ACCP Annual Meeting

Scientific Abstracts

ORIGINAL RESEARCH

ADR/Drug Interactions

1E. Cardiac risk of concomitant levofloxacin with amiodarone. Benjamin Miao, PharmD Candidate[1], Luigi Brunetti, PharmD, 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
Presented at the ACCP Virtual Poster Symposium, May 2016, Best Poster Award, First Place.

2. Effects of multiple doses of lansoprazole on the pharmacokinetics of neratinib in healthy adult subjects. Kiana Keyvanjah, PharmD[1], Daniel DiPrimeo, MS[1], Ai Li, PhD[1], Mohammad Obaidi, PhD[2], Dennis Swearingen, MD[2], Alvin Wong, PharmD[1]; (1) Puma Biotechnology Inc. (2) Celerion
INTRODUCTION: Most orally administered anticancer protein kinase inhibitors (PKIs) are weakly basic with pH-dependent solubility. Acid-reducing agents increase gastric pH from 1.5–3 to 5–6, leading to reduced absorption of PKIs, including HER2-targeted tyrosine kinase inhibitors (TKIs). Acid suppressive therapy is prevalent in cancer patients, and herein evaluated with neratinib.
RESEARCH QUESTION OR HYPOTHESIS: To evaluate the effects of lansoprazole, a proton-pump inhibitor, on the pharmacokinetics and safety of neratinib (Puma Biotechnology Inc.), a pan-HER TKI.
STUDY DESIGN: Open-label, 2-period, fixed-sequence study (ClinicalTrials.gov: NCT02334501).
METHODS: Healthy adults received a single oral dose of neratinib 240 mg, followed by a washout period, followed by oral lansoprazole 30 mg once daily for 7 days and a single dose of neratinib 240 mg on Day 5. Pharmacokinetic sampling was performed for 72 h after each neratinib dose. Plasma neratinib concentration-time data were analyzed using noncompartmental methods. A drug-drug interaction was concluded if 90% confidence intervals (CIs) for geometric mean ratios (GMR) of $AUC_{0\text{-}t}$ (area under the plasma concentration-time curve from t_0 to last quantifiable non-zero concentration), $AUC_{0\text{-}inf}$ (AUC from t_0 extrapolated to infinity), and C_{max} (peak plasma concentration) for neratinib plus lansoprazole versus neratinib alone were outside the 80–125% limits. Software: Phoenix® WinNonlin® V6.3; SAS® V9.3.
RESULTS: Fifteen subjects were enrolled. Geometric least-squares means of neratinib C_{max} were reduced from 84.502 ng/mL with neratinib alone to 24.486 ng/mL with neratinib plus lansoprazole. $AUC_{0\text{-}t}$ decreased from 1478.0 ng.hr/mL with neratinib to 426.15 ng.hr/mL with neratinib plus lansoprazole, and $AUC_{0\text{-}inf}$ decreased from 1557.2 ng.hr/mL to 541.57 ng.h/mL. GMRs (90% CI) for $AUC_{0\text{-}t}$ 28.833 (22.68–36.65), $AUC_{0\text{-}inf}$ 34.778 (28.68–42.18) and C_{max} 28.977 (22.17–37.87) were all below the lower limit of the prespecified equivalence interval (80%). Treatment-emergent adverse events, all mild, were reported by 5 (33%) subjects.
CONCLUSION: Lansoprazole reduced the rate and extent of neratinib exposure in healthy subjects.

Adult Medicine

4. Assessment heparin anticoagulation adequacy in the obese non-acute coronary syndrome patient population using aPTT and anti-Xa assays. Kelly Rudd, PharmD[1], Valerie Bush, PhD[2], Anush Patel, MD[3], Melissa Scribani, MS[4], Narmadha Panneerselvam, MD[3], Kulothungan Gunasekaran, MD[3]; (1) Department of Pharmacy, Bassett Medical Center, Cooperstown, NY (2) Department of Pathology, Bassett Medical Center, Cooperstown, NY (3) Department of Medicine, Bassett Medical Center, Cooperstown, NY (4) Statistical Center, Bassett Research Institute, Cooperstown, NY
INTRODUCTION: Heparin is a commonly used anticoagulation agent historically monitored by the activated partial thromboplastin time (aPTT.) The anti-Xa assay has gained interest given the reduced impact by acute phase reactions and common clotting factor deficiencies. While therapeutic ranges are established for each assay, there is limited literature regarding the correlation of these laboratory tests in special populations where biochemical changes are hypothesized to impact aPTT accuracy.
RESEARCH QUESTION OR HYPOTHESIS: This study was designed to assess the aPTT to anti-Xa correlation in obese patients (weighing > 90 kg) and the rates of achieving therapeutic levels of anticoagulation, as measured by the aPTT and anti-Xa at 6 and 24 h.
STUDY DESIGN: This study is a prospective analysis of laboratory values from subjects receiving heparin as part of their usual medical care.
METHODS: The 6 and 24 h laboratory samples were collected from adult patients > 18 years of age, weighing > 90 kg, on heparin therapy for non-cardiac indications. The aPTT and anti-Xa results were measured simultaneously for each subject sample collected. Patient demographics and outcomes data were collected.
RESULTS: Poor correlation between aPTT and anti-Xa was found, as a combined cohort of all weights, and when stratified by weight, at both 6 and 24 h. Controlling for BMI did not improve the correlation. By both tests, a clinically relevant proportion of patients remain subtherapeutic on heparin at both6 and 24 h.
CONCLUSION: Based upon this study, there is no ability to determine whether the aPTT or anti-Xa, is the better assessment of anticoagulation status in patients weighing > 90 kg, however there are signals that the two assays are discordant in the obese population, and that our current heparin protocol may be insufficient in achieving adequate anticoagulation levels in this patient population.

5. Fixed dose tranexamic acid in patients undergoing primary unilateral total hip or knee arthroplasty. Michelle Kohute, PharmD[1], Rachael Durie, PharmD, BCPS[2], Danielle Candelario, PharmD, BCPS[1]; (1) Jersey Shore University Medical Center, Neptune, NJ (2) Rutgers University – Ernest Mario School of Pharmacy, Piscataway, NJ
INTRODUCTION: Intravenous Tranexamic acid (TXA),an antifibrinolytic agent, is FDA approved for use in hemophilia; however, it is widely used off label to reduce blood loss and transfusions in patients undergoing surgical procedures. The benefits of weight-based TXA have been demonstrated in patients undergoing total hip or knee arthroplasty with no significant increase in adverse effects.
RESEARCH QUESTION OR HYPOTHESIS: The purpose of this study was to determine if fixed dose TXA can reduce blood transfusions, autologous blood recovery system use and surgical costs in unilateral primary total hip and knee arthroplasty.
STUDY DESIGN: Retrospective chart review of 400 adult patients at our 600 bed academic tertiary care medical center who underwent unilateral primary total hip or knee replacement.
METHODS: Control patients were selected from July 30th, 2012 to January 21st, 2013, prior to the addition of TXA to hospital formulary. Intervention patients underwent a procedure between February 1st, 2013 to July 30th, 2013 and received a fixed dose of 1–2 grams of TXA pre-operatively. Bilateral procedures or revisions were excluded.

RESULTS: A total of 400 patients were included for analysis; 200 in each the control group and fixed dose TXA group. Baseline characteristics were similar in both groups. Among patients receiving fixed dose TXA, total drop in post-operative hemoglobin (g/dL) was significantly lower (2.9 vs. 3.5; p<0.001), autologous blood recovery system usage was 66% percent lower (7.0 vs. 73.0; p<0.001), and fewer patients required blood transfusions (38 vs 17; p=0.002). No adverse reactions to TXA were reported. Use of TXA resulted in an overall cost savings of $72,932 at $364 per case.
CONCLUSION: The use of pre-operative fixed doses of TXA in unilateral hip or knee replacement was associated with a significant reduction in post-operative hemoglobin drop, autologous blood recovery system use, and blood transfusions.

6E. Exploring the risk factors for community-acquired Clostridium difficile. Allison Bell, PharmD, MSc[1], Ethan Pippin, PharmD[2]; (1) Department of Pharmacy Practice, The University of Mississippi School of Pharmacy, Jackson, MS (2) Department of Pharmacy, The University of Mississippi Medical Center, Jackson, MSPresented at Mid-South Residency Conference, Memphis, TN, April 21–22, 2016.

8. Evaluation of the chronic obstructive pulmonary disease exacerbation prescribing patterns at an academic medical center. Sarah Petite, PharmD, BCPS, Julie A. Murphy, PharmD, BCPS, FASHP, FCCP; College of Pharmacy and Pharmaceutical Sciences, University of Toledo, Toledo, OH
INTRODUCTION: The Global Initiative for Chronic Obstructive Lung Disease (GOLD) guidelines recommend a systemic corticosteroid treatment course of prednisone 40 mg PO daily for 5 days, and a short-acting muscarinic antagonist or beta-agonist as treatment for chronic obstructive pulmonary disease (COPD) exacerbations. Some studies suggest that a metered dose inhaler (MDI) may be the preferred method of delivery versus nebulizers for the bronchodilator.
RESEARCH QUESTION OR HYPOTHESIS: Adherence to GOLD guideline standard-dose (<= 200 mg prednisone equivalents [PE]) systemic corticosteroids is associated with a lower 30-day readmission rate compared to high-dose (> 200 mg PE).
STUDY DESIGN: Quasi-experimental, retrospective, cohort, single-center study.
METHODS: Adult patients admitted to an internal medicine service from January 1, 2014 to December 31, 2015 for COPD exacerbation were included. Data was collected from date of hospital admission until 30 days following discharge. Categorical data was analyzed using Chi-square or Fisher's exact test and continuous data was analyzed using Mann-Whitney U test.
RESULTS: Two hundred twenty unique patient encounters were identified. Eighty-three patients (37.7%) received standard-dose (median PE 200 mg [150–200]) and 137 patients (62.3%) received high-dose (median PE 485 mg [281–689]) systemic corticosteroids (p<0.001). Thirty-day readmission rates were similar (18.1% vs. 14.6%; p=0.466) between standard-dose and high-dose groups, respectively. Length of stay (LOS) was shorter for the standard-dose (median 3 days [2–4]) vs. high-dose (4 days [2.5–5.5]) treatment group (p<0.001). Twelve patients (5.4%) received short-acting bronchodilators via MDI vs. 199 patients (90.5%) receiving nebulizers. Thirty-day readmission rates were not significantly different between patients receiving MDIs (16.7%) vs. nebulizers (16.6%) (p=0.203). Patients treated with MDIs had a hospital LOS that was shorter than patients treated with nebulizers (median 2.5 days [1.1–3.9] vs.4 days [2–6]; p=0.086).
CONCLUSION: No differences were observed in 30-day readmission rates between systemic corticosteroid groups and short-acting bronchodilator groups. Adherence to GOLD guideline recommended systemic corticosteroids was associated with a shorter LOS.

