after 20 days and he was discharged at 24 days. Investigation noted this was his second perampanel overdose and ICU admission for aggressive behavior and altered mentation lasting 8 weeks before resolution.
DISCUSSION: Our case describes a prolonged course of altered mentation and aggressive behavior which differed from the other published case describing complete resolution at 2 days. Unexpected findings such as hyperreflexia, myoclonus, hypertonia, acidosis, and elevated CK cannot rule out coingestants or other causes. The pharmacokinetic properties may explain the prolonged time to resolution. A score of 4 on the Naranjo scale gives a possible cause of symptoms due to perampanel overdose.
CONCLUSION: Perampanel overdose may lead to prolonged altered mentation and aggressive behavior requiring lengthy hospitalizations. Management includes supportive care.

Endocrinology

513. Linezolid-associated hypoglycemia in a patient with type 2 diabetes mellitus: a case report *Erin Raney, Pharm.D., BCPS, BC-ADM*[1], Rebekah M Jackowski, Pharm.D.[1], David Hume, D.O., ABFM, AOBFM[2]; [1]Department of Pharmacy Practice, Midwestern University, College of Pharmacy-Glendale, Glendale, AZ [2]Arizona College of Osteopathic Medicine, Midwestern University, Glendale, AZ

INTRODUCTION: Linezolid is a key antibiotic for the treatment of respiratory and skin and soft tissue infections associated with antibiotic resistant organisms. The potential risk for hypoglycemia with its use was added to product labeling in 2012 based upon post-marketing evidence. Specific characterization of the onset, duration, and extent of the risk, as well as clinical management recommendations are limited. This report describes early onset hypoglycemia requiring temporary discontinuation of insulin in a patient with Type 2 diabetes mellitus.

CASE: A 52 year old male initiated a 10-day outpatient course of linezolid for lower extremity MRSA cellulitis. His chronic antidiabetic regimen was insulin glargine 70 units once daily, insulin lispro 17 units before dinner, sitagliptin 100 mg once daily, and metformin 1,000 mg twice daily. During the month prior to linezolid, the average fasting and postprandial blood glucose (BG) were 125 mg/dL and 180 mg/dL, respectively, with an A1C of 7.6%. On day 2 of linezolid, patient reported multiple BG values of 50–75 mg/dL. Insulins glargine and lispro were held and oral medications continued. BG remained controlled without hypoglycemia during the remainder of the antibiotic course and for 1 week beyond completion. Insulin glargine was then added at 10 units daily and titrated over 2 weeks, with the addition of insulin lispro after that time.

DISCUSSION: Reports in the literature describe median hypoglycemia onset of 7 days, with little information on the extent and duration of required medication adjustments. In this case the onset was rapid and required an extended course of patient consultation and medication modification well beyond the completion of linezolid. No other identifiable changes in medications or diet were noted, supporting the antibiotic's causality.

CONCLUSION: Clinicians prescribing linezolid must be aware of the need for careful monitoring during and after the antibiotic course to address hypoglycemia in patients with diabetes.

HIV/AIDS

514. Dabigatran use with concurrent darunavir/ritonavir in a HIV-positive patient *Payal Kakadiya, Pharm.D.*[1], Robert Higginson, PA-C[2], Patricia Fulco, Pharm.D.[1]; [1]Department of Pharmacy, VCU Health, Richmond, VA [2]Department of Internal Medicine-Infectious Diseases, VCU Health, Richmond, VA

INTRODUCTION: Concurrent use of apixaban or rivaroxaban with ritonavir or cobicistat (COBI) is contraindicated due to cytochrome P450 inhibition resulting in supra-therapeutic concentrations and increased hemorrhagic risk. Dabigatran is primarily renally eliminated, a substrate of intestinal permeability-glycoprotein (pgp) and renal multidrug and toxin extrusion-1 (MATE-1) transporter. Ritonavir and COBI inhibit pgp and MATE-1. Concurrent ritonavir and dabigatran use was theorized to be safe if separated by 2 h. Healthy volunteer data suggest increased dabigatran concentrations with COBI, but no drug-drug interaction (DDI) with ritonavir.

CASE: A 74-year-old African American male with a past medical history of multi-drug resistant HIV (viral load undetectable) and triple cardiac bypass surgery with pacemaker placement was anticoagulated with warfarin (8 years). Dabigatran (150 mg twice daily) was substituted by his cardiologist with concurrent antiretrovirals (ARVs) including: darunavir-cobicistat, rilpivirine, emtricitabine-tenofovir alafenamide, and raltegravir. An expected DDI resulted in darunavir-COBI discontinuation with darunavir-ritonavir once daily initiated. The dabigatran peak (2 h after ingestion) and trough concentrations were 285 ng/mL (64–443 ng/mL) and 59 ng/mL (<73 ng/mL), respectively, with aPTT values of 60 s with concurrent dabigatran and ritonavir. Presently, no bleeding events have resulted.

DISCUSSION: Ritonavir inhibits pgp similarly to COBI. Healthy volunteer data suggest no clinically significant increase in thrombin time or dabigatran concentrations with ritonavir co-administration. Recommended dabigatran trough concentrations of <73 ng/mL in atrial fibrillation patients suggest a decreased risk of bleeding. Our patient (normal body weight and GFR) maintained recommended dabigatran concentrations with no hemorrhagic events with concurrent ritonavir use.

CONCLUSION: Dabigatran use with concurrent ritonavir does not appear to result in a significant DDI. Based on this case report and healthy volunteer data, there is no need for dose reduction or separation. Concurrent COBI and dabigatran use should not be administered based on healthy volunteer data, but further data in HIV-positive patients should be evaluated.

Infectious Diseases

515. Use of continuous infusion ceftolozane-tazobactam with therapeutic drug monitoring in a patient with cystic fibrosis: a case report *Sarah Elizabeth Davis, Pharm.D. Candidate 2019*[1], Jared Ham, Pharm.D.[2], Jennifer Hucks, M.D.[3], Alyssa Gould, Pharm.D.[4], Rachel Foster, Pharm.D., MBA[4], David Nicolau, Pharm.D., FCCP, FIDSA[5], P. Brandon Bookstaver, Pharm.D., FCCP, BCPS, AAHIVP[6]; [1]South Carolina College of Pharmacy, University of South Carolina, Columbia, SC [2]Palmetto Health Richland, Columbia, SC [3]Division of Pulmonary and Critical Care, Palmetto Health Richland, Columbia, SC [4]University of South Carolina College of Pharmacy, Palmetto Health Richland, Columbia, SC [5]Center for Anti-Infective Research and Development, Hartford Hospital, Hartford, CT [6]Department of Clinical Pharmacy & Outcomes Sciences, University of South Carolina College of Pharmacy, Columbia, SC

INTRODUCTION: Modified dosing strategies are utilized to manage multi-drug resistant (M.D.R) pathogens and augmented drug clearance in cystic fibrosis (CF). We describe the use of continuous infusion (CI) ceftolozane-tazobactam (C/T) with therapeutic drug monitoring (TDM) in a CF patient with M.D.R *Pseudomonas aeruginosa* and *Escherichia coli*.

CASE: A 30-year-old woman with a history of CF was admitted for pulmonary exacerbation. Past medical history revealed a mild penicillin allergy and multiple CF exacerbations in the past year with positive sputum cultures for extended-spectrum beta-lactamase (ESBL) *E. coli*, M.D.R P. aeruginosa, and methicillin-susceptible Staphylococcus aureus (MSSA). Empiric antibiotic therapy included inhaled amikacin, IV ceftazidime-avibactam, and IV vancomycin. Sputum cultures were positive for M.D.R P. aeruginosa (mucoid strain), ESBL + E. coli and MSSA. Susceptibility of C/T was determined by *E*-test (*E. coli* MIC 0.25 μg/mL; *P. aeruginosa* MIC 0.19 μg/mL). On hospital day 7, the antimicrobial stewardship team recommended discontinuation of ceftazidime-avibactam and initiation of C/T 3 g loading dose followed by CI (6 g/500 mL over 24 h) for 10 additional days to transition to a favorable outpatient regimen. C/T serum TDM is detailed in Table 1. The patient experienced clinical resolution and improvement in pulmonary function tests.Table 1. HDLC assay Ceftolozane and Tazobactam serum concentrations:

Time (h) following C/T via CI (6 g/500 mL)	Ceftolozane concentrationμg/mL	Tazobactam concentrationμg/mL
0.0	28.60[a]	1.44[a]
2.0	20.07	2.27
17.0	20.13	2.06
41.0	25.31	2.57

[a]Serum levels 3 h after administering a 3 g load of C/T.

DISCUSSION: Limited guidance exists for C/T dosing in CF patients, but evolving data suggest 3 g every 8 h via intermittent

infusion in deep-seated infections. The patient clinically improved on 6 g CI C/T and serum concentrations were well above the MIC, despite anticipated augmented renal clearance.
CONCLUSION: These data suggest that sufficient C/T concentrations may be achieved in CF patients when delivered via CI.

517E. Use of leucovorin for the management of drug – induced pancytopenia in a patient infected with *Toxoplasma gondii* Eleanor Broadbent, Pharm.D., *Alexa Carlson, Pharm.D., BCPS*, Elizabeth Hirsch, Pharm.D.; Northeastern University – Bouvé School of Pharmacy, Boston, MA
Presented at the American Society of Health-System Pharmacists Midyear Clinical Meeting, Las Vegas, NV, December 4-8, 2016.

Nephrology

518. Midodrine treatment in a hemodialysis patient with treprostinil-induced hypotension: a case report Beatrice Drambarean, Pharm.D., BCPS, BCACP[1], *Ali Alobaidi, Pharm.D. Candidate*[2], Paula Bielnicka, Pharm.D. Candidate[2]; [1]Department of Pharmacy Practice, University of Illinois at Chicago, College of Pharmacy, Chicago, IL [2]University of Illinois at Chicago, College of Pharmacy, Chicago, IL
INTRODUCTION: Hypotension is a serious complication defined as blood pressure less than 90/60 mmHg which can cause interruption of hemodialysis and suboptimal ultrafiltration. Midodrine is a vasoconstrictor used for treatment of hypotension. Safety of dosing greater than 30 mg daily have not been established to date. We report using midodrine 90 mg daily for treatment of treprostinil-induced hypotension, a vasodilator used for treatment of pulmonary arterial hypertension (PAH).
CASE: A 49-year-old African-American male with history of end-stage renal disease receiving hemodialysis three times weekly, PAH, heart failure, pulmonary embolism, cor pulmonale, and failed renal transplant. In 2015, treprostinil subcutaneous infusion was initiated for PAH, subsequently causing hypotension with pre-dialysis blood pressure of 60/50 mmHg. During the 6-month follow-up period, 38 of 62 dialysis sessions were held or discontinued due to severe hypotension with mean (±SD) lowest systolic and diastolic intradialytic blood pressures of 72.92 ± 8.06 mmHg and 48.45 ± 9.91 mmHg, respectively. While treprostinil increased to goal dose of 100 ng/kg/min; counteracting treprostinil effects was achieved by administering midodrine 10 mg TID for 2 months and titrating to 20 mg TID by month 4. Additional 10 mg intradialytic midodrine was initiated at month 4 and titrated to 30 mg by month 6. Midodrine total daily dose increased from 30 mg to 90 mg over 6-months without any adverse effects. As hypotension resolved, midodrine intradialytic dose was discontinued and maintenance regimen was deescalated to 20 mg TID.
DISCUSSION: Unlike previous case reports that indicated maximum daily dosing of 30 mg, our patient received 90 mg daily; the highest midodrine dose reported to date. Sixty one percent of dialysis sessions were interrupted, which warranted using large doses of midodrine to prevent fluid overload, poor blood pressure control, and inadequate ultrafiltration.
CONCLUSION: Midodrine can be safely used at 90 mg daily for treatment of treprostinil-induced hypotension and prevention of hemodialysis interruption.

519. A case report of sodium correction with low-sodium CVVH replacement fluid solutions for a critically ill patient with hyponatremia and acute kidney injury *Clayton Johnston, Pharm.D., MBA, MA, MEd*[1], Javier Neyra, M.D., MSCS[2]; [1]Pharmacy Services, University of Kentucky HealthCare, Lexington, KY [2]University of Kentucky HealthCare, Lexington, KY
INTRODUCTION: For patients with chronic, severe hyponatremia, correction of serum sodium should not be more than 6–8 mEq/L over 24 h to reduce the risk for osmotic demyelination syndrome. To provide gradual correction of serum sodium, successive higher concentrations of low-sodium replacement fluids may be used.
CASE: A 47-year-old female was admitted to the ICU from an outside hospital for further evaluation of acute kidney injury related to aortoiliac occlusive disease. Serum creatinine over 9 mg/dL was reported by the outside hospital. On admission, the patient's serum creatinine was 8.34 mg/dL. CT scan of the abdomen and pelvis noted right greater than left renal artery artherosclerosis/stenosis with an occluded inferior mesenteric artery as well as moderate to severe stenosis to the superior mesenteric artery and additional evidence of right renal atrophy secondary to arterial insufficiency. The patient's serum sodium was 114 mEq/L indicating severe hyponatremia. Five hours later, the decision was made to initiate the patient on CVVH. Standard dialysate has a sodium concentration of 140 mEq/L. To provide gradual correction of the serum sodium concentration, standard replacement fluid solution was diluted with sterile water to 124 mEq/L sodium. At 31 h, bags were diluted to a concentration of 131 mEq/L sodium. A rate of 1.5 L/hr was throughout the case. With a serum sodium of 132 mEq/L, the patient was transition to standard replacement fluid solutions of 140 mEq/L concentration 68 h after initiation.
DISCUSSION: This case illustrates low-sodium CVVH replacement fluid targeting 10–12 mEq/L concentration above the patient's nadir sodium level may be used to correct hyponatremia at appropriate rates of no more than 6–8 mEq/L/day. This rate of correction should reduce the risk for osmotic demyelination syndrome.
CONCLUSION: Gradual correction of serum sodium may be accomplished for patients with chronic, severe hyponatremia with successive higher concentrations of low-sodium CVVH replacement fluids.

Oncology

520. Case report of intravenous methotrexate administration in patient on continuous venovenous hemofiltration with resultant toxic methotrexate levels *Christan Mychajlonka, Pharm.D.*[1], John J. Radosevich, Pharm.D., BCPS, BCCCP[2], Jonathan Harmon, Pharm.D.[1]; [1]Pharmacy, St. Joseph's Hospital and Medical Center, Phoenix, AZ [2]St. Joseph's Hospital & Medical Center – Dignity Health, Phoenix, AZ
INTRODUCTION: Methotrexate (MTX) requires dose reductions in renal impairment, but definitive data for high dose methotrexate dosing in continuous venovenous hemofiltration (CVVH) setting is limited. Most available literature only discusses the use of CVVH or hemodialysis for the removal of methotrexate toxicity. A major compendium recommends a 50% dose reduction in patients undergoing CVVH.
CASE: A 54 year-old female newly diagnosed with Burkitt's lymphoma was initiated on R-CODOX-M (Intravenous rituxan + cyclophosphamide + vincristine + doxorubicin + high dose methotrexate with intrathecal cytarabine and methotrexate). The patient presented with acute kidney injury prior to chemotherapy administration, and was placed on hemodialysis, followed by CVVH on day 4 of chemotherapy. After urinary alkalinization, MTX 1,500 mg/m^2 was given on day 11 of the chemotherapy cycle at 50% dose reduction. Resultant MTX levels obtained while the patient remained on CVVH at 23, 47, 71, 97, and 113 h post-treatment were respectively 101.52, 26.95, 16.42, 9.64, and 5.59 μmol/L. Leucovorin was subsequently dose adjusted based on levels. Glucarpidase was not used. The patient remained on CVVH, but her status further deteriorated during the hospital and was eventually placed on comfort care.

DISCUSSION: The 50% recommended dose reduction of MTX for a patient undergoing CVVH resulted in supratherapeutic levels. The levels remained elevated 5 days after the start of methotrexate therapy despite CVVH and rescue leucovorin. This patient had multiple contributing cofactors to her decline in a high grade lymphoma. Based on the outcomes of this isolated patient case, a further dose reduction of at least 75% of the normal methotrexate dose should be considered in CVVH patients.
CONCLUSION: We describe a case of toxic MTX levels in a CVVH patient given 50% dose reduction. Further studies and case reports are needed to provide definitive dosing in this patient population.