9. A retrospective analysis of the relationship between health literacy and medication adherence. Anthony Zaki, BS, Michael J. Gonyeau, BS, Pharm, PharmD, BCPS, FCCP; Northeastern University School of Pharmacy, Boston, MA
INTRODUCTION: Adults with limited health literacy have difficulty understanding and using health information. Poor medication adherence can lead to a higher rate of hospitalizations and use of emergency services.
RESEARCH QUESTION OR HYPOTHESIS: Patients at greater risk of poor health literacy will be less adherent to their medications.
STUDY DESIGN: A retrospective, observational study of 234 patients admitted to a general medicine service over a one-year period. IRB approval was obtained.
METHODS: Pharmacist and pharmacy student medication-reconciliation notes were evaluated for medication adherence (assessed via pharmacy refill records and patient interview), and health literacy (REALM-R scores). Subjects were >= 18 years, English-speaking, taking >= 1 medication, with a REALM-R evaluation. Patients were non-adherent if < 80% of doses for any individual medication or < 75% of doses of all medications were taken. REALM-R scores of <= 6 were defined as at risk for poor health literacy. The primary outcome was the relationship between health literacy and medication adherence. Bivariate pearson correlations were calculated, with all analyses performed with SPSS® V23 utilizing a two-tailed Î± = 0.05 to assess significance.
RESULTS: 171 of 234 patients met eligibility with mean age of 56.35 ± 19.47, average of 10 ± 5.51 medications and mean REALM-R of 6.76 ± 2.16. 23.3% of patients were at risk for poor health literacy. 61.05% were adherent. Patients at risk for poor health literacy as well as those under the age of 60 had lower adherence rates ($r = 0.158$, p<0.05; $r = 0.277$, p<0.01). Patients with higher education levels had higher health literacy scores ($r = 0.404$, p<0.001).
CONCLUSION: ****A relationship between health literacy and medication adherence exists, illustrating the importance of educating patients to encourage proper medication usage. While these data include a mostly adherent population that is at low risk for health literacy issues overall, a clinically significant benefit to patient health may be achieved through increased patient education.

10. Influence of an order set on the management of acute exacerbation of chronic obstructive pulmonary disease. Alyssa Thompson, PharmD[1], Eli Deal, PharmD, FCCP, BCPS[1], Jeffrey Atkinson, MD[2]; (1) Department of Pharmacy, Barnes-Jewish Hospital (2) Division of Pulmonary and Critical Care Medicine, Washington University School of Medicine, St. Louis, MO
INTRODUCTION: The Global Initiative for Chronic Obstructive Lung Disease (GOLD) Guidelines provide evidence-based recommendations for patients hospitalized with acute exacerbation of chronic obstructive pulmonary disease (AECOPD). The purpose of this study was to characterize the management of and resultant outcomes in patients hospitalized with AECOPD in a 1315-bed tertiary academic medical center pre- and post-implementation of an order set intended to guide the management of AECOPD.
RESEARCH QUESTION OR HYPOTHESIS: Does an AECOPD order set improve adherence to GOLD Guideline recommendations?
STUDY DESIGN: Single-center quasi-experimental before-after study
METHODS: Patients were included in the pre-implementation group if they were admitted for AECOPD from August 1, 2013 to July 31, 2014. Treatment failure was defined as transfer to an ICU for worsening respiratory status after hospital day 2, inpatient mortality, or 30-day readmission. Areas for improvement were identified including steroid dosing and antimicrobial use. An AECOPD order set was implemented on December 8, 2015. A subsequent chart review was conducted in the post-implementation period from December 8, 2015 to April 1, 2016.

RESULTS: One hundred fifty patients were included in the pre-implementation period and 56 in the post-implementation period. The AECOPD order set was used appropriately in 44/56 (78.6%) cases. Sixteen (10.7%) patients during the pre-implementation period and 1/20 (5%) in the post-implementation outcomes group experienced treatment failure. The median (IQR) cumulative systemic corticosteroid dose in prednisone equivalents was 396 mg (238–546) in the pre-implementation period and 220 mg (200–260) in the post-implementation period. Inpatient antibiotic use was concordant with GOLD guideline recommendations in 75/150 cases (50%) and 19/36 cases (52.8%) in the pre- and post-implementation periods, respectively.
CONCLUSION: Steroid doses and durations utilized were appropriately reduced with the implementation of the AECOPD order set. Antibiotics continue to be overused. Further study is needed to accurately determine the impact of the order set on treatment failure.

12. Heart rate control as a marker of beta-blocker efficacy in hospitalized heart failure patients. Ryan E. Owens, PharmD, BCPS[1], Timothy Self, PharmD[2], Jennifer Twilla, PharmD BCPS[3], Carolyn Cummings, PharmD[3], Carrie S. Oliphant, PharmD, FCCP, BCPS-AQ Cardiology[3]; (1) Department of Pharmacy, The University of Tennessee Health Science Center/Methodist University Hospital, Memphis, TN (2) College of Pharmacy, The University of Tennessee Heath Science Center, Memphis, TN (3) Department of Pharmacy, Methodist University Hospital, Memphis, TN
INTRODUCTION: Raised resting heart rate (HR), > 70 beats per minute (bpm), has been shown to be a risk factor for cardiovascular outcomes and hospital readmissions, specifically in heart failure patients with reduced ejection fraction (HF*r*EF). Given their mortality benefit, beta-blockers are recommended in HF*r*EF, with a goal to titrate to a maximum dose rather than a specific HR target. The purpose of this study was to examine if hospitalized HF*r*EF patients receiving beta blockade are achieving optimal HR control prior to hospital discharge and determine the impact on hospital readmissions.
RESEARCH QUESTION OR HYPOTHESIS: Does targeting a HR < 70 bpm reduce HF*r*EF readmissions?
STUDY DESIGN: Multi-site, retrospective study
METHODS: HF*r*EF patients admitted between 09/2013–09/2015 were reviewed. Inclusion criteria: age > 18 years, EF < 40%, beta-blocker use >= 48 h, and appropriate concomitant standard HF regimen at discharge. Exclusion criteria: ICU admission, dobutamine administration, atrial fibrillation history, implantable pacemaker and documented noncompliance. Patients were divided into groups based upon discharge HR control (< 70 bpm vs. >= 70 bpm).
RESULTS: Of the 3378 patients screened, 225 met inclusion criteria with 20% achieving optimal HR control (n=46 HR < 70 bpm; n=179 HR >= 70 bpm) and only 17% receiving a beta-blocker titration. Of note, only 25% of patients receiving >= 50% target dose (n=79) and 28% receiving 100% target dose (n=39) achieved optimal HR control. Analysis revealed that patients with a HR < 70 bpm vs. HR >= 70 bpm exhibited similar 30-day readmission rates (9% vs. 11% respectively; p>0.99) and ER visits (11% vs. 8% respectively; p=0.57). Similar 30-day readmission rates were also observed in patients receiving >= 50% target dose compared to those receiving < 50% target dose (9% vs. 11% respectively; p=0.82).
CONCLUSION: Readmission rates were similar among HF*r*EF patients despite the majority failing to achieve optimal HR control secondary to beta-blockade. However, beta-blockade still remains suboptimal relative to guideline recommended target doses. Opportunities exist for inpatient beta-blocker optimization before adding alternative pharmacologic agents to achieve HR control.

13. Characterization of venous thromboembolism developed in an inpatient setting in adult medicine patients. Kara Piechowski, PharmD[1], Jon P. Wietholter, PharmD, BCPS[2]; (1) West Virginia University Medicine, Morgantown, WV (2) Department of Clinical Pharmacy, West Virginia University School of Pharmacy, Morgantown, WV
INTRODUCTION: Venous thromboembolism (VTE) is a significant cause of morbidity and mortality. Standard of care focuses on preventing VTEs in all hospitalized patients. Administration of pharmacologic VTE prophylaxis, use of compression devices, ambulation, and other measures may aid in prevention. Numerous studies have investigated VTE rates in trauma and surgery populations but less is known about VTEs in the adult medicine population.
RESEARCH QUESTION OR HYPOTHESIS: What patient-specific factors affect the development of VTEs in adult medicine patients?
STUDY DESIGN: This retrospective chart-review study examined medical records from December 2013 to July 2015 at a large academic medical center.
METHODS: Inclusion criteria included age > 18 years old, admission to an adult medicine service, and development of a VTE during admission. Patients were excluded if they had VTE on admission or were on anticoagulation before admission.
RESULTS: During a 1.5 year period, out of 12,781 patients admitted to medicine services, 52 patients developed a VTE while hospitalized (0.4%). Most patients (96.2%) were determined to be at "medium-risk" of developing a VTE by the admitting physician and only 3.8% were labelled "high-risk." Six patients (11.5%) had surgery during the admission, and five patients (9.6%) had an active malignancy. Thirty-four percent had a risk factor for bleeding (thrombocytopenia, active bleeding, etc.). The majority of patients had out-of-bed orders (75%) and 40.4% were ordered compression devices. Pharmacological VTE prophylaxis was ordered for 73.1% of patients; however, 24.4% of doses were not administered.
CONCLUSION: In hospitalized adult medicine patients who developed VTEs during admission, most were labelled only "medium-risk" for VTE and the majority were ambulatory. In addition, pharmacologic VTE prophylaxis orders were not consistently administered to patients. This identifies an opportunity to further investigate and potentially target these characteristics to prevent VTEs in the future.

14. An evaluation of acyclovir dosing in obesity. Jennifer Twilla, PharmD, BCPS[1], Joyce Broyles, PharmD[2], Alicia Sanchez, PharmD[3], Christopher K. Finch, PharmD, BCPS, FCCM[4]; (1) Department of Pharmacy, Methodist University Hospital, Memphis, TN (2) Methodist Unviersity Hospital (3) University of Tennessee, College of Pharmacy (4) University of Tennessee, College of Pharmacy, Memphis, TN
INTRODUCTION: Intravenous (IV) acyclovir is an antiviral predominantly used in the treatment of herpesvirus infections. In obese patients, current recommendations for dosing IV acyclovir suggest using ideal body weight. While this is the most widely accepted dosing strategy in obese patients, there is a paucity of data available surrounding this topic and literature suggesting adverse renal effects when other weights are used. Much of the information utilized for dose adjustments in obese patients on IV acyclovir is extrapolated from a study presented in abstract form only.
RESEARCH QUESTION OR HYPOTHESIS: Does utilizing actual body weight to dose IV acyclovir increase the risk for nephrotoxicity in non-obese and obese patients?
STUDY DESIGN: A retrospective analysis of patients admitted to Methodist LeBonheur Healthcare adult hospitals receiving IV acyclovir between 1/1/2010–3/14/2015 was conducted.
METHODS: Inclusion criteria: >= 18 years old and received IV acyclovir for >= 48 h. Exclusion criteria: pregnancy and incomplete data points. Patients were evaluated for weight used for dosing, development of AKI, and risk factors for AKI.

RESULTS: Of the 499 patients screened, 468 met inclusion criteria with 344 patients dosed on actual body weight, 73 on ideal body weight, and 51 on adjusted body weight. Table 1 describes development of AKI based on weight used for dosing and BMI category. Of the patients that developed AKI, 74% received intravenous fluids.

Patient category	AKI
Dosing weight, n (%)	
Actual body weight	84 (24)
Ideal body weight	20 (27)
Adjusted body weight	16 (31)
BMI category, n (%)	
Underweight (<18.5)	2 (11.7)
Normal weight (18.5–24.99)	28 (19.5)
Overweight (25–29.99)	26 (23)
Obese (30–39.99)	26 (32.7)
Severe obesity (>40)	13 (35)

CONCLUSION: Based on the results of this study, dosing weight used did not impact AKI development. However, an interesting finding was that the number of patients developing AKI was associated with increasing BMI categories. Further evaluation of weight and AKI in patients receiving acyclovir is warranted.

15. Impact of pharmacist-led medication reconciliation and discharge counseling on 30-day all-cause hospital readmissions in high-risk patients: A single center study. Grace Shyh, PharmD[1], Daniel Crossman, MD[2], Magalie Bruneus, MD[2], Savira Kochhar, MS[3]; (1) Department of Pharmacy, New York-Presbyterian Hospital, New York, NY (2) Department of Medicine, New York-Presbyterian Hospital, New York, NY (3) Department of Medicine, Weill Cornell Medicine, New York, NY

INTRODUCTION: Elderly patients with debilitating ailments attribute to the highest 30-day hospital readmissions. Previous research has shown repeat hospitalizations are associated with more nosocomial infections, decreased quality of life and increased socioeconomic burden.