521. Case report on the novel sublingual administration of all-trans retinoic acid in combination with intravenous arsenic trioxide for the treatment of newly diagnosed Acute Promyelocitic Leukemia *Christan Mychajlonka, Pharm.D.*[1], John J. Radosevich, Pharm.D., BCPS, BCCCP[2], Jonathan Harmon, Pharm.D.[1]; [1]Pharmacy, St. Joseph's Hospital and Medical Center, Phoenix, AZ [2]St. Joseph's Hospital & Medical Center – Dignity Health, Phoenix, AZ
INTRODUCTION: All-trans retinoic acid (ATRA) and intravenous arsenic trioxide are commonly used to treat Acute Promyelocytic Leukemia (APL). Unfortunately, ATRA is only available as a gelatin capsule filled with a yellow viscous oily suspension, which creates a real world challenge for the effective treatment in patients with limited gastrointestinal access.
CASE: A 30 year-old female diagnosed with intermediate risk APL presented with deteriorating clinical status, which required mechanical ventilator support. Upon diagnosis, she was initiated on oral ATRA in combination with IV arsenic trioxide. The patient's calculated ATRA dose of 50 mg (5 capsules), was administered sublingually twice daily from day 2 to 40. In conjunction, she received 35 doses of arsenic between days 1 to 40. The repeat bone marrow biopsy on day 37 indicated no evidence of APL by routine morphology and flow cytometry. Cytogenetic studies also confirmed APL in cytogenetic remission prior to discharge.
DISCUSSION: One previous case study described the sublingual use of ATRA, but the SL route was only used for a short period of the treatment course then transitioned back to PO (*Ann Pharmacother*. 1999 Apr;33(4):503-5.). After oral administration, ATRA is well absorbed with mean peak plasma concentrations between 1 and 3 h after dosing with an elimination half-life of 0.5–2 h. The following process for sublingual (SL) administration was implemented: capsules were handled with personal protective equipment, cut open immediately prior to administration using dedicated scissors kept in a biohazard bag, and the viscous contents of the capsule were then squeezed under the patient's tongue.
CONCLUSION: Sublingual ATRA may provide an effective alternative route of administration. To our knowledge, this is the first report of solely using the sublingual form of ATRA in an intubated critically ill patient with IV arsenic trioxide for the effective treatment of APL.

522. Success of a novel therapeutic approach for systemic light chain amyloidosis: a case report *Hawawu Adamu, Pharm.D. Candidate, 2018*[1], Justin Arnall, Pharm.D. BCOP[2], Manish Bhuthani, Medical Doctor[3]; [1]School of Pharmacy/ Pharmacy department, Wingate University/ Carolinas Healthcare system, Charlotte, NC [2]Levine Cancer Institute, Pharmacy department, Carolinas Healthcare system, Charlotte, NC [3]Levine Cancer Institute, Oncology, Carolinas Healthcare system, Charlotte, NC
INTRODUCTION: Systemic light chain amyloidosis (AL) is a rare hematologic disorder where proteins infiltrate tissues leading to organ failure and death. The treatment of AL is directed at recovering organ function with therapeutic strategies following those of multiple myeloma with plasma cell-directed therapies. Guidelines recommend steroids, immunomodulatory, proteasome inhibitors, and cytotoxic agents in various combinations with stem cell transplantation (SCT) in eligible patients. The use of single agent daratumumab has been reported in AL achieving rapid and deep responses. The combination of daratumumab, pomalidomide, and dexamethasone (DaraPoM.D.) particularly interesting for severe AL based on success in multiple myeloma.
CASE: A 43 year old female with AL and concomitant multiple myeloma presented with severe bowel dysmotility causing abdominal pain, anemia, and a 100-pound unintentional weight loss. A combination of cyclophosphamide, bortezomib, and dexamethasone (CyBorD) was initiated but after five cycles her symptoms were progressing and therapy was switched to the regimen of DaraPoM.D. in an attempt to optimize response. At the conclusion of 2 cycles she had achieved an amyloid complete-hematologic response, with her recurring ileus and abdominal pain significantly improved to the point where she was able to eat and was gaining weight with decreased abdominal distension.
DISCUSSION: AL is a disease characterized by short survival especially with multiorgan involvement and in the refractory setting. The combination DaraPoM.D. is of particular interest based on success seen in multiple myeloma where response rates as high as 90% has been seen, but has yet to be reported in AL.
CONCLUSION: Given the severe symptoms and refractory nature of our patient's disease DaraPoM.D. was reasonable. With the tolerability and response seen, this patient experience supports a formal clinical trial evaluating the safety and efficacy of DaraPoM.D. in AL.

Pediatrics

523. Vancomycin induced mild pancytopenia associated with fever and rash in a pediatric patient: a case report *Titilola Afolabi, Pharm.D.*; College of Pharmacy, Midwestern University, Glendale, AZ
INTRODUCTION: Vancomycin is frequently used to manage serious resistant gram-positive infections and has been reported to adversely affect white blood cells (WBCs) and platelets. This case describes the development of mild pancytopenia, fever and rash in a child treated with vancomycin.
CASE: A 4-year-old female with no prior medical history was admitted for left index finger osteomyelitis. Wound cultures were positive for methicillin-resistant *Staphylococcus aureus* (MRSA) susceptible to vancomycin. The patient was initiated on intravenous (IV) vancomycin 20 mg/kg (360 mg) every 6 h with goal trough concentration of 15–20 μg/mL. On day 6, patient was discharged home on IV vancomycin 26 mg/kg (470 mg) every 8 h for nine days. Five days later, the patient returned to the emergency department (ED) with fever, decreased activity and appetite. She was administered IV ceftriaxone 50 mg/kg (1,000 mg) and oral acetaminophen 15 mg/kg (285 mg). Blood cultures obtained produced no growth and urinalysis was unremarkable. Patient was discharged home and instructed to continue vancomycin, but she returned the following day with new onset generalized maculopapular rash and persistent fevers despite acetaminophen use. The patient was admitted to the intensive care unit and blood samples revealed nadir values of WBCs 2.4 K/μL, red blood cells 3.83 M/μL, hemoglobin 9.5 K/μL, hematocrit 27.1% and platelets 134 K/μL. Vancomycin was discontinued on day 14 of therapy. A complete blood count (CBC) obtained a day after revealed upwards trend of all blood cell lines.
DISCUSSION: This is the first report describing vancomycin associated pancytopenia, rash and fever in a child. The most likely etiology of this patient's pancytopenia is vancomycin. Based on the Naranjo adverse drug event probability scale, the association of vancomycin administration with pancytopenia, rash and fever was categorized as possible.
CONCLUSION: Clinicians should consider CBC monitoring during extended vancomycin treatment durations (exceeding 1 week) in pediatric patients.

524. Clostridium difficile: a case of transmission from a healthcare worker to their child *Vanthida Huang, Pharm.D.*[1], Jessica Hasty, Pharm.D.[2], Scott Hall, Pharm.D.[2]; [1]Department of Pharmacy Practice, Midwestern University, College of Pharmacy-Glendale, Glendale, AZ [2]HonorHealth John C. Lincoln Medical Center, Phoenix, AZ

INTRODUCTION: *Clostridium difficile* is a gram-positive spore-forming anaerobic bacillus, major nosocomial enteropathogen. The epidemiology of *C. difficile* infections (CDI) has changed dramatically for both adults and pediatrics in recent years. Notably, the emergence of an epidemic strain NAP1 has been associated with increased mortality/morbidity. Pediatrics typically present with community-acquired and diagnostic testing results in greater false positives. Risk factors for CDI include prior antibiotic exposure and healthcare workers' (HCWs) transmission. Thus, we describe a case of pediatric NAP1-positive CDI potentially due to the transmission from HCW.

CASE: A 16-year-old female presented to the emergency department (ED) with a chief complaint of diarrhea; absent from school for 6 days due to diarrhea, fever, dizziness, and cramping abdominal pain. Patient ingested Colorado River water a week ago. Prior to ED, patient was treated with loperamide, ibuprofen, and bismuth subsalicylate without relief. She was switched from doxycycline to clindamycin 300 mg PO TID for acne 4 months ago. A member of the child's family is a HCW. Results of a *C. difficile* PCR was NAP1-positive. Patient diagnosed with moderate *C. difficile* colitis; metronidazole 500 mg PO QID for 14 days prescribed upon discharge.

DISCUSSION: Community-acquired CDI with NAP1 in otherwise young and healthy child is not uncommon; however, this case should further reinforce the need for appropriate hand hygiene and infection control to prevent the spread of infections from HCWs to household members. The primary mode of transmission of CDI is person-to-person via fecal-oral route from asymptomatic carriers. Cases in pediatric patients are increasing; further investigation in pediatrics is warranted to better understand the disease epidemiology and diagnoses.

CONCLUSION: Pediatric CDI cases are increasing; however, CDI with NAP1-positive can be alarming in patients from the community without hospital exposure. Proper infection control and hand hygiene is of utmost importance to prevent the transmission of CDI.

Peri-Operative Care

525. Refractory anaphylaxis following sugammadex administration: a case report *Amanda Giancarelli, Pharm.D., BCCCP, CNSC*, Kara Birrer, Pharm.D., BCPS; Department of Pharmacy, Orlando Health, Orlando, FL

INTRODUCTION: Sugammadex (Bridion) is a novel reversal agent for aminosteroidal neuromuscular blockers (NMB) as an alternative to neostigmine and glycopyrrolate. Few cases of sugammadex anaphylaxis have been reported. We present a case of almost immediate onset anaphylaxis following administration of sugammadex for the reversal of rocuronium.

CASE: Sixty-eight year old male with no known drug allergies presented with left hip fracture. He was taken to the operating room for fixation. Induction (propofol, fentanyl, lidocaine and rocuronium) and maintenance (sevoflurane) of anesthesia were uneventful. At the conclusion of the case vital signs were stable. He was given sugammadex 200 mg (~2 mg/kg) for residual neuromuscular blockade prior to extubation. Three minutes later, he became hypotensive (62/30) and his oxygen saturation dropped to 90% on 100% FiO_2. He required 3 liters of crystalloid, a total of 1 mg epinephrine, 1 g calcium chloride, and 100 mEq sodium bicarbonate for resuscitation. An epinephrine drip was initiated to maintain blood pressure. No cutaneous reaction was noted. An emergent transesophageal echo ruled out pulmonary embolus or fat emboli. He received additional rocuronium (50 mg) approximately 30 min into resuscitation along with fentanyl and midazolam. Blood pressure stabilized and he was weaned off the epinephrine drip 1 h after the sugammadex dose and 30 min after the repeat rocuronium dose. He was extubated 4 h after the reaction.

DISCUSSION: Sugammadex-related anaphylaxis is rare. All reported cases were for rocuronium reversal and the onset occurred ≤4 min after sugammadex administration – similar to our case. Our patient did not have a cutaneous reaction; which is consistent with three previously published cases. Reactions to both sugammadex and the sugammadex-rocuronium complex have been demonstrated. Our patient likely had a true sugammadex allergy as he improved following a repeat rocuronium dose.

CONCLUSION: Sugammadex-induced anaphylaxis presents with immediate onset and may occur without cutaneous reactions.

Psychiatry

526. Pruritus associated with duloxetine: a case report *Bridget Bradley, Pharm.D., BCPP*; School of Pharmacy, Pacific University, HIllsboro, OR

INTRODUCTION: Duloxetine is a serotonin norepinephrine reuptake inhibitor (SNRI) used in the treatment of variety of psychiatric and medical conditions. Pruritus is a rare adverse effect reported with SNRI therapy, this describes a case report of pruritus associated with duloxetine.

CASE: A 39-year-old female with major depressive disorder was referred to the clinical pharmacist for a possible adverse reaction to duloxetine in April 2017. The patient had been taking duloxetine 60 mg daily (titrated from 30 mg daily) since October 2016. The patient reported to her PCP in April 2017 that for 3 months had been experiencing itchiness in her whole body without lesions that she has attributed to the duloxetine. Patient was tapered off of duloxetine over 1 week and was initiated on escitalopram 10 mg titrated to 20 mg daily. Within 1 week of stopping duloxetine the itchiness had decreased to being mild and not daily, within one month itchiness had subsided. The only medication change during this time was the initiation of losartan 25 mg daily on same day she started escitalopram. With a Naranjo score of 6, duloxetine is a probable case of pruritus for this patient.

DISCUSSION: Pruritus is documented as a post-marketing adverse effect and included on the January 2017 FDA label, however is not included as an adverse effect in some tertiary resources. This case report identifies duloxetine as a probable case of pruritus which improved with discontinuation.

CONCLUSION: Duloxetine is a probable cause of pruritus and prescribers should be aware and monitor patients for itching when prescribing duloxetine.

Substance Abuse/Toxicology

527. Prolonged hypertension following massive clonidine overdose: case report *Alexandra McPherson, Pharm.D., MPH*, Travis Reinaker, Pharm.D., BCPS, BCCCP; Department of Pharmacy, Einstein Medical Center – Philadelphia, Philadelphia, PA

INTRODUCTION: Patients who present following clonidine overdose typically exhibit central nervous system depression, hypotension, and bradycardia. Few available reports detail the course of adult patients with prolonged hypertension, limiting proven treatment strategies. We present the case of an adult patient who experienced prolonged hypertension and bradycardia following a massive, intentional clonidine overdose managed with nicardipine.

CASE: A 48-year-old African American female with a history of hypertension, depression, and substance abuse presented to the Emergency Department after ingesting one hundred 0.1 mg clonidine tablets. Initial evaluation revealed hypertensive emergency and bradycardia. Intravenous nitroglycerin was initiated to

manage hypertension, but the patient was ultimately switched to intravenous nicardipine for better blood pressure control. The patient returned to her baseline clinical status 72 h post-ingestion.
DISCUSSION: Since receiving FDA approval for use as an antihypertensive agent nearly fifty years ago, clonidine has been used for an increasing number of off-label indications. Clonidine is an α_2-adrenergic agonist with both central and peripheral effects. Clinical presentation can vary in cases of overdose, depending on the dose ingested. At higher doses (>6 mg), peripheral effects predominate and patients can present with hypertension. Limited data is available on the antihypertensive of choice to manage prolonged hypertension in the case of a clonidine overdose. Following poor blood pressure control with a nitroglycerin infusion, our patient was able to achieve and maintain hemodynamic stability through the use of a nicardipine infusion.
CONCLUSION: In conjunction with supportive care, intravenous nicardipine is a viable treatment option for clonidine overdose presenting with severe, prolonged hypertension and bradycardia.

Systematic Reviews/Meta-Analysis Adult Medicine

528. Azithromycin triple therapy versus clarithromycin triple therapy for *Helicobater pylori* eradication: a meta-analysis *Ryan E. Owens, Pharm.D., BCPS*[1], Winter J. Smith, Pharm.D., BCPS[2], Stephen B. Neely, MPH[3], Kiya K. Harrison, Pharm.D., BCPS[4]; [1]Department of Pharmacy Practice, Wingate University School of Pharmacy, Hendersonville, NC [2]Adult Medicine Division, Texas Tech University Health Sciences Center School of Pharmacy, Dallas, TX [3]Office of Instructional Science and Assessment, University of Oklahoma Health Sciences Center, College of Pharmacy, Oklahoma City, OK [4]Department of Pharmacy: Clinical and Administrative Sciences, University of Oklahoma College of Pharmacy, Oklahoma City, OK
BACKGROUND: Clarithromycin-based triple therapy regimens are frequently utilized to treat *Helicobacter pylori* (*H. pylori*) infections in clinical practice. However, concerns of cost or significant drug interactions for select patients may limit clarithromycin's use in such regimens and minimal data currently exists examining alternative macrolide choices. This meta-analysis aimed to assess clinical outcomes (eradication rates and adverse effects) of azithromycin-based triple therapy versus clarithromycin-based triple therapy in *H. pylori*-infected, treatment-naïve adult patients.
METHODS: A systematic literature search of PubMed and OVID MEDLINE (from inception through April 2017) was conducted with the following search terms "azithromycin", "clarithromycin", and "*Helicobacter pylori*" to identify randomized controlled trials (RCTs) comparing two macrolide standard triple therapy arms (azithromycin or clarithromycin plus a proton pump inhibitor and either amoxicillin or nitroimidazole). RCTs were included if the population consisted of treatment-naïve adults and reported data of successful eradication and/or side effects via an intention-to-treat (ITT) method. Risk of bias was assessed with the Jadad score and tests for heterogeneity, Q and I^2, were used to measure variance between studies.
RESULTS: Four RCTs were included for analysis (N = 736, mean Jadad Score 2.5 out of 5). Examining ITT results, azithromycin-based eradication rates were inferior to clarithromycin-based eradication rates (149 of 209 (71%) versus 169 of 209 (81%), respectively; OR = 0.59 (95% CI: 0.37–0.93), p = 0.0237). Overall incidence of side effects did not differ significantly between regimens (13.09% azithromycin-based vs. 14.65% clarithromycin-based, RR 0.89 (0.54–1.47)). The results were associated with no significant heterogeneity (I^2 = 0%, p = 0.72).
DISCUSSION: This meta-analysis does not support azithromycin substitution for clarithromycin in standard triple therapy regimens for *H. pylori* eradication. Trial teatment regimens and total treatment durations varied, ranging from 4–14 days, both representing analysis limitations. Ultimately, clinicians should consider other guideline-recommended regimens if clarithromycin is not a viable option.
OTHER: Authors declare no conflicts of interest. This study was not registered or funded.