RESEARCH QUESTION OR HYPOTHESIS: The authors hypothesized pharmacist-led medication reconciliation and discharge counseling would reduce high-risk patients' 30-day all-cause hospital readmissions and improve the HCAHPS (Hospital Consumer Assessment of Healthcare Providers and Systems) medication communication domain survey.

STUDY DESIGN: This was a prospective, single center, randomized controlled pilot study in the New York-Presbyterian Hospital, NY.

METHODS: Patients with multiple prior admissions and polypharmacy were randomized into either the pharmacy intervention group or the control group each with standard of care. Primary endpoint was the impact of pharmacist-led medication reconciliation and discharge counseling on 30-day hospital readmissions and the HCAHPS medication communication domain survey. Secondary endpoints included characterization of effective counseling and identification of independent risk factors for readmissions. Baseline patient characteristics will be collected and readmission risk factors will be analyzed using linear regression with multivariate analysis.

RESULTS: total of 76 patients were enrolled from July 1st, 2015 through March 31st, 2016. Compared with patients without pharmacy interventions (n=27), patients with pharmacy interventions (n=49) demonstrated a decreasing trend of 30-day hospital readmissions (14.8% vs. 10.2%, respectively, p=0.30). The HCAHPS medication communication domain survey improved at the peak of this project, increasing from the 28th percentile to the 63rd percentile from April 2015 through December 2015. Written medication information and family support were helpful counseling approaches. Advanced age greater than 70, taking more than 10 medications, as well as inability for self-care were independent risk factors for 30-day hospital readmissions.

CONCLUSION: To effectively reduce 30-day hospital readmissions among high-risk patients, pharmacist-led medication reconciliation and discharge counseling should be incorporated into the discharge planning. Future research should focus on systematically stratifying patients based on the independent risk factors to receive pharmacy interventions upon discharge.

Ambulatory Care

16E. Clinical validation of R-T estimation for CoaguChek XS INR results. Christopher Richter, PharmD[1], James Taylor, PharmD[2], Joyanna Wright, PharmD[1], Bradley Fletcher, MD, PhD[3]; (1) Department of Pharmacy, UF Health, Gainesville, FL (2) Department of Pharmacotherapy and Translational Research, University of Florida College of Pharmacy, Gainesville, FL (3) Department of Medicine, University of Florida College of Medicine, Gainesville, FLPublished in Annals of Pharmacotherapy. 2016. In Press.

17. Role of clinical pharmacy service in optimizing patient care in a sickle cell outpatient center. Jin Han, PharmD, PhD[1], Shubha Bhat, PharmD[1], Michel Gowhari, DO[2], Santosh Saraf, MD[2]; (1) Department of Pharmacy Practice, College of Pharmacy, University of Illinois at Chicago, Chicago, IL (2) Section of Hematology/Oncology, Department of Medicine, University of Illinois at Chicago, Chicago, IL

INTRODUCTION: Ambulatory care clinical pharmacy services have expanded beyond primary care settings in recent years, but literature supporting the benefits of clinical pharmacy involvement in specialty areas is lacking.

RESEARCH QUESTION OR HYPOTHESIS: The objective of this study was to evaluate the impact of a newly-implemented clinical pharmacy service on disease-specific clinical outcomes in a Sickle Cell Outpatient Center.

STUDY DESIGN: This was a retrospective cohort study.

METHODS: A total of 385 patients with sickle cell disease (SCD) who were 18 years and older received outpatient care at a single sickle cell center between January 1, 2014 and December 31, 2014. Medication utilization, immunization record, and disease management information were collected. The impact of the clinical pharmacy service on quality measurements including hydroxyurea dose escalation, immunization completion, and disease state management, were evaluated using descriptive and multivariate analyses.

RESULTS: The number of pharmacy encounters, defined as a clinic visit when a clinical pharmacist interviewed a patient and documented it in the medical records, was a significant determinant for hydroxyurea dose optimization (OR 1.48, p=0.02). The immunization rates for the 23-valent pneumococcal polysaccharide vaccine, the 13-valent pneumococcal conjugate vaccine, and influenza vaccine were 66%, 47%, and 62% respectively. The pharmacy service contributed significantly to the immunization completeness (OR 1.38, p<0.001). The screenings for microalbuminuria (OR 2.14, p<0.001), vitamin D deficiency (OR 2.1, p<0.001), and sickle retinopathy (OR 1.16, p=0.05) were also significantly improved through pharmacy interventions. The medication reconciliation completion rate was markedly higher with pharmacy encounters (99% vs 12%, p<0.001).

CONCLUSION: This study demonstrates that a new clinical pharmacy service implemented in a specialty area (i.e. SCD) significantly improved the clinical outcomes including medication optimization, immunization, and disease state management. The quantitative approach in assessing disease-specific quality measurements provides a direction to evaluate and justify clinical pharmacy service in a specialty area.

18. Comparison of pharmacist to physician Medicare wellness services. Jeanna Sewell, PharmD[1], Daniel M. Riche, PharmD, FCCP, BCPS, CDE, ASH-CHC[2], Scott Malinowski, PharmD[1], Joshua Fleming, PharmD, BCACP[1], Richard Jackson, MD[3]; (1) Department of Pharmacy Practice, University of Mississippi School of Pharmacy, Jackson, MS (2) University of Mississippi School of Pharmacy, Jackson, MS (3) Department of Medicine, University of Mississippi School of Medicine, Jackson, MS

INTRODUCTION: Annual Medicare Wellness Visits (AWV) are a benefit provided for Medicare beneficiaries to increase focus on wellness and preventative measures and are currently limited in their provision. Pharmacists are allowed to conduct AWVs which offers a potential avenue for outpatient revenue generation. There is limited data on comparison of pharmacist provision of AWVs to other health-care professionals.

RESEARCH QUESTION OR HYPOTHESIS: AWVs performed by a pharmacist are similar in terms of interventions and revenues generated when compared to those performed by a physician.

STUDY DESIGN: Retrospective cohort performed via chart review

METHODS: A report was used to determine AWVs conducted by a pharmacist and three participating physicians. Through chart review, documentation was accessed to quantify and categorize the number and types of referrals, health advice, laboratory tests, procedures, vaccinations, and screenings that were recommended during each patient's AWV. Outcomes for referral appointments were also captured. The primary outcome was total number of interventions made by a pharmacist compared to those made by a physician during an AWV. Differences in number of recommendations per visit and financial data were analyzed using Student's *t*-test. Fisher's exact test was used to determine the association between number of recommendations made and percentage of recommendations completed. (Ī±=0.05)

RESULTS: Data was collected on all visits conducted form December 2013 to March 2016. The pharmacist performed 19 subsequent visits and the physicians performed 89 visits. Overall, the pharmacist group made significantly more interventions than the physician group ($p<0.05$). More interventions were made in the areas of health advice ($p<0.05$), vaccine recommendations ($p<0.01$), and screenings in the pharmacist group ($p<0.001$). The physicians ordered significantly more laboratory tests per visit ($p<0.001$). Reimbursement was $105.03 and $99.62 in the pharmacist and physician groups, respectively.

CONCLUSION: Pharmacist-provided AWVs are at least comparable to those provided by a physician and offer an additional access point for valuable services for Medicare beneficiaries.

19. Closing communication gap about medication utilization: Evaluation of patient-specific behaviors for not Bringing medication Bottles to Clinic (BBC). Sweta Patel, PharmD, BCPS, Gina J. Ryan, PharmD, CDE; Department of Pharmacy Practice, Mercer University College of Pharmacy, Atlanta, GA

INTRODUCTION: Inaccuracies in medication reconciliation lead to medication errors. Despite various reminder efforts made by healthcare providers, only 25% of patients end up Bringing their medication Bottles to Clinic (BBC). Currently, there is no information available in literature that has assessed the reasoning(s) behind these low rates.

RESEARCH QUESTION OR HYPOTHESIS: This study seeks to identify the reasons why patients do not BBC, evaluate specific patient characteristics associated with these rates and identify potential patient-directed intervention(s) that can be assessed in future studies.

STUDY DESIGN: This is a prospective, multi-clinic, single center survey study of adult patients with scheduled clinic appointments at either Cardiology or Diabetes clinics.

METHODS: The survey was divided into four domains: patient demographics, three survey instruments (the short-form Test of functional Health Literacy in Adults, the Morisky eight-item Medication Adherence Scale and the Social Support Questionnaire Short Form), reasons related to not BBC, and suggested interventions for improving the rates of BBC. Descriptive statistics and bivariate correlations were assessed, along with linear and logistic regression. A p value <0.05 was considered to be statistically significant.

RESULTS: Two hundred thirty patients were included. Of these, 73% did not BBC and the most common reasons included "doctor has all medication information in computer" followed by "did not think it was important." Number of providers seen in last 6 months (-0.130; $p=0.04$) and annual income (-0.129; $p=0.04$) were associated with not BBC. Per these patients, the most common suggestions for improving these rates included "explaining why BBC is important" followed by "giving a special bag for BBC."

CONCLUSION: The findings from this study suggest that patients who do not BBC are not aware of its importance. Additionally, there are specific patient demographics that are associated with patients' behavior of not BBC. Future randomized trials should utilize these factors and test interventions directed towards improving patient awareness.

20. A parallel-controlled study evaluating the clinical impact of an interprofessional transitions of care service in the primary care setting. Shelley Otsuka, PharmD[1], Jennifer Smith, PharmD[2], Radha Patel, PharmD, MPH, BCACP, CPH[3], Laura Pontiggia, MS, PhD[4]; (1) Department of Pharmacy Practice and Administration, Philadelphia College of Pharmacy, Philadelphia, PA (2) University of the Sciences Philadelphia College of Pharmacy (3) Department of Pharmacotherapeutics and Clinical Research, University of South Florida College of Pharmacy, Tampa, FL (4) Mischer College of Arts and Sciences, University of the Sciences, PA

INTRODUCTION: High hospital readmission rates have a substantial financial impact on healthcare institutions. Several studies have demonstrated the efficacy of various transitions of care (TOC) services in reducing the rate of preventable hospital readmissions. There is currently a gap in the literature evaluating the effectiveness of outpatient TOC services involving an interprofessional team compared to usual care.

RESEARCH QUESTION OR HYPOTHESIS: Can post-hospitalization discharge follow-up care utilizing an interprofessional TOC service with the involvement of a clinical pharmacist reduce the rate of hospital reutilizations as compared to patients receiving usual care?

STUDY DESIGN: This was a prospective, parallel-controlled study conducted at two outpatient internal medicine clinics within an academic medical center.

METHODS: Data was collected from September 2013 - October 2014. This study included patients recently discharged from a University of Pennsylvania Health System (UPHS) hospital. The interventional group included patients who were scheduled for the interprofessional TOC servicewithin 30 days of discharge. The control group included patients who received usual careat a different internal medicine clinic within UPHS. The primary outcome was the composite rate of 30-day hospital reutilization (defined as either a hospital readmission or emergency department visit) between groups. Chi-squared tests were used for bivariate analyses for intention to treat and per protocol analyses for the primary outcome.

RESULTS: There were 330 patients in both the interventional and usual care group for the intention to treat analysis. 52 patients in the interventional group had a reutilization compared with 70 patients in the control group (15.76% vs. 21.21%, $p=0.0711$). In the per protocol analysis, 28 patients in the interventional group had a reutilization compared to 70 in the usual care group (11.48% vs. 21.21%, $p=0.0022$).