Cardiovascular

530. The efficacy of low molecular weight heparin for the prevention of symptomatic venous thromboembolism in patients with lower leg immobilization; a meta-analysis *Osamah Alfayez, Pharm.D, CDE*[1], Mohammad Alsharhan, Pharm.D[2], Majed Al Yami, Pharm.D, BCPS, ASH-CHC[3]; [1]College of Pharmacy, University of Arizona, Tucson, AZ [2]King Faisal Specialist Hospital and Research Center, Riyadh, Saudi Arabia [3]King Saud bin Abdulaziz University for Health Sciences, Riyadh, Saudi Arabia
BACKGROUND: The purpose of this meta-analysis is to evaluate the efficacy of pharmacological thromboprophylaxis with low molecular weight heparin (LMWH) in preventing symptomatic venous thromboembolism (VTE) in patients with lower leg immobilization.
METHODS: A comprehensive literature search was conducted using EMBASE and MEDLINE databases (from 1946 to March 2017) using the following key words: thrombosis, deep vein thrombosis, pulmonary embolism, immobilization and low molecular weight heparin. Two investigators extracted data and confirmed by a third investigator. Studies were included if they evaluated the effectiveness of LMWH versus placebo for the prevention of VTE in patients with lower leg immobilization. Studies were excluded if they were non-randomized controlled trials or used methods for prophylaxis other than the prespecified interventions. Articles meeting a JADAD score of 3 or higher were included in the analysis. The pre-specified efficacy outcomes were symptomatic VTE, symptomatic deep vein thrombosis (DVT) and pulmonary embolism (PE). The Mantel-Haenszel random-effects model risk ratio (RR) and corresponding 95% CIs were calculated to estimate the pooled treatment effects. Heterogeneity was assessed by using I^2 statistic.
RESULTS: Eight studies, including 3,003 patients (1,511 receiving pharmacological thromboprophylaxis with LMWH and 1,492 receiving placebo) met eligibility criteria and were retained for the meta-analysis. Pharmacological thromboprophylaxis was associated with an approximately 53% reduction in the incidence of symptomatic VTE events compared with placebo (RR = 0.47, 95% CI = 0.22–0.98, I^2 = 8.5%). Pharmacological thromboprophylaxis showed no reduction in symptomatic DVT and PE events compared to placebo (RR = 0.47, 95% CI = 0.22–1.02, I^2 = 0%) and (RR = 0.53, 95% CI = 0.15–1.83, I^2 = 0%) respectively.
DISCUSSION: Pharmacological thromboprophylaxis with LMWH might reduce the incidence of symptomatic VTE in patients with lower leg immobilization with no effect on symptomatic DVT and PE events. However, these findings should be interpreted in context, since not all included trials were powered to detect symptomatic VTE events.
OTHER: N/A.

531. Efficacy and safety of direct oral anticoagulants for standard duration thromboprophylaxis in hospitalized medically-ill patients: meta-analysis of randomized controlled trials *Majed Al Yami, Pharm.D, BCPS, ASH-CHC*[1], Osamah Alfayez, Pharm.D, CDE[2], Razan Alsheikh, Pharm.D, BCPS[2]; [1]King Saud bin Abdulaziz University for Health Sciences, Riyadh, Saudi Arabia [2]College of Pharmacy, University of Arizona, Tucson, AZ
BACKGROUND: The objective of this meta-analysis is to evaluate the safety and efficacy of direct oral anticoagulants (DOACs)

for standard-duration thromboprophylaxis in medically ill patients.
METHODS: We searched EMBASE and MEDLINE (from 1946 to March 2017) as well as abstracts from major cardiology societies' meetings. Search terms used were: venous thromboembolism, rivaroxaban, apixaban, betrixaban, factor Xa inhibitor, and direct oral anticoagulants. Titles, abstracts, and full text reports were screened and reviewed by two authors. Disagreements were resolved by joint review and consensus with an escalation clause for a third reviewer to mediate any unresolved issues. Studies were included if they evaluated rivaroxaban, apixaban, or betrixaban versus enoxaparin for standard-duration thromboprophylaxis in hospitalized medically ill patients. The Mantel-Haenszel random-effects model risk ratio (RR) and corresponding 95% CIs were calculated using the metan routine in Stata (version 14.2) to estimate the pooled treatment effects. Heterogeneity was assessed by the I^2 statistic.
RESULTS: Three studies (two available as full text and one as an abstract) including 21,751 patients met our inclusion criteria. There were no significant differences in thromboprophylactic efficacy between DOACs and enoxaparin as to symptomatic VTE (RR = 0.88, 95% CI = 0.52–1.49, I^2 = 0%), symptomatic DVT (RR = 1.03, 95% CI = 0.35–3.06, I^2 = 20.4%), non-fatal PE (RR = 0.91, 95% CI = 0.19–4.28, I^2 = 57.5%) and VTE-related death (RR = 0.64, 95% CI = 0.21–1.97, I^2 = 0%). Further, DOAC prophylaxis was associated with a greater risk of major bleeding (RR = 1.70, 95% CI = 1.02–2.82, number need to harm NNH = 638) with no observed heterogeneity (I^2 = 0%).
DISCUSSION: Our meta-analysis suggests that standard-duration thromboprophylaxis with DOACs in hospitalized medically ill patients has a comparable efficacy to enoxaparin in reducing the risk of VTE events but with approximately two-fold increase in the risk of major bleeding compared to enoxaparin. These findings support the 2012 American College of Chest Physicians (ACCP) guidelines recommendations for the routine use of standard-duration thromboprophylaxis with low molecular weight heparin in medically-ill patients.
OTHER: Not funded.

532. Safety of direct oral anticoagulants with P2Y12 inhibitors: a systematic review and meta-analysis of clinical trials *Yoonsun Mo, Pharm.D.*[1], Eric Yeh, Ph.D.[1], Anna Nogid, Pharm.D.[1], Felix Yam, Pharm.D.[2]; [1]Arnold and Marie Schwartz College of Pharmacy and Health Sciences, Long Island University Pharmacy, Brooklyn, NY [2]Skaggs School of Pharmacy and Pharmaceutical Sciences, UC San Diego, La Jolla, CA
BACKGROUND: In patients with non-valvular atrial fibrillation undergoing percutaneous coronary intervention (PCI), dual antiplatelet therapy (DAPT) with an oral $P2Y_{12}$ inhibitor and aspirin is commonly combined with a direct oral anticoagulant (DOAC) for secondary stroke prevention. However, the safety of the combination of DOACs and $P2Y_{12}$ inhibitors, especially newer, more potent agents (e.g., ticagrelor, prasugrel) remains uncertain. This systematic review provides the most updated evidence on the safety of adding a $P2Y_{12}$ inhibitor (±aspirin) to DOAC therapy in patients undergoing PCI.
METHODS: A literature search of MEDLINE, WEB OF SCIENCE, EMBASE, the Cochrane library, and citations from retrieved articles was conducted to identify randomized trials evaluating safety outcomes including bleeding among patients receiving a DOAC and any oral $P2Y_{12}$ inhibitors as single or dual antiplatelet therapy. The Jadad scale was used to assess the methodological validity of each study. The Mantel-Haenszel method was used to pool bleeding outcomes in a random effects model.
RESULTS: Of 244 records identified through a database search, 9 studies involving 31,434 patients met the inclusion criteria for the systematic review, of which 6 studies were included in the meta-analysis. Overall, included studies were of high quality (Jadad scale ≥3). Compared with DAPT, adding a DOAC to a $P2Y_{12}$ inhibitor significantly increased a composite of major and minor bleeding (HR 2.37, 95% CI 1.7–3.29, $p < 0.001$) with mild study heterogeneity (I^2 = 31%). The funnel plot showed minimal publication bias.
DISCUSSION: Combining DOAC therapy with $P2Y_{12}$ inhibitors increases the risk of bleeding when compared with DAPT alone. Further studies are needed to determine the optimal management of patients requiring both DOAC therapy and single or dual antiplatelet therapy with $P2Y_{12}$ inhibitors.
OTHER: Authors have no conflict of interests to disclose.

533. Extended duration dual antiplatelet therapy after percutaneous coronary intervention in patients with peripheral arterial disease: a meta-analysis *Hua Ling, Pharm.D., MS*, Ebony Andrews, Pharm.D., David Ombengi, Pharm.D., MPH, Danielle Brown, Pharmacy Student; Department of Pharmacy Practice, School of Pharmacy, Hampton University, Hampton, VA
BACKGROUND: Patients with peripheral arterial disease (PAD) undergoing percutaneous coronary intervention (PCI) are at elevated risk of ischemic and bleeding events. However, the optimal duration of dual antiplatelet therapy (DAPT) after PCI in patients with PAD is unknown.
METHODS: A systematic literature search was performed through June 2017 using PubMed, EMBASE and Cochrane databases with the following key terms: "dual antiplatelet therapy", "P2Y12 inhibitor", "myocardial infarction" (MI), PCI and PAD. The analysis was restricted to randomized trials published in English in patients with PAD receiving extended DAPT (≥12-month) after MI or PCI. The Cochrane Risk of Bias Tool was used to assess bias risk. Overall analysis was performed using Review Manager 5.3 with a random-effects model by using the Mantel-Haenszel method.
RESULTS: Two randomized controlled trials involving 895 patients were included in this review. Compared to the placebo group, the occurrence of Major Adverse Cardiovascular and Cerebrovascular Events (MACCE) in patients receiving extended DAPT was lower but not statistically significant (odds ratio [OR] 0.76, 95% confidence interval [CI] 0.37–1.57; p = 0.46). The results were associated with substantial heterogeneity (I^2 = 71%, p = 0.07). Extended DAPT was not significantly associated with increased GUSTO moderate/severe bleeding events (OR 1.63, 95% CI 0.84–3.18; p = 0.15; I^2 = 0%, p = 0.59).
DISCUSSION: Among patients with PAD, extended DAPT after PCI results in a non-significant difference in ischemic and bleeding events compared to placebo, respectively. The review was limited by the small number of published trials. One of the two trials compared the extended DAPT versus short DAPT (≤6-month), which may cause overestimation of the benefits of extended DAPT in MACCE in our results. The routine use of extended DAPT in this cohort should be carefully evaluated.
OTHER: Authors have no conflicts of interest. No external funding or registration.

Infectious Diseases

534. Sofosbuvir/velapastavir/voxilaprevir for the treatment of hepatitis C: a systematic review *Elias Chahine, Pharm.D., FCCP, BCPS (AQ-ID)* , Kurt Pessa, MS, Lisa Mella, BA; Lloyd L. Gregory School of Pharmacy, Palm Beach Atlantic University, West Palm Beach, FL
BACKGROUND: Direct-acting antivirals (DAAs) represent a breakthrough in the treatment of hepatitis C virus (HCV) infection. The objective of this report is to review the efficacy of sofosbuvir/velpatasvir/voxilaprevir (SOF/VEL/VOX) in patients with HCV infection.
METHODS: A literature search was conducted through April 2017 utilizing Medline with the following search terms "voxilaprevir", "GS-9857", and "NS3/4A". Additionally, relevant abstracts

from The Liver Meeting were also reviewed. The risk of bias was assessed using the Cochrane Risk of Bias Tool.
RESULTS: The following studies were retrieved: one Phase I, five Phase II, and four Phase III trials, POLARIS-1 through 4. Primary endpoints were sustained virologic response rates 12 weeks after the end of treatment (SVR_{12}). POLARIS-1 enrolled 445 patients with HCV genotypes 1 through 6 previously exposed to NS5A inhibitors. SVR_{12} rates were 96% with SOF/VEL/VOX for 12 weeks compared to 0% with placebo. POLARIS-2 enrolled 611 patients with HCV genotypes 1 through 6 and no prior exposure to DAAs. SVR_{12} rates were 95% with SOF/VEL/VOX for 8 weeks compared to 98% with SOF/VEL for 12 weeks (−3.4%, 95% CI, −6.2% to −0.6%). POLARIS-3 enrolled 611 patients with HCV genotype 3 with cirrhosis and no prior exposure to DAAs. SVR_{12} rates were 96% with both SOF/VEL/VOX for 8 weeks and SOF/VEL for 12 weeks (95% CI, 91 to 99%). POLARIS-4 enrolled 445 patients with HCV genotypes 1 through 4 previously exposed to DAAs but not NS5A inhibitors. SVR_{12}rates with SOF/VEL/VOX for 12 weeks were 97% compared to 90% with SOF/VEL for 12 weeks ($p = 0.092$).
DISCUSSION: SOF/VEL/VOX represents a single pangenotypic pill for the treatment of HCV infection with high SVR_{12}rates in patients previously exposed to DAAs and in patients with genotype 3 with cirrhosis and no prior exposure to DAAs. Limitations include the exclusion of patients with renal impairment and HIV coinfection.
OTHER: N/A.

535. Phototoxicity with lomefloxacin versus other flouroquinolones: a systematic review and meta-analysis *Mohannad Alshibani, Pharm.D.*; College of Pharmacy, University of Arizona, Tucson, AZ
BACKGROUND: Several reports showed an association between the use of Fluoroquinolones (FQs) and phototoxicity, which has led to withdrawal of some FQs from market. Lomefloxacin is one of the most common FQs that has been linked to causing serious phototoxicity reactions. However, it is still available in several countries around the world. This meta-analysis focused on comparing the rates of phototoxicity for lomefloxacin versus other FQs.
METHODS: We searched the PubMed, EMBASE, Cochrane Library databases, and websites of ClinicalTrials.gov and ClinicalTrialsRegister.eu for any RCT which compared lomefloxacin versus other FQs and reported rates of phototoxicity. We estimated the Peto odds ratios (ORs) with 95% confidence intervals (CIs) using random-effects model. Heterogeneity (I2) was assessed by using a Cochran's chi-squared test. The primary outcome was the rate of photosensitivity according to the ITT principle. A subgroup analysis was performed based on inclusion of inpatients versus outpatients.
RESULTS: A statistically significant higher phototoxicity rate was identified with lomefloxacin compared to other FQs (Peto OR, 5.502; 95% CI, 3.230–9.374; $p < 0.001$; $I^2 = 0\%$). 4.18% of patients in the lomefloxacin group experienced phototoxicity compared to 0.09% of patients in the other group. The subgroup analysis found a statistically significant increase in rate of phototoxicity in the studies that included outpatients (Peto OR, 5.811; 95% CI, 3.341–10.107; $p < 0.001$; $I^2 = 0\%$) but not those that included inpatients (Peto OR, 2.759; 95% CI, 0.386–19.255; $p = 0.312$; $I^2 = 0\%$).
DISCUSSION: This meta-analysis identified a significantly higher phototoxicity rates in the lomefloxacin arm compared to the arm of other FQs. This finding supports that the use of lomefloxacin should be discouraged in most patients, particularly those at high risk of developing photosensitivity reactions unless future data identified a unique benefit to use of this antibiotic over other FQs.
OTHER: Fluoroquinolones; Phototoxicity; lomefloxacin; meta-analysis.

536. Continuous versus intermittent infusion of vancomycin and the risk of acute kidney injury in critically ill adults: a systematic review and meta-analysis *Alexander Flannery, Pharm.D., BCCCP, BCPS*[1], Brittany Bissell, Pharm.D., BCCCP[1], Samuel Fu, Pharm.D. Candidate[2], Melissa Bastin, Pharm.D., BCPS[1], Javier Neyra, M.D., MSCS[3], Peter Morris, M.D.[4]; [1]Department of Pharmacy Services, University of Kentucky HealthCare, Lexington, KY [2]Department of Pharmacy Practice and Science, University of Kentucky College of Pharmacy, Lexington, KY [3]Division of Nephrology, Bone and Mineral Metabolism, University of Kentucky College of Medicine, Lexington, KY [4]Division of Pulmonary, Critical Care, and Sleep Medicine, University of Kentucky College of Medicine, Lexington, KY
BACKGROUND: Continuous infusion vancomycin (CIV) may reduce the risk of acute kidney injury (AKI) when compared to intermittent infusion vancomycin (IIV), particularly in high-risk patient populations. In this meta-analysis, we aim to examine the risk of AKI associated with CIV versus IIV in critically ill adults.
METHODS: We systematically searched MEDLINE, CINAHL, Web of Science, International Pharmaceutical Abstracts, and Google Scholar through June 2017 using a combination of terms including variants of the following: critical care, intensive care, vancomycin, continuous, and intermittent. We included randomized trials and observational studies evaluating AKI associated with CIV versus IIV in critically ill adults for the primary outcome. Secondary outcomes included serum level and area-under-the-curve (AUC) target attainment. Risk of bias was assessed using the Newcastle-Ottawa and Jadad scales. A funnel plot was evaluated for publication bias and heterogeneity assessed with I^2 statistic. The generic inverse variance method in RevMan (v5.3) was used to analyze the primary outcome in a random effects model while the Mantel-Haenszel method was used for secondary outcomes.
RESULTS: Of 416 citations screened, 10 studies including 2,360 patients were evaluated for the primary outcome (2 randomized trials, 8 observational). The odds ratio (OR) of AKI was 0.49 (95% CI 0.33–0.70) for CIV compared to IIV. Furthermore, IIV was less likely than CIV to achieve serum level target attainment (OR 0.30, 95% CI 0.16–0.57) and AUC target attainment (OR 0.25, 95% CI 0.11–0.55).
DISCUSSION: In critically ill adults, CIV is associated with lower risk of AKI and superior pharmacokinetic target attainment than IIV. Limitations of this analysis include varying definitions of AKI, varying dosing protocols, primarily observational data, and potential publication bias. Future studies are needed to evaluate the impact of infusion strategy on pharmacokinetic target attainment and clinical outcomes, notably AKI, in this susceptible population.
OTHER: No external funding. Registration: PROSPERO 2017: CRD42017053746.