CONCLUSION: Patients receiving post-hospitalization discharge follow-up care utilizing an interprofessional structured TOC service with involvement of a clinical pharmacist may be an effective approach for reducing 30-day reutilization rates.

21. Weight gain predictors in a Latino population with diabetes. Marie Davies, PharmD, MS[1], John Cheng, MD[2]; (1) Western University of Health Sciences College of Pharmacy, Pomona, CA (2) Harbor UCLA Family Health Center, Harbor City, CA
INTRODUCTION: The prevalence of diabetes in the Latino population is 12% compared to 9.3% for all Americans. Likewise obesity accounts for 42% vs. 32.6% in Latino and White adults respectively. In a retrospective review of a pharmacist-run diabetes clinic in an urban underserved primary care clinic, Latino patients gained significantly more weight than non-Latino patients (+0.83 kg vs −0.37 kg; p=0.048).
RESEARCH QUESTION OR HYPOTHESIS: The purpose of this study was to identify predictors associated with weight gain in an underserved Latino population being actively managed for their type 2 diabetes.
STUDY DESIGN: This IRB-approved retrospective chart review was done at Harbor-UCLA Family Medicine Clinic.
METHODS: Patients included were > 18 y/o, Hispanic/Latino ethnicity, had type 2 diabetes, and had >= 1 pharmacy clinic visit. Pre- and post-pharmacy clinic visit(s) data from March-December 2015 was collected. Patients were excluded who did not have a pre- and post-weight. Statistics included univariate analysis using Student's test and linear regression.
RESULTS: Of 94 patients, average age was 53.6 years and 61 (65%) were female. The average weight gain was 0.83 kg (1.83 lbs) with an average of 104 days between measurements. The average reduction in A1C was 1.6% and average increase in insulin units was 10.8 units. Most patients, 78(83%), were on basal insulin, and many, 61(65%), were on bolus insulin. Significant predictors for weight gain included: decrease in A1C (p<0.001), increase in total insulin units (p=0.006), younger age (p=0.014), not being on metformin (p=0.044), and a higher baseline A1C (p<0.0001). Only 11 patients were not on metformin therefore confounders may exist in this result. Gender, number of pharmacist appointments, weight at baseline, and insulin dose at baseline were non-significant predictors.
CONCLUSION: Latino patients gain significantly more weight than others groups. Gaining weight may be associated with higher baseline A1C, younger age, and achieving glycemic control by decreasing A1C and increasing total daily insulin dose.

22E. Assessing the effect of pharmacist care on diabetes-related outcomes in a rural outpatient clinic: a retrospective case-control study. Cynthia Moreau, PharmD[1], Karen Sando, PharmD, BCACP, CDE[1], Daniel Zambrano, PharmD[2]; (1) Department of Pharmacotherapy and Translational Research, University of Florida College of Pharmacy, Gainesville, FL (2) Department of Pharmaceutical Outcomes and Policy, University of Florida College of Pharmacy, Gainesville, FL
Presented at the Florida Residency Conference on May 19, 2016.

23. Impact of language preference on diabetes outcomes for patients referred to clinical pharmacy services. Brandon Nuziale, PharmD[1], Edward Saito, PharmD, BCACP[1], Melanie Foeppel, PharmD[2]; (1) School of Pharmacy, Pacific University, Hillsboro, OR (2) School of Pharmacy, Pacific Univeristy, Hillsboro, OR
INTRODUCTION: Language barriers often serve as obstacles for patients within health care. Current evidence demonstrates improved health outcomes for patients who have language concordance with their provider. The purpose of this study is to assess the equity of care provided to patients seen by clinical pharmacy services (CPS) at Virginia Garcia Memorial Health Center (VGMHC) for the treatment of diabetes based on language preference.
RESEARCH QUESTION OR HYPOTHESIS: Of those patients referred to CPS at VGMHC for diabetes, there is no difference in HgbA1c between patients whose language preference is English compared with those who prefer a non-English language.
STUDY DESIGN: This retrospective cohort study evaluated the difference in HbA1c between patients whose language preference is English compared with those whose preferred language is non-English.
METHODS: Patients were included if they were referred to and seen by CPS for diabetes at VGMHC between January 1 and December 31, 2014 for a minimum of 2 CPS visits and who have baseline and 6 month HgbA1c data available. Data collected via EMR review and reporting include A1c data, prescribed diabetes medications, language preference, documented use of translator services, and language concordance of the managing pharmacist.
RESULTS: A total of 91 patients were included in the analysis of the primary outcome with 42 patients in the English group and 49 in the non-English group. Reported as the change in HgbA1c from baseline to 6 months for patients in each group, a change of −1.44% and −1.09% respectively with a p value of 0.387 was observed. Secondary outcomes including number of patients with HgbA1c > 9% stratified by language preference, and percent of patients on various regimen complexities were also analyzed.
CONCLUSION: There is no statistical difference in change of HbA1c from baseline to 6 months for patient with English vs. Non-English language preference who are referred to CPS at VGMHC.

24E. Evaluation of a collaborative care model with pharmacist-provided medication reviews for adults receiving hemodialysis. Paik Shia Lim, PharmD, BCPS[1], Bih Yee Chia, BSc Pharm[1Hons], Hua Heng McVin Cheen, BSc PharmHons, CGP, BCACP[1], Xin Yi Gwee, BSc Pharm[1Hons], Mee Yin Melissa Chow, Bachelor of Pharmacy, BCPS[1], Giat Yeng Khee, PharmD, BCPS[1], Wan Chee Ong, PharmD, CGP, BCPS[1], Yu Ling Cheryl Lim, BScPharmHons, CGP[1], Lina Hui Lin Choong, MBBS, M Med Int Med, FAMS[2]; (1) Department of Pharmacy, Singapore General Hospital, Singapore, Singapore (2) Department of Renal Medicine, Singapore General Hospital, Singapore, Singapore
Presented at 15th Asian Pacific Congress of Nephrology & 52nd Australian & New Zealand Society of Nephrology Annual Scientific Meeting 2016. Asian Pacific Society of Nephrology. Perth, Western Australia, September 17–21, 2016

25E. Impact of pharmacist telephone follow-up calls on patients with chronic obstructive pulmonary disease discharged from hospital to home. Luma Succar, PharmD[1], Rejena Azad, PharmD[1], Rafael Felippi, PharmD, BCPS[2], Katherine K. Perez, PharmD, BCPS[1], Kayode Giwa, PharmD, BCPP[1], April Moretto, RN, CMBC[3]; (1) Department of Pharmacy Services, Houston Methodist Hospital, Houston, TX (2) Department of Pharmacy Services, Houston Methodist Hospital; Houston Methodist Physicians' Alliance for Quality, Houston, TX (3) Houston Methodist Physicians' Alliance for Quality, Houston, TX
Presented at the American Society of Health-System Pharmacists Summer Meeting, Baltimore, Maryland, May 11–15, 2016

26. Assessing the impact on medication choice and drug cost savings from addition of a clinical pharmacist in a rural Illinois outpatient setting. Bryan Zobeck, PharmD[1], Martin MacDowell, DrPH[2], Allison Schriever, PharmD[1], Heidi Olson, PharmD[1]; (1) Pharmacy Practice, University of Illinois College of Pharmacy at Rockford, Rockford, IL (2) National Center for Rural Health Professions, University of Illinois College of Pharmacy at Rockford, Rockford, IL
INTRODUCTION: Prior pharmacist intervention literature centers primarily in academic centers and often utilizes estimated cost avoidance or disregards costs of medications added. Rural setting and direct medication cost savings/addition represent novel patient selection and research approach in pharmacist intervention literature.

RESEARCH QUESTION OR HYPOTHESIS: Introduction of a clinical pharmacist to a rural family medicine residency clinic will result in clinically significant medication-related interventions and net direct medication cost savings.
STUDY DESIGN: Retrospective cohort qualitatively and quantitatively described.
METHODS: A clinical pharmacist began prospectively reviewing patient profiles in coordination with physician office visits. Interventions were communicated verbally for physician consideration. Real time pharmacist intervention data was recorded using a modified Drug Therapy Problem classification (based on Strand, et al.). Eighteen months (starting Nov. 2012) of these interventions were retrospectively analyzed. Primary outcomes, interventions and direct medication savings/costs, are reported descriptively and were based on actual wholesale price (AWP) to maximize external validity.
RESULTS: During the study period, 634 interventions were recommended with 437 (69%) accepted. The most common interventions were improper drug selection (25.1%), untreated indication (23.5%), and drug use without indication (19.6%). Nearly 52% and 88% of interventions were in patients aged 60+ and 40+, respectively. The most common recommendations in patients aged 60+ were improper drug selection (27.2%) and drug use without indication (24.8%). Net direct medication savings of all recommendations totaled $209,186. Median cost savings per intervention was highest for drug use without indication ($219.60), adverse drug reaction ($50.40), and improper drug selection ($46.80) whereas untreated indication resulted in a median $46.80 cost addition per recommendation.
CONCLUSION: Incorporation of a clinical pharmacist into a rural outpatient family medicine clinic resulted clinically-relevant pharmacologic interventions and significant direct medication savings. Incorporation of clinical pharmacists into ambulatory care settings serves patients, providers, and healthcare payers.

27. Clinical effectiveness of the improving health of at risk rural patients (IHARP) pharmacist-physician collaborative care model. Gary R. Matzke, PharmD[1], Karen Williams, PharmD[2], Leticia Moczygemba, PharmD PhD[3], Michael Czar, PhD, RPh[2], William Lee, BPharm, MPA[4]; (1) Department of Pharmacotherapy and Outcomes Sciences, Virginia Commonwealth University School of Pharmacy, Richmond, VA (2) Department of Pharmacy, Carilion New River Valley Medical Center, Christiansburg, VA (3) Department of Pharmacotherapy and Outcome Sciences, Virginia Commonwealth University School of Pharmacy, Richmond, VA (4) Carilion Clinic, Roanoke, VA
INTRODUCTION: The CMS Innovation Center has supported the development and evaluation of models of care that result in better health, better care, and smarter spending
RESEARCH QUESTION OR HYPOTHESIS: Does the IHARP model improve clinical outcomes in patients with multiple chronic diseases?
STUDY DESIGN: This three year prospective project evaluated the impact of the IHARP continuity of care model on the clinical outcomes of 2480 patients from a 23 county rural population relative to a comparator group (n=2480) that received usual care.
METHODS: Clinical pharmacists embedded into 22 primary care practices connected with inpatient and community pharmacists to provide comprehensive medication management (CMM) for patients with multiple chronic diseases. Propensity score matching was used to identify a comparator group from non-IHARP clinics. A 2-way repeated measures ANOVA examined the impact of the IHARP model on A1c, systolic and diastolic blood pressure (SBP and DBP), and LDL. The *a priori* significance level was 0.05.
RESULTS: The mean age of the IHARP and comparator patients was 65 years, 57% were female, 87% were white, and 63 were Medicare beneficiaries. Significant reductions ($p<0.0001$) from baseline to follow-up in A1c, SBP, DBP, and LDL of 1.2%, 22.5 mmHg, 21.8 mmHg and 19.9 mg/dL, respectively, were observed in diabetics with baseline values above goal. Significant reduction in SBP, DBP, and LDL of 17.3 mmHg, 16.6 mmHg, and 13.6 mg/dL were noted in the non-diabetic patients. The improvements in A1c, SBP and DBP among the IHARP diabetics and SBP in the non-diabetics were significantly greater ($p<0.05$) than observations in the comparator group.
CONCLUSION: The significant improvements in clinical outcomes within the IHARP group exceeded or equaled the improvements noted in the comparator group. These improvements demonstrate the value that an integrated clinical pharmacist care model can provide to underserved rural patients.

28. Evaluation of a clinical pharmacy protocol to convert patients from warfarin to a non-vitamin K oral anticoagulant (NOAC) in a family medicine clinic. Marina Maes, BS, Joseph J. Saseen, PharmD, Liza Wilson, PharmD; Department of Clinical Pharmacy, University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO
INTRODUCTION: Patients requiring anticoagulation have traditionally been treated with warfarin. However, NOACs have several advantages to warfarin including fewer drug-drug interactions, predictable pharmacokinetics and lack of INR monitoring. It is in the interest of patients and providers to switch from warfarin to NOACs when appropriate. There are limited data describing a systematic approach of evaluating and converting patients from warfarin to a NOAC.
RESEARCH QUESTION OR HYPOTHESIS: What percentage of patients were converted from warfarin to a NOAC following pharmacist to provider recommendations using an eligibility protocol?
STUDY DESIGN: Retrospective review of clinical data.
METHODS: Medical records of warfarin treated patients enrolled in a nurse managed anticoagulation service were reviewed by the clinical pharmacy team. Patients' indication for anticoagulation therapy and relevant clinical information were documented. Patients with contraindications to NOAC therapy or indications not FDA approved were excluded. Recommendations were documented in the EHR and sent to medical providers for review. If the recommendation was accepted, the patient was contacted by the physician or pharmacist to offer conversion to a NOAC. Clinical data was continuously documented. Outcomes of recommendations were evaluated using descriptive statistics.
RESULTS: Of the 74 patients enrolled in the nurse managed anticoagulation service, 32 patients (43%) were eligible for a NOAC. Of the patients eligible to switch, 15 (47%) patients were successfully switched to a NOAC. All providers who responded were in agreement with clinical pharmacy team-recommended plan. The most common reason for remaining on warfarin was patient decline of NOAC therapy.
CONCLUSION: A pharmacist driven protocol was easily implemented in our family medicine clinic. Medical providers had high acceptance of the clinical pharmacy team's recommendations. This protocol decreased the number of patients requiring INR monitoring and the NOAC eligibility protocol is used continuously to assess new patients on the anticoagulation panel. The largest barrier to switching from warfarin to a NOAC was patient acceptance.

29. Sustained virologic response with peginterferon plus ribavirin in the Illinois prison population infected with hepatitis C virus through telemedicine: a retrospective chart review. Lillian Bellfi, PharmD Candidate[1], Jeremy Young, MD, MPH[2], Leo Pratt, PharmD Candidate[1], Alisha Patel, PharmD Candidate[3], Diana Mei, PharmD Candidate[1], Juliana Chan, PharmD, FCCP, BCACP[1]; (1) College of Pharmacy, University of Ilinois at Chicago, Chicago, IL (2) University of Illinois at Chicago, College of Medicine (3) College of Pharmacy, University of Illinois at Chicago, Chicago, IL
INTRODUCTION: The landscape for hepatitis C virus (HCV) treatment has changed with new generation direct-acting antivirals, however, peginterferon and ribavirin are still included as

backbones for certain treatment regimens. Although the correctional population traditionally has poor access to subspecialty healthcare, the University of Illinois at Chicago (UIC) is uniquely positioned to manage therapy and assess HCV treatment responses in a multidisciplinary telehealth clinic led by clinical pharmacists and students.
RESEARCH QUESTION OR HYPOTHESIS: What are the treatment responses and associated demographics for HCV infected prisoners treated with peginterferon/ribavirin at a subspecialty telehealth clinic?
STUDY DESIGN: An IRB-approved retrospective chart review.
METHODS: HCV-infected prisoners within the Illinois Department of Corrections treated with peginterferon/ribavirin from 6/5/2010 to 6/10/2014 were included in the study. The primary objective was to assess treatment response to determine who achieved a sustained virologic response (SVR). Secondary endpoints include the effect of treatment duration, genotype, and HCV acquisition risk factors on treatment response.
RESULTS: One hundred fifty subjects were included for analysis. Of these, 97 (64.7%) achieved SVR. There were 21 (21.7%), 36 (37.1%), and 39 (40.2%) genotype 1, 2, and 3 subjects, respectively. One subject was co-infected with two genotypes. Typical treatment lengths ranged from 24 to 72 weeks with 74 subjects (76.3%) reaching SVR with up to 24 weeks of treatment. Of these 74 patients, 73 were genotype 2 or 3 alone and one had a 2b/3a genotype co-infection. Reasons for unattainable SVR include discontinuation due to non-response, partial response, relapse, discontinuation due to side-effects, patient choice, and transfer out of prison.
CONCLUSION: Our study found that treatment from the UIC HCV Telemedicine Clinic achieved SVR rates slightly higher than those found in the non-correctional population (54–56%). This suggests that HCV-infected prisoners benefit from treatment with peginterferon/ribavirin via subspecialty telemedicine clinics, with outcomes as good as the general public.

Cardiovascular

30E. Real world comparison of major bleeding risk among non-valvular atrial fibrillation patients newly initiated on apixaban, warfarin, dabigatran or rivaroxaban: a 1:1 propensity-score matched analysis. Gregory Lip, MD, Allison Keshishian, MPH, Shital Kamble, PhD, MS, MBA, Xianying Pan, MS, Leah Burns, MPH, Jack Mardekian, PhD, Cristina Masseria, PhD, Amanda Bruno, PhD, Hemant Phatak, PhD; (1) Bristol-Myers Squibb
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31. Intracoronary nicardipine as a safe and cost-effective alternative to nitroprusside for slow- or no-reflow during percutaneous coronary intervention. Adam Pennoyer, PharmD, Douglas Jennings, PharmD, Amisha Patel, MD, Ajay Kirtane, MD, Karlene Ma, PharmD; New York Presbyterian Columbia University Medical Center, New York, NY
INTRODUCTION: Slow- or no-reflow (SNR) phenomenon is defined as the lack of return of TIMI Grade 3 flow to ischemic myocardium following percutaneous coronary intervention (PCI) despite removal of the incident obstruction. Intracoronary (IC) nitroprusside (NTP) was first-line treatment for SNR at our institution; however, increasing acquisition costs of this agent prompted addition of IC nicardipine (NCD) to formulary.
RESEARCH QUESTION OR HYPOTHESIS: IC-NCD will prove a safe and less costly alternative to IC-NTP for SNR during PCI.
STUDY DESIGN: Single-center, retrospective review.
METHODS: Patients 18 years of age or older who received a dose of IC-NCD or IC-NTP during PCI were included. The primary outcome is the rate of study drug failure, defined as the requirement of an additional IC vasodilator. The primary safety outcome was change in blood pressure pre- and post- study drug administration (ˆ†SBP). Total drug costs (defined according to hospital acquisition fees) for each case were compared between IC-NCD and IC-NTP, which included the costs of additional IC vasodilators (e.g. adenosine).
RESULTS: The analysis included 135 patients (mean age 66 years, 77% male, 10% STEMI). There was no difference in study drug failure between the IC-NCD and IC-NTP groups (9/18 vs. 34/117; p=0.07). There were no significant differences in median [IQR] ˆ†SBP (7 [−25–23) vs. 5 [−13–18]; p=0.55), or the median number of study drug doses (1 [1–1] vs. 1 [1–1]; p=0.68), or the median number of rescue drug doses (1 [1–2] vs. 1 [1–2]; p=0.31). The mean cost of all IC vasodilator agents used for slow/no-reflow per case was significantly lower in the IC-NCD group than the IC-NTP group ($13.16 vs. $884.59; p<0.001).
CONCLUSION: IC-NCD appears to be a safe, less expensive alternative to IC-NTP for treatment of slow- or no-reflow phenomenon during PCI.

32E. Major bleeding risk in elderly patients age ≥ 75 years with non-valvular atrial fibrillation initiating oral anticoagulants: A 'real-world' comparison of warfarin, apixaban, dabigatran, or rivaroxaban. Gregory Lip, MD, Allison Keshishian, MPH, *Shital Kamble, PhD, MS, MBA*, Xianying Pan, MS, Leah Burns, MPH, Jack Mardekian, PhD, Ruslan Horblyuk, PhD, MBA, Melissa Hamilton, MPH; (1) Bristol-Myers Squibb
Presented at Abstract has been accepted to the 2016 European Society of Cardiology (ESC) Annual Congress. Abstract will be present at ESC 2016, Aug 27–31, Rome, Italy.

33. Platelet reactivity with clopidogrel versus prasugrel in patients with systolic heart failure. Paul Dobesh, PharmD, FCCP, BCPS[1], Deepak Thomas, MD[2], Abigail Schweitzer, PharmD[1], Timothy Louie, PharmD[1], Brain Lowes, MD, PhD[3], Craig Reha, PharmD[4], Julie Oestreich, PharmD, PhD[5]; (1) University of Nebraska Medical Center, Omaha, NE (2) University of Arkansas for Medical Sciences, Jonesboro, AR (3) Department of Cardiology, University of Nebraska Medical Center, Omaha, NE (4) Nebraska Medicine, Omaha, NE (5) University of Kentucky College of Pharmacy, Lexington, KY
INTRODUCTION: Patients with systolic HF commonly have elevated hepatic venous pressures, which may adversely affect centrilobular cells and the associated CYP450 enzymes. Since clopidogrel requires more CYP450 involvement, patients with HF may convert less clopidogrel to the active metabolite and produce less platelet inhibition compared to prasugrel.
RESEARCH QUESTION OR HYPOTHESIS: We hypothesize that in patients with symptomatic systolic HF, prasugrel produces greater platelet inhibition compared to clopidogrel.
STUDY DESIGN: Randomized, prospective, open-label, crossover study
METHODS: Subjects with symptomatic (NYHA Class II-IV) systolic HF (EF <= 35%) were randomized to either clopidogrel 75 mg or prasugrel 10 mg daily for two weeks, and then transitioned to the other agent for an additional 2 weeks. Platelet reactivity was assessed at baseline, 2 weeks, and 4 weeks with the VerifyNow® P2Y12 assay, platelet VASP P2Y12 assay, and light transmission aggregometry (LTA) with 5 and 20 μM ADP. We used a repeated measures ANOVA and Tukey's post-hoc test to compare between groups (baseline, clopidogrel, and prasugrel)
RESULTS: A total of 30 subjects were enrolled. The mean age was 59 years and 73% were male. The mean EF was 29.2 ± 6.2 (SD). After 2 weeks, mean platelet reactivity units (PRU) decreased from 257 ± 65 at baseline to 156 ± 52 with clopidogrel (p<0.001) and 66 ± 52 on prasugrel (p<0.001). Prasugrel significantly reduced aggregation by a mean of 90 PRU compared to clopidogrel (p<0.001). Mean light transmission was significantly lower with prasugrel compared to clopidogrel for both 5 μM (32 ± 18% vs 47 ± 19%) and 20 μM (38 ± 19% vs 54 ± 18%)

ADP (p<0.01 for both). Furthermore, a significant reduction in mean platelet reactivity index with prasugrel compared to clopidogrel (25 ± 20% vs 49 ± 16%) was also demonstrated by the VASP P2Y12 assay (p<0.01).
CONCLUSION: Prasugrel demonstrates a significant reduction in platelet aggregation compared to clopidogrel in patients with symptomatic systolic HF.

34E. Real-world comparison of major bleeding and associated costs among treatment-naive non-valvular atrial fibrillation patients initiating apixaban or warfarin. Alpesh Amin, MD[1], Allison Keshishian, MPH[2], Lin Xie, MPH[2], Onur Baser, PhD, MS[2], Kwanza Price, MPH[2], Lien Vo, PharmD, MPH[2], Jack Mardekian, PhD[2], Mario Mendoza, MD, MS[2], Shalabh Singhal, MD[2], Chad Patel, PharmD[2], Kevin Odell, PharmD[2], Jeffrey Trocio, MPH[2]; (1) UC Irvine College of Medicine, Irvine, CA (2) Bristol-Myers Squibb, Plainsboro, NJ
Presented at 2016 European Society of Cardiology (ESC) Annual Congress., Aug 27–31, 2016, Rome, Italy.

36E. Influence of progesterone administration on drug-induced torsades de pointes in AV node-ablated isolated perfused rabbit hearts. James Tisdale, PharmD[1], Heather Jaynes, MSN[1], Brian Overholser, PharmD[1], Kevin Sowinski, PharmD[1], David Flockhart, MD, PhD[2], Richard Kovacs, MD[2]; (1) College of Pharmacy, Purdue University, Indianapolis, IN (2) School of Medicine, Indiana University, Indianapolis, IN
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37. Chronological changes and correlates of loop diuretic dose in left ventricular assist device patients. Kazuhiko Kido, PharmD, MS[1], Richard Charnigo, PhD[2], Bennet George, MD[3], Tracy Macaulay, PharmD[4], Sara Brouse, PharmD[5], Maya Guglin, MD, PhD[3]; (1) Pharmacy Practice, South Dakota State University College of Pharmacy, Sioux Falls, SD (2) Department of Statistics, University of Kentucky, Lexington, KY (3) Gill Heart Institute, University of Kentucky, Lexington, KY (4) Pharmacy, University of Kentucky (5) Pharmacy Services, University of Kentucky HealthCare, Lexington, KY
INTRODUCTION: To our knowledge, no clinical study has evaluated the prevalence, dosages, and correlates of diuretic dose for patients after left ventricular assist device (LVAD) implantation.
RESEARCH QUESTION OR HYPOTHESIS: The primary question of the present study was how the prevalence and chronological change in dose of loop diuretics after LVAD placement were characterized. The secondary question was which correlates of actual loop diuretic dose in multiple follow-up visits were identified.
STUDY DESIGN: Retrospective cohort study.
METHODS: We retrospectively reviewed medical records in adult patients with LVAD in the University of Kentucky. Prevalence of diuretic use and furosemide equivalent dose were assessed before LVAD implantation and at seven pre-specified time points thereafter: 1 week, 1 month, 3 months, 6 months, 1 year, 18 months, and 2 years. Correlation analyses and linear mixed modeling were used to identify correlates of diuretic dose before and after LVAD implantation.
RESULTS: Eighty two patients were included. The prevalence of loop diuretic use decreased significantly within 1 week after LVAD implantation (95% before vs. 82% one week after, p=0.048) and remained significantly lower than at baseline throughout 2 year follow-up; however, the prevalence never decreased below 50%. Furosemide equivalent dose was significantly decreased from baseline at every time point after implantation (p<0.006 for all). No variable was significantly associated with furosemide equivalent dose at every time point after implantation.
CONCLUSION: Loop diuretics are commonly used after LVAD implantation, though at both lower prevalence and dose than before implantation. A clear and consistent explanatory pattern was not detected. Due consideration should be given to discontinuation or dose reduction once LVAD support is initiated.

38E. Trends in antihypertensive medication use among U.S. patients with resistant hypertension, 2008–2014. Steven Smith, PharmD, MPH[1], Andrew Hwang, PharmD[2], Chintin Dave, PharmD[3]; (1) University of Florida (2) Departments of Pharmacotherapy & Translational Research and Community Health & Family Medicine, University of Florida Colleges of Pharmacy and Medicine (3) Department of Pharmaceutical Outcomes & Policy, University of Florida College of Pharmacy, Gainesville, FL
Presented at the 31st Annual Scientific Meeting and Exposition of the American Society of Hypertension, New York, NY, May 14, 2016.

40. The role of plasma renin activity for improving precision of antihypertensive drug therapy in European Americans and African Americans. Mai Mehanna, BSPharm, BCPS[1], Yan Gong, PhD[1], Caitrin W. McDonough, PhD[1], Amber Beitelshees, PharmD, MPH[2], John Gums, PharmD[1], Arlene B. Chapman, MD[3], Julie Johnson, PharmD[1], Stephen Turner, MD[4], Rhonda Cooper-DeHoff, PharmD, MS[1]; (1) Department of Pharmacotherapy and Translational Research and Center for Pharmacogenomics, College of Pharmacy, University of Florida, Gainesville, FL (2) Department of Medicine, University of Maryland, Baltimore, MD (3) Department of Medicine, University of Chicago (4) College of Medicine, Mayo Clinic, Rochester, MN
INTRODUCTION: Plasma renin activity (PRA) is an indicator of HTN pathophysiology.
RESEARCH QUESTION OR HYPOTHESIS: PRA is a useful biomarker to personalize antihypertensive drug selection.
STUDY DESIGN: BP response in hypertensive adults enrolled in the Pharmacogenomic Evaluation of Antihypertensive Responses 2 (PEAR 2) study, who underwent a 4 week washout, were treated with metoprolol (MET) (100 mg daily), followed by another 4 week washout, then chlorthalidone (CTD) (25 mg daily).
METHODS: Clinic BP was used to estimate mean systolic BP (SBP) and diastolic BP (DBP) changes from baseline by race. Paired t-test was used to compare BP responses between MET and CTD overall, and by PRA level (< 0.65 and >= 0.65 ng/mL/h) in subjects treated with both drugs.
RESULTS: A total of 103 African Americans (AA) and 134 European Americans (EA) were included. Overall in AA, CTD was associated with greater reduction in SBP compared with MET (−15.5 ± 14.1 vs. −7.3 ± 16.3 mmHg, p=0.0008) but a similar DBP response (−8.9 ± 8 vs. −7 ± 8.5, p=0.096). Among AA with PRA < 0.65 (n=73, 70.9%), CTD was associated with greater reduction in SBP and DBP compared with MET (−18.3/−10 ± 13.5/8 vs. −5.7/−6.2 ± 14.6/7.7, p<0.0001/0.004). In AA with PRA >= 0.65 (n=30, 29.1%), BP responses to MET and CTD were similar (p=0.6/0.2). Overall in EA, MET was associated with greater reduction in DBP response compared with CTD (−11.1 ± 8.5 vs. −8.6 ± 8.1, p=0.016), however SBP responses were similar (−12.8 ± 14.7 vs. −16 ± 14.1, p=0.07). In EA with PRA < 0.65 (n=45, 33.6%), CTD was associated with greater reduction in SBP and DBP (−21.9/−11.9 ± 13.7/8.1 vs. −7.3/−7.5 ± 14.2/7.7, p<0.0001/0.004). In EA with PRA >= 0.65 (n=89, 66.4%), MET was associated with greater reduction in DBP (−12.9 ± 8.3 vs. −7 ± 7.6, p<0.0001), and similar SBP response (p=0.2).
CONCLUSION: Overall, PRA level is a good indicator of BP response to MET and CTD and its use could improve precision of antihypertensive drug selection to optimize BP response.

41. Feasibility of apixaban dose adjustment recommendations in atrial fibrillation. Caitlin Gibson, PharmD[1], Carmen B. Smith, PharmD, BCPS[2], Michael Scalese, PharmD[3]; (1) Department of Pharmacotherapy, University of North Texas System College of Pharmacy, Fort Worth, TX (2) St. Louis College of Pharmacy, St. Louis, MO (3) Department of Pharmacy Practice, Auburn University Harrison School of Pharmacy, Mobile, AL
INTRODUCTION: FDA approved apixaban dosing for prevention of stroke and systemic embolism in non-valvular atrial fibrillation (NVAF) includes a dose reduction from 5 mg twice daily (BID) to 2.5 mg BID in patients with >= 2 of the following criteria: age >= 80 years, weight <= 60 kg, or serum creatinine (SCr) >= 1.5 mg/dL. The dose adjustments are more complicated than most renally eliminated medications which require adjustments based solely on creatinine clearance.
RESEARCH QUESTION OR HYPOTHESIS: Are apixaban dosing recommendations feasible to implement in daily practice?
STUDY DESIGN: Multicenter retrospective chart review.
METHODS: Hospitalized patients >= 18 years receiving apixaban for NVAF at three medical centers from September 2014 to 2015 were included. The primary outcome was to determine if providers order apixaban in accordance with FDA approved dosages. The secondary outcome was to determine if pharmacists are effective at modifying non-FDA approved apixaban orders. Descriptive statistics were utilized.
RESULTS: A total of 607 patients were included. The mean age, SCr, and weight was 71.4 years, 1.38 mg/dL and 90.2 kg, respectively. Apixaban was appropriately dosed by providers in 83.0% (n=504) of patient orders. After pharmacist review, 87.1% (n=529) of apixaban orders were at the FDA approved dose, 11.9% (n=72) of patients received a lower dose and 1.0% (n=6) received a higher dose than recommended. Reasons for deviation from recommended dosing included continuation of home dose (47%), perceived increased bleeding risk (23%), or no reason was specified (30%).
CONCLUSION: The majority of apixaban orders for NVAF were appropriate based on FDA approved dosages after provider entry and pharmacist review. Apixaban dosing appears to be feasible in daily practice, however improved diligence in reviewing apixaban orders is recommended to optimize patient outcomes and safety.

42E. Mortality following initiation or discontinuation of guideline directed medical therapies in hospitalized heart failure patients in the atherosclerosis risk in communities study. Richard Tran, PharmD[1], Jo E. Rodgers, PharmD, FCCP, BCPS-AQ Cardiology[1], Ahmed Aldemerdash, PharmD[1], Patricia Chang, MD, MS[2], Carla Sueta, MD, PhD[2], Josephine Asafu-Adjei, PhD[3], Anna Kucharska-Newton, PhD[3], Sally Stearns, PhD[3], Orly Vardeny, PharmD[4], Brystana Kaufman, MSPH[3], Eliza Daubert, PharmD[1]; (1) Division of Pharmacotherapy and Experimental Therapeutics, Eshelman School of Pharmacy, University of North Carolina, Chapel Hill, NC (2) School of Medicine, University of North Carolina, Chapel Hill, NC (3) School of Public Health, University of North Carolina, Chapel Hill, NC (4) School of Pharmacy, University of Wisconsin, WI
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43. Optimal heparin dosing in the obese and morbidly obese. Emily Breedlove, PharmD[1], Lindsey Hosch, PharmD[1], Lauren Scono, PharmD[1], Chad Knoderer, PharmD[2]; (1) Pharmacy, St. Francis Health, Indianapolis, IN (2) Butler University College of Pharmacy and Health Sciences, Indianapolis, IN
INTRODUCTION: Despite large inter-patient variability in response at similar doses, heparin is frequently utilized for treatment of venous thromboembolism (VTE). Current data on the most optimal heparin dosing strategy for overweight/obese patients is conflicting.
RESEARCH QUESTION OR HYPOTHESIS: In patients receiving therapeutic heparin infusions, is there a difference in the time to activated partial prothrombin time (aPTT) goals in non-obese, obese, and morbidly obese patients?
STUDY DESIGN: This was a retrospective cohort study.
METHODS: Patients 18 years or older receiving heparin for VTE treatment from July 1, 2013 to July 31, 2015 were evaluated, and categorized into three groups based on body mass index (BMI): normal (BMI < 30 kg/m^2), obese (BMI 30 - 39.9 kg/m^2), and morbidly obese (BMI >= 40 kg/m^2). Height, weight, initial bolus dose, initial infusion rate, time aPTT and therapeutic infusion rate were collected. Therapeutic aPTT was considered 57 to 96 sec. The primary outcome was time to therapeutic aPTT. Secondary outcomes were bleeding and recurrent thromboembolic events. Demographic and clinical characteristics, including primary and secondary outcomes, between groups were compared using Chi-square, analysis of variance, or Kruskall-Wallis for non-parametric data. p-values <0.05 were considered statistically significant.
RESULTS: A total of 121 non-obese, 110 obese, and 63 morbidly obese patients were included, with a mean (SD) age (years) of 66.6 (16.5), 66 (14.5), and 57 (15.6), respectively. Median (IQR) time to first therapeutic aPTT (hours:min) was 15:00 (8:04 - 23:21), 15:40 (9:22 - 25:09), and 15:22 (7:54 - 23:40; p=0.229). Bleeding events occurred in 14%, 11.8% and 7.9% of non-obese, obese, and morbidly obese patients (p=0.478), respectively. No recurrent thromboembolic events were documented.
CONCLUSION: These findings suggest that obese and morbidly obese patients achieve a therapeutic aPTT within a similar timeframe as non-obese patients when a dosing body weight is utilized for heparin dosing.

44. Determination of optimal diuresis targets for patients in acute decompensated heart failure. Keith Chow, PharmD, Krystal Haase, PharmD, FCCP, BCPS, Shelby Needham, PharmD Candidate, Eric J. MacLaughlin, PharmD, FASHP, FCCP, BCPS; Texas Tech University Health Sciences Center School of Pharmacy, Amarillo, TX
INTRODUCTION: Data to guide diuresis targets are lacking in patients admitted with acute decompensated heart failure (ADHF). Some authors suggest a maximum diuresis of 2 L/day with more conservative goals (e.g., 1 L/day) for unstable patients. However, these targets have not been formally evaluated.
RESEARCH QUESTION OR HYPOTHESIS: Critically ill ADHF patients with diuresis >= 2 L/day are more likely to develop worsening renal function (WRF) than those who do not exceed those volumes.
STUDY DESIGN: Retrospective cohort of adult ICU patients.
METHODS: Patients admitted between October 2013 and September 2015 with a primary ICD-9 code of heart failure and who received a loop diuretic were included. Patients with severe renal failure (SCr > 2.5 mg/dL or estimated GFR < 30 mL/min) or cardiogenic shock were excluded. The primary endpoint was incidence of WRF based on diuresis volume. Secondary endpoints included length of stay (LOS), other diuresis-related adverse events, and changes in novel diuresis indicators (e.g., Hgb). Categorical endpoints were compared using chi-squared or Fisher's exact test and continuous endpoints were analyzed using Student's t-test or Wilcoxon rank-sum as appropriate.
RESULTS: 141 of 220 identified patients met inclusion and exclusion criteria. Baseline characteristics, including heart failure status and renal function were similar between groups. There was no difference in WRF in patients with >= 2 L/day of diuresis on day 1 or 2 compared to those with < 2 L/day (26% vs. 38%, p=0.12). Patients who developed WRF had lower diuresis volumes at 24 h (1.0 L vs. 1.7 L, p=0.046) and 72 h (2.9 L vs. 4.6 L, p=0.018) than those with no change in renal function. Adverse events and LOS did not differ between groups.
CONCLUSION: Diuresis >= 2 L/day does not increase risk of WRF. Patients with WRF had lower diuresis volumes than their counterparts. Larger studies are needed to determine a direct impact on patient outcomes.

45. A comparison of the efficacy, safety, and costs of intravenous nitroprusside and nicardipine. Elizabeth Walker, PharmD[1], Matt Jones, PharmD[1], Mark Mlynarek, RPh[1], Kaitlin Starosta, PharmD[1], Long To, PharmD[2]; (1) Pharmacy Department, Henry Ford Hospital, Detroit, MI (2) Henry Ford Hospital, Detroit, MI

INTRODUCTION: While intravenous sodium nitroprusside (SNP) is commonly used for hypertensive conditions requiring rapid blood pressure (BP) control, recent SNP acquisition cost increases have brought attention to use of cost-effective alternative medications such as nicardipine (NIC). In an effort to contain hospital spending, a restriction on SNP use was implemented.

RESEARCH QUESTION OR HYPOTHESIS: The purpose of this study was to assess differences in efficacy, safety, and costs between SNP and NIC.

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

METHODS: Adult patients (n=130) who received at least 60 min of SNP or NIC for the management of post-operative hypertension, aortic dissection, or a hypertensive crisis between January and December 2015 were evaluated. Endpoints included time to BP goal, percent BP reduction, number of dose adjustments, additional anti-hypertensive usage, and incidence of adverse events. SNP utilization and medication acquisition costs using average wholesale price were compared pre- and post-restriction implementation.

RESULTS: Patients who received SNP had a shorter median time to BP goal achievement compared to those who received NIC (45 vs 60 min, p=0.02). Patients who received NIC had greater reductions in systolic BP over 12 h of treatment (p<0.01). SNP infusions required more dose adjustments than NIC infusions (median 15 vs 6, p<0.01), and more patients who received SNP required additional intravenous anti-hypertensive agents (44.6% vs 18.5%, p<0.01). There were no significant differences in adverse events between treatment groups. Following SNP restriction, dispensed orders decreased by 40% which was associated with $224,624 in cost savings over 6 months.

CONCLUSION: SNP achieved goal BP more rapidly than NIC; however NIC had a greater BP reduction over time and SNP required significantly more dose adjustments and additional intravenous anti-hypertensive agents. Implementation of a restriction policy was successful in decreasing SNP utilization and resulted in significant decreases in hospital expenses.

48. Venous thromboembolism prophylaxis in medically ill patients; a mixed treatment comparison meta-analysis. Abir O. Kanaan, PharmD[1], Jennifer L. Donovan, PharmD[2], Majed Al Yami, PharmD, BCPS, ASH-CHC[3], Matthew A. Silva, PharmD[2]; (1) Meyers Primary Care Institute, Worcester, MA (2) MCPHS University, Worcester, MA (3) The University of Arizona, Tucson, AZ

INTRODUCTION: Medically-ill patients are at an increased risk for developing venous thromboembolism (VTE) including deep vein thrombosis (DVT) and pulmonary embolism (PE). Unfractionated heparin (UFH), low molecular weight heparins (LMWHs), fondaparinux, and direct oral anticoagulants (DOACs) have been evaluated for the prevention of VTE in this patient population.

RESEARCH QUESTION OR HYPOTHESIS: Evaluation of the efficacy and safety of anticoagulants for VTE prophylaxis in medically-ill patients.

STUDY DESIGN: Mixed treatment comparisons (MTC) meta-analysis.

METHODS: A literature search was conducted to identify randomized trials evaluating UFH, LMWHs (enoxaparin, dalteparin, nadroparin, and certoparin), fondaparinux, apixaban or rivaroxaban for the prevention of VTE in medically ill patients. Key articles were retrieved and cross-referenced for additional trials. Trials were screened and evaluated by all authors and entered into ADDIS (version 1.16.6) to generate direct and indirect comparisons for outcomes of VTE, DVT, PE, death from any cause, major bleeding, minor bleeding and any bleeding events. Data were reported in the form of rate ratio (RR) and credible interval (CI).

RESULTS: Ten articles representing eight anticoagulants were evaluated in a treatment network of 28,382 patients with 4320 person-years of follow-up. The mean age was 72.2 years and 52% were women. The results found all active treatments had similar efficacy in preventing VTE, DVT, PE, death from any cause and each had similar risk of minor and major bleeding. Overall, placebo was associated with more VTE and DVT events compared to LMWHs and DOACs.

CONCLUSION: Our analysis indicates that UFH, LMWHs and DOACs are comparable in preventing VTE, DVT, PE, death from any cause and in association to minor and major bleeding. Anticoagulant selection for VTE prophylaxis in medically-ill patients should be individualized based on patient characteristics and risks, preferences, along with specific pharmacokinetic and pharmacodynamic considerations.

Clinical Administration

49. Impact of shadow rounding on patient recall of medication indications and side effects. Lanh Dang, PharmD, Bernadette Belgado, PharmD, Denise Kelley, PharmD, Marci DeLos Santos, PharmD; Department of Pharmacy, UF Health Jacksonville, Jacksonville, FL

INTRODUCTION: Interdisciplinary collaboration between healthcare professionals may increase the medication communication (MC) domain scores in the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey and increase patient knowledge of medications. Shadow rounding can assess patient understanding of medication information.

RESEARCH QUESTION OR HYPOTHESIS: Will interdisciplinary MC strategies and shadow rounding affect patient recall of medication information?

STUDY DESIGN: This study was an Institutional Review Board approved, single-center, retrospective, quality improvement project.

METHODS: All patients on comparator and pilot units received medication counseling from pharmacy staff. The comparator only received shadow rounding once whereas the pilot unit received shadow rounding up to 2 times and interdisciplinary MC strategies including nursing in-services and implementation of visual cues. The primary outcome evaluated patient recall of medication discussion. Secondary outcomes included differences in MC HCAHPS scores within each unit and between units. Data was collected from October and November 2015.

RESULTS: Of the 124 patients that received shadow rounding, 66/79 (83.5%) patients on the pilot unit recalled a medication discussion compared to 41/45 (91.1%) on the comparator unit (p=NS). Significantly more patients on the pilot unit (36/80 [45.6%]) understood both medication indications and side effects than the comparator unit (10/45 [22.2%]) (p=0.011). The pilot unit had higher composite MC HCAHPS scores in quarter 4 than the comparator unit, 70.37% and 64.78% respectively (p=NS). Composite MC HCAHPS improved by 2.42% on the pilot unit compared to a decrease of −0.37% on the comparator unit between quarter 3 and 4 (p=NS).

CONCLUSION: Interdisciplinary MC strategies and shadow rounding may have contributed to an increase in patient understanding of medication information. The positive results in numerically increasing MC HCAHPS scores prompted expansion of the project throughout the hospital.

Community Pharmacy Practice

50. Pharmacy interpretation and translation refugee services in the city of Buffalo. *Gina M. Prescott, PharmD, BCPS*, Sarah

Dascanio, PharmD/MPH Candidate, Angela Pieprzak, PharmD/MPH Candidate; School of Pharmacy and Pharmaceutical Sciences, University at Buffalo, Buffalo, NY
INTRODUCTION: Refugees accessing the US healthcare system have limited English language skills and health literacy. Community pharmacies are the most accessible healthcare provider available to service them.
RESEARCH QUESTION OR HYPOTHESIS: To evaluate the presence and utilization of interpretation/ translation services available to refugees in local community pharmacies.
STUDY DESIGN: Pharmacies serving refugees were identified based on geographic areas (zip codes) where refugees reside. A 30-question survey consisting of free response and multiple choice questions was developed. Content included pharmacy and refugee service demographics, types of interpreting and translation services, and the interest in/availability of other resources.
METHODS: The survey was administered prospectively to a pharmacist/technician via an on-site interview. Administration was from March 2, 2016 to March 18, 2016. Frequency data was analyzed with Microsoft Office Excel and SAS.
RESULTS: A total of 15 pharmacies were identified and administered surveys. One pharmacy that did not service refugees was excluded. The most common pharmacy was a large community chain (50%) or independent (43%). The majority of the pharmacies know some of their refugees' country of origin (93%). Most pharmacists thought their staff was knowledgeable about their translation/ interpretation services offered (86%); however, less than half were knowledgeable on finding outside resources (43% versus 57%). Pharmacists believe they moderately understand who refugees are and their differences (71%), but fewer had a moderate/lesser understanding of a refugee view of US health care (57%). The translation services were through computer software, non-pharmacy software, and on-site personnel (79%, 71%, and 57%, respectively). Interpretation services were similar. Translation and interpretation services were described as adequate (71% and 82%, respectively), however most were 'rarely' used (87% and 71%, respectively).
CONCLUSION: While the availability of translation and interpretation services at pharmacies with a high refugee population may be sufficient, the utilization of these services may be lacking. Pharmacists could benefit from additional refugee healthcare training.

51E. Community pharmacists' perspective toward medical prescription clarity and content in Alexandria, Egypt. Omnia Abdelrahman, BSc, MSc[1], Salma Saber, BSc[2], Maha Abdul-Latif, BSc, BCPS, DB[3], Nessrin Elnimr, DrPH[4], Aida Reda, DrPH[5], Adel Abou Ali, PharmD, ScD, MS[6]; (1) Department of Pharmaceutics, Faculty of Pharmacy, Alexandria University, Alexandria, Egypt (2) Oncology Department, Alexandria University, Alexandria (3) Faculty of Pharmacy, Alexandria University, Ministry of Health, Alexandria, Egypt (4) Department of Epidemiology, High Institute of Public Health, Alexandria University, Alexandria (5) Department of epidemiology, High Institute of Public Health, Alexandria University, Alexandria (6) Clinical Pharmacy Department, Faculty of Pharmacy, King Khalid University, Abha, Saudi Arabia
Presented at the American Pharmacists Association (APhA) Annual Meeting and Exposition, Baltimore, MD, March 4–7, 2016.

Critical Care

52E. Evaluation of intravenous bumetanide versus intravenous furosemide in patients with heart failure with reduced ejection fraction and chronic kidney disease. *Rachel Dobersztyn, PharmD, BCPS*[1], Kimberly Ackerbauer, PharmD, BCCCP, BCPS[2], Joshua DeMott, PharmD, BCCCP, BCPS[2]; (1) Midwestern University Chicago College of Pharmacy, Downers Grove, IL (2) Rush University Medical Center, IL
Poster presented at the UHC Pharmacy Council Meeting, Anaheim, CA, December 5, 2014.
53. Continuous infusion ketamine for analgosedation in mechanically ventilated adult critically ill patients. John J. Radosevich, PharmD, BCPS, BCCCP[1], Christine Tafoya, PharmD[2], Summer Rhodes, PharmD Candidate[1], James Damilini, PharmD, MS, BCPS[1], Jeremy Feldman, MD[3], Asad E. Patanwala, PharmD[4]; (1) St. Joseph's Hospital & Medical Center - Dignity Health, Phoenix, AZ (2) School of Pharmacy and Health Professions, Creighton University, Omaha, NE (3) Arizona Pulmonary Specialists, Phoenix, AZ (4) Pharmacy Practice and Science, The University of Arizona College of Pharmacy, Tucson, AZ
INTRODUCTION: There is a paucity of data regarding the use of ketamine as a continuous infusion for analgosedation in the intensive care unit (ICU).
RESEARCH QUESTION OR HYPOTHESIS: The objective of this study was to determine if ketamine use is associated with improved sedation scores in mechanically ventilated patients.
STUDY DESIGN: Retrospective, observational.
METHODS: The study was conducted in an academic medical center in the United States. Medical records of mechanically ventilated adult patients receiving sustained infusions of ketamine between July 2013 and December 2015 were evaluated. The primary outcome was the occurrence of Richmond Agitation Sedation Scores (RASS) outside of the goal range of −2 to 0. This was evaluated before and after ketamine administration and compared using the McNemar's test. Secondary outcomes were a descriptive evaluation of ketamine dosing, duration of mechanical ventilation, ICU length of stay, and in-hospital mortality.
RESULTS: A total of 49 patients were included in the study cohort. Patients had a mean age of 53 ± 15 years, 54% (n=26) were female, and majority were medical ICU patients (57%, n=28). Prior to ketamine, 39% (n=19) had at least one RASS score outside of the goal range, which decreased to 8% (n=4) of patients after ketamine initiation ($p<0.001$). Most patients (88%, n=43) were initiated at a ketamine dose of 5 μg/kg/min, and this was titrated to a median dose of 10 μg/kg/min (IQR 7 to 10 μg/kg/min). The median duration of ketamine use was 48 h (IQR 31 to 142 h). Patients had a median duration of mechanical ventilation of 9 days (IQR 4 to 16 days), and ICU length of stay of 12 days (4 to 19 days). Overall, 63% (n=31) of patients survived to hospital discharge.
CONCLUSION: Sustained infusions of ketamine may improve the quality of sedation in mechanically ventilated patients in the ICU.

54E. International survey of pharmacologic VTE prophylaxis practice in critically Ill obese patients. Abigail Antigua, PharmD[1], Stacy Voils, PharmD[2]; (1) Department of Pharmacy, North Florida Regional Medical Center, Gainesville, FL (2) College of Pharmacy, UF College of Pharmacy, Gainesville, FL
Presented at SCCM Annual Congress Meeting, Orlando, FL, February 20–24, 2016.

55. Assessment of non-compliance with bundle therapy for the treatment of sepsis on the inpatient floor. Paige DeLuca, PharmD[1], Shereef Ali, PharmD BCPS[2], Nikunj Vyas, PharmD[3], Anthony Fryckberg, PharmD, BCPS, BCCCP[4]; (1) Pharmacy, Kennedy University Hospitals, Turnersville, NJ (2) Pharmacy, Kennedy Health, Cherry Hill, NJ (3) Pharmacy, Kennedy University Hospitals, Stratford, NJ (4) Department of Pharmacy, Kennedy University Hospitals, Sewell, NJ
INTRODUCTION: Sepsis is the cause of one in every four deaths in the hospital setting. The surviving sepsis campaign has recently created an initiative to increase early recognition and treatment of sepsis in patients on hospital medical, surgical and telemetry units.
RESEARCH QUESTION OR HYPOTHESIS: To assess the effect of non-compliance with 6 h resuscitation bundle elements

and its impact on 7-day and all-cause mortality with sepsis, severe sepsis, and septic shock. In addition, the impact of appropriate antimicrobial management, appropriate intravenous fluids, and overall compliance of bundle elements on all-cause mortality was assessed.
STUDY DESIGN: A retrospective multicenter chart review was performed among 500 patients, 18 years of age and older, admitted between January 1, 2015 and December 31, 2015 to non-intensive care unit hospital floors throughout three university teaching hospitals in New Jersey.
METHODS: The presence of two out of four systemic inflammatory response syndrome (SIRS) criteria with an infection qualifies for a diagnosis of sepsis after admission to the hospital. This was assessed using the Siemens Soarian® electronic medical record. The medical record was assessed for timing and appropriateness of antibiotics, intravenous fluids given, and mortality rate among 160 included patients.
RESULTS: A statistically significant difference was found with 28 day in-hospital mortality and all-cause mortality as treatment was more non-compliant with bundle therapy; ($p=0.0004$, $p<0.0001$), respectively. Inappropriate timing of blood cultures ranging from 73–88% was highest area of noncompliance. Approximately 72% of patients diagnosed with septic shock were not given 30 mL/kg of intravenous fluids.
CONCLUSION: Overall, following the 6 h resuscitation bundle for patients developing sepsis in the hospital can lower the mortality rate. The greatest areas of non-compliance were seen with the timing of blood cultures and fluid resuscitation. Early recognition of sepsis on the inpatient floor can improve implementation of the sepsis bundle and decrease overall mortality rates.

56. Enhanced renal clearance and impact on vancomycin trough concentration in patients with hemorrhagic stroke. Kathryn Morbitzer, PharmD[1], Dedrick Jordan, MD[2], Kelly Sullivan, PharmD[3], Emily Durr, PharmD[4], Casey Olm-Shipman, MD, MS[2], Denise Rhoney, PharmD[1]; (1) Division of Practice Advancement and Clinical Education, UNC Eshelman School of Pharmacy, Chapel Hill, NC (2) UNC School of Medicine (3) UNC Hospitals Department of Pharmacy (4) Department of Pharmacy, University of North Carolina Hospitals, Chapel Hill, NC
INTRODUCTION: Accurate assessment of renal function remains a challenge in patients with hemorrhagic stroke and impacts optimization of drug dosing. Patients with critical illness exhibit a hyperdynamic response leading to enhanced renal clearance. No studies exist evaluating the measured creatinine clearance of these patients and impact on vancomycin trough concentrations.
RESEARCH QUESTION OR HYPOTHESIS: Enhanced renal clearance results in underexposure to desired serum concentrations of vancomycin.
STUDY DESIGN: Sub-study of larger single-center prospective observational study of patients with hemorrhagic stroke admitted to the NSICU (January 2015-July 2015), where daily 8-h urinary creatinine clearances were performed.
METHODS: Directly measured urinary CrCl were compared with routine estimated CrCl based on the Cockcroft-Gault equation. This sub-study assessed vancomycin concentrations at steady-state in patients enrolled in the larger study who also received vancomycin during the study period.
RESULTS: Seventeen patients were included in this evaluation, 12 with aneurysmal subarchonid hemorrhage. The study sample was 73% female with a median age of 63 (IQR 56–71) years. The median Hunt and Hess grade was 3 (IQR 2–4), median modified Fisher grade was 3 (IQR 3–4), median ICH score was 3 (IQR 3–4), and median admission GCS was 9 (IQR 6–12). The median measured urinary CrCl at the time of the vancomycin trough concentration was 130.8 mL/min/1.73 m^2 (IQR 107.8–216). This differed from the median estimated CrCl at the time of the trough [100.4.1 mL/min/1.73 m^2 (IQR 76–133.8)]. Median measured serum vancomycin trough concentration was 11.6 mg/dL (9–16.7) compared to the predicted median of 17.2 mg/dL (IQR 11.4–28.5).
CONCLUSION: Patients with hemorrhagic stoke experienced urinary CrCl greater than estimated CrCl predicted based on the Cockcroft-Gault equation. This enhanced clearance likely resulted in measured vancomycin trough concentrations that were lower than predicted. Further study is needed to optimize medication regimens in this patient population to prevent underexposure.

57E. Enhanced renal clearance in patients with aneurysmal subarachnoid hemorrhage. Kathryn Morbitzer, PharmD[1], Dedrick Jordan, MD[2], Casey Olm-Shipman, MD, MS[2], Kelly Sullivan, PharmD[3], Emily Durr, PharmD[3], Denise Rhoney, PharmD[1]; (1) Division of Practice Advancement and Clinical Education, UNC Eshelman School of Pharmacy, Chapel Hill, NC (2) UNC School of Medicine (3) UNC Hospitals Department of Pharmacy
Presented at Neurocritical Care Society Annual Meeting, National Harbor, MD, Sept 15 - 18, 2016.

58E. Enhanced renal clearance in patients with intracerebral hemorrhage. Kathryn Morbitzer, PharmD[1], Dedrick Jordan, MD[2], Kelly Sullivan, PharmD[3], Emily Durr, PharmD[3], Casey Olm-Shipman, MD, MS[2], Denise Rhoney, PharmD[1]; (1) Division of Practice Advancement and Clinical Education, UNC Eshelman School of Pharmacy, Chapel Hill, NC (2) UNC School of Medicine (3) UNC Hospitals Department of Pharmacy
Presented at Neurocritical Care Society Annual Meeting, National Harbor, MD, September 15–18, 2016.

59. A