Nephrology

537. Systematic review of erythropoiesis-stimulating agent dosing algorithms in hemodialysis patients *Calvin Meaney, Pharm.D., BCPS*[1], Jamie Gaesser, Pharm.D.[2], Ben Robinson, BS[2], Wojciech Krzyzanski, Ph.D.[2], Mandip Panesar, M.D., FASN[3], Gauri Rao, Pharm.D., MS[4]; [1]Department of Pharmacy Practice, University at Buffalo School of Pharmacy and Pharmaceutical Sciences, Buffalo, NY [2]University at Buffalo School of Pharmacy and Pharmaceutical Sciences, Buffalo, NY [3]Erie County Medical Center, Buffalo, NY [4]Division of Pharmacotherapy and Experiential Education, University of North Carolina Eshelman School of Pharmacy, Chapel Hill, NC
BACKGROUND: Clinical use of erythropoiesis-stimulating agents (ESA) in hemodialysis patients is problematic due to complex pharmacokinetics, delayed biomarker response, and a narrow target

hemoglobin of 10–11 g/dL. The purpose of this study was to define characteristics and performance of current ESA dosing algorithms.
METHODS: A systematic literature review was conducted in accordance with PRISMA. Pubmed and EMBASE were queried from inception to 5/1/2017. Inclusion criteria were algorithms applied to humans, use of epoetin or darbepoetin, patients on hemodialysis, and published in English. A standardized database was for data extraction. The primary endpoint was the proportion of patients at the target hemoglobin (defined by each individual study) over the study period. Bias was assessed with Cochrane Collaboration's tool.
RESULTS: The literature search yielded 2,048 results, of which 9 studies met inclusion criteria (n = 10,454). Attainment of target hemoglobin ranged from 37% to 86% (mean 64%). Hemoglobin variability decreased in all studies. Bias was high in 7/9 studies due to observational design. Algorithms with the best performance were artificial intelligence (77% hemoglobin target attainment) and model predictive control (73%) guided. All algorithms included hemoglobin and ESA dosing data; 2/9 included ferritin (mean 81% at target hemoglobin); 3/9 included erythrocyte lifespan (mean 78% at target hemoglobin).
DISCUSSION: Current ESA dosing algorithms have varying degrees of success. No universally applicable algorithm exists. Some complex algorithms have shown high success rates in humans, whereas others (artificial neural networks and reinforcement learning) have demonstrated success in simulation only. Inlcusion of iron indices and erythrocyte lifespan appear to improve algorithm performance. Future studies should include a large number of subjects, compare a clinically applicable algorithm to the current standard of care, and evaluate clinical outcomes, quality of life, and costs.
OTHER: There are no funding, conflicts of interest, or registrations to report for this study.

Other Pharmacoeconomics/Outcomes

539E. A mixed treatment comparison of droxidopa and midodrine for the treatment of neurogenic orthostatic hypotension *Jack J. Chen, Pharm.D.*[1], Yi Han, Ph.D.[2], Wilson Joe, Ph.D.[2]; [1]College of Pharmacy, Marshall B. Ketchum University, Fullerton, CA [2]Cello Health, Yardley, PA
Presented at the 22nd Annual Conference of the International Society for Pharmacoeconomics and Outcomes Research, Boston, MA, May 20-24, 2017.

Pulmonary

540. Triple versus dual therapy in COPD: a meta-analysis *Melissa Lipari, Pharm.D., BCACP*[1], Sheila Wilhelm, Pharm.D., FCCP, BCPS[2], Pramodini Kale-Pradhan, Pharm.D., FCCP[3]; [1]Pharmacy Practice, Eugene Applebaum College of Pharmacy, Wayne State University & Health Sciences and St. John Hospital and Medical Center, Detroit, MI [2]Department of Pharmacy Practice, Wayne State University, Eugene Applebaum College of Pharmacy & Health Sciences and Harper University Hospital, Detroit, MI [3]Department of Pharmacy Practice, Wayne State University, Eugene Applebaum College of Pharmacy & Health Sciences and St. John Hospital and Medical Center, Detroit, MI
BACKGROUND: This meta-analysis evaluates the rates of exacerbations and adverse events of triple therapy with inhaled corticosteroids (ICS) + long acting beta-agonist (LABA) + long acting muscarinic antagonist (LAMA) compared to dual therapy with LABA + LAMA or LABA + ICS for chronic obstructive pulmonary disease (COPD).
METHODS: A systematic literature search of PubMed, EMBASE, CINAHL, Web of Science, and Cochrane databases through June 2017 was conducted to identify English-language, prospective randomized controlled trials (RCTs) comparing triple to dual therapy in adults with COPD. All trials reported adverse reactions or exacerbations. Studies involving maintenance therapy with short acting muscarinic antagonist or beta agonists were excluded. Risk of bias was assessed using Jadad score. Analysis was performed using Review Manager 5.3. Random-effects model and Mantel-Haenszel method were used. The results were reported as odds ratios (OR) with 95% confidence intervals (CI).
RESULTS: Eight RCTs were included (n = 4,945; median Jadad score 3 of 5). One trial compared LABA + LAMA + ICS to LABA + LAMA; seven trials compared LABA + LAMA + ICS to LABA + ICS. Seven trials (n = 4,890) reported a lower likelihood of exacerbations with triple therapy compared to dual therapy: OR 0.69 (95% CI 0.52–0.93). There were no differences in overall adverse effects OR 0.98 (95% CI 0.87–1.11; 8 studies, n = 4,945) pneumonia OR 1.03 (95% CI 0.65–1.64; 7 studies, n = 4,890), or cardiovascular events OR 0.8 (95% CI 0.51–1.26; 5 studies, n = 3,670).
DISCUSSION: Triple therapy reduces the number of exacerbations and appears to be as safe as dual therapy without increasing the incidence of pneumonia or cardiovascular events. Although several studies were evaluable, it was difficult to discern the severity of COPD in some of the trials which makes it difficult to apply the findings to specific COPD categories.
OTHER: None of the authors have conflicts to declare nor was the study funded.

541. Triple versus monotherapy in COPD: a meta-analysis *Melissa Lipari, Pharm.D., BCACP*[1], Sheila Wilhelm, Pharm.D., FCCP, BCPS[2], Pramodini Kale-Pradhan, Pharm.D., FCCP[3]; [1]Pharmacy Practice, Eugene Applebaum College of Pharmacy, Wayne State University & Health Sciences and St. John Hospital and Medical Center, Detroit, MI [2]Department of Pharmacy Practice, Wayne State University, Eugene Applebaum College of Pharmacy & Health Sciences and Harper University Hospital, Detroit, MI [3]Department of Pharmacy Practice, Wayne State University, Eugene Applebaum College of Pharmacy & Health Sciences and St. John Hospital and Medical Center, Detroit, MI
BACKGROUND: This meta-analysis evaluates the rates of exacerbations and adverse events of triple therapy with inhaled corticosteroids (ICS) + long acting beta-agonist (LABA) + long acting muscarinic antagonist (LAMA) compared to monotherapy with LAMA for chronic obstructive pulmonary disease (COPD).
METHODS: A systematic literature search of PubMed, EMBASE, CINAHL, Web of Science, and Cochrane databases through June 2017 was conducted to identify English-language, prospective randomized controlled trials (RCTs) comparing triple to monotherapy in adults with COPD. All trials reported adverse reactions or exacerbations. Studies involving maintenance therapy with short acting muscarinic antagonist or beta agonists were excluded. Risk of bias was assessed using Jadad score. Analysis was performed using Review Manager 5.3. Random-effects model and Mantel-Haenszel method were used. The results were reported as odds ratios (OR) with 95% confidence intervals (CI).
RESULTS: Seven RCTs were included (n = 5,079; median Jadad score 3 of 5). Seven trials compared LABA + LAMA + ICS to LAMA. Five trials (n = 2,335) reported a lower likelihood of exacerbations with triple therapy compared to monotherapy: OR 0.68 (95% CI 0.48–0.95). There were no differences in overall adverse effects OR 1.00 (95% CI 0.88–1.12; 7 studies, n = 5,079). However, there was a trend towards a higher likelihood of pneumonia with triple therapy compared to monotherapy OR 1.34 (95% CI 0.77–2.32; 5 studies, n = 4,364).

DISCUSSION: Triple therapy reduces the number of exacerbations. Although there are no differences in overall adverse effects between groups, there may be a higher likelihood of pneumonia with triple therapy compared with monotherapy. Many of the studies do not explicitly categorize COPD severity of the enrolled patients making it difficult to apply the findings to clinical practice.
OTHER: None of the authors have conflicts to declare nor was the study funded.

Substance abuse/Toxicology

542. A systematic review of exchange transfusion utilization in xenobiotic-induced methemoglobinemia Steven Nerenberg, Pharm.D.[1], *Nadia Awad, Pharm.D., BCPS*[2], Pamela Hargwood, MLIS, AHIP[3], Patrick Bridgeman, Pharm.D., BCPS[1]; [1]Department of Pharmacy Practice and Administration, Ernest Mario School of Pharmacy, Rutgers, The State University of New Jersey, Piscataway, NJ [2]Department of Pharmacy, Robert Wood Johnson University Hospital, New Brunswick, NJ [3]Robert Wood Johnson Library of the Health Sciences, Rutgers, The State University of New Jersey, New Brunswick, NJ
BACKGROUND: Methylene blue is typically the antidote of choice when treating patients with xenobiotic-induced methemoglobinemia. However, there are certain situations when methylene blue may not be effective, available, or limited by its own toxicities. To the authors' knowledge, a systematic review evaluating exchange transfusion (ET) for the treatment of methemoglobinemia has not been conducted.
METHODS: Pubmed, Scopus and Web of Science from January 1900 to April 2017 were queried for articles using the following search terms: methemoglobinemia, benzocaine toxicity, dapsone toxicity, fertilizer toxicity, exchange transfusion, plasmapheresis, red blood cell exchange, and plasma exchange. English and non-English articles were retrieved for review. For the article to be included in this systematic review, ET must have been utilized for the treatment of xenobiotic-induced methemoglobinemia. Only those articles evaluated in humans in the form of case reports, case series, or controlled trials with full text available, and published in the English language were included.
RESULTS: 153 articles were identified by our search strategy for possible inclusion for review. 28 articles were included for review. 26 articles were identified as case reports and 2 of articles were identified as experimental studies. Most patients were male (73%) with a mean age was 30.9 years. The mean change of methemoglobin level for those treated with ET was 30.5% (n = 14). The mortality rate of patients who received ET for xenobiotic-induced methemoglobinemia was 17%.
DISCUSSION: ET has been used as an adjunct therapy for xenobiotic-induced methemoglobinemia as a means to effectively reduce methemoglobin concentrations. Reporting bias may limit actual efficacy and safety of ET as an application in managing xenobiotic-induced methemoglobinemia.
OTHER: No funding has been received to conduct this systematic review. The authors have no financial relationships or conflicts of interest to disclose. This systematic review is under review for acceptance on PROSPERO, the international prospective register for systematic reviews.

Transplant/Immunology

543. Systematic review and meta-analysis of proliferation signal inhibitor effect on chronic lung allograft dysfunction Alyssa Faipler, BS[1], Cody Moore, Pharm.D., MPH[1], Carlo Iasella, Pharm.D.[1], Matthew Morrell, M.D.[1], Randall Smith, Ph.D.[1], John McDyer, M.D.[2], *Christopher Ensor, Pharm.D.*[3]; [1]University of Pittsburgh, Pittsburgh, PA [2]Division of Pulmonary, Allergy, and Critical Care Medicine, University of Pittsburgh Medical Center, Pittsburgh, PA [3]School of Pharmacy, Department of Pharmacy & Therapeutics, University of Pittsburgh, Pittsburgh, PA
BACKGROUND: To identify differences in incidence of chronic lung allograft dysfunction (CLAD) and other outcomes in lung transplant recipients (LTR) treated with proliferation signal inhibitors (PSIs) versus standard immunosuppression (non-PSIs).
METHODS: A systematic review of English articles using MEDLINE, EMBASE, SCOPUS, and Cochrane Databases was performed for studies published through November 2016. Search terms included sirolimus, everolimus, and lung transplant, adhering to PRISMA recommendations. Observational or randomized studies that reported clinical outcomes in LTRs were included; individual case reports, duplicate studies; abstracts and reports containing other organ transplants were excluded. Pooled odds ratios (pOR) were calculated from a random-effects model and heterogeneity among studies was quantitated with I^2 value. Bias was assessed through funnel plots.
RESULTS: 7 studies from 2006 through 2016 representing 913 LTRs were analyzed. CLAD after one year was not different for PSIs versus non-PSIs (5 studies; pOR = 0.891, 95% CI 0.641–1.239, p = 0.494). There were no differences in acute cellular rejection (5 studies; pOR = 0.647, 95% CI 0.351–1.193, p = 0.163), total infections (3 studies; pOR = 1.193, 95% CI 0.799–1.781, p = 0.388), cytomegalovirus infections (6 studies; pOR = 0.582, 95% CI 0.297–1.138, p = 0.114), malignancy (3 studies; pOR = 1.480, 95% CI 0.708–3.093, p = 0.297), and death (4 studies; pOR = 0.729, 95% CI 0.469–1.135, p = 0.162). Patients receiving PSIs had a 4.779-fold higher risk of venous thromboembolism (2 studies; pOR = 4.779, 95% CI 2.027–11.270, p < 0.01).
DISCUSSION: This meta-analysis found no significant difference in development of CLAD and other secondary outcomes when comparing PSIs to non-PSIs. To our knowledge, this is the first meta-analysis to evaluate these outcomes in this cohort. Limitations include a low number of studies differences in follow up. Larger multi-center studies are needed to assess the role of PSI-based immunosuppression in LTRs.
OTHER: The authors have no conflicts or funding to disclose.

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PHARMACOTHERAPY

CORRIGENDUM

2017 ACCP Annual Meeting, October 7–10, 2017

In ACCP Annual Meeting,[1] an abstract was excluded from the originally published issue.

Here is the missing abstract:

201. Ribavirin plus interferon in the management of Middle East respiratory syndrome coronavirus: a historical control study of 113 patients.

Eyad Alkhadhairi, Pharm.D.[1], Sulaiman Alzubairy, Pharm.D., MBA, BCPS, BCOP, SIDP[2], Maram Abuzaid, MS, Pharm.D.[3] and Abdulkhaliq Alsalman, RPh, MSc, PhD[1]; (1)College of Pharmacy, Northern Border University, Rafha, Saudi Arabia (2)Clinical Pharmacy Services, Johns Hopkins Aramco Healthcare, Dhahran, Saudi Arabia (3)Prince Mohammed bin Abdulaziz Hospital, Riyadh, Saudi Arabia

Introduction: Since September 2012, WHO has reported nearly 2,000 laboratory-confirmed cases of the Middle East respiratory syndrome coronavirus (MERS-CoV), predominantly from Saudi Arabia. There is no anti-infective therapy approved for the infection. However, based on limited data, oral ribavirin combination with PEGylated interferon α2a injection (RIF) has been used.

Research Question or Hypothesis: What are the mortality rates and clinical outcomes in MERS-CoV patients treated with RIF plus supportive care versus supportive care alone (SCA)?

Study Design: Retrospective historical control

Methods: Chart data collection for all patients diagnosed with laboratory-confirmed MERS-CoV infection between September 2013 and June 2017. The primary endpoint was death due to infection; secondary endpoints were the requirement for CRRT and mechanical ventilation, and changes from baseline serum creatinine (SrCr), and urea nitrogen.

Results: 113 patients met the study inclusion criteria; 49 of whom have received RIF and 64 SCA. In the RIF group, 24 patients have died (49%) and 23 patients (36%) in the SCA arm (p=0.182). CRRT was required in 24 RIF patients (49%) and 17 (27%) SCA patients (p=0.018). 31 patients (63%) in the RIF group required mechanical ventilation and 25 patients (39%) with SCA (p=0.014). The average rise in SrCr and urea nitrogen from baseline in the RIF arm were 2.14 mg/dl, and 42 mg/dl, respectively, while they were 1.36 and 39, respectively, in the SCA arm (p=0.050, and p=0.876, respectively).

Conclusion: In our study, RIF addition to supportive care was associated with inferior clinical outcomes. Larger prospective well-designed studies are warranted to confirm these findings.

We apologize for this error.

Reference

1. 2017 ACCP Annual Meeting. Pharmacotherapy 2017;37(12):e124–238. doi: 10.1002/phar.2052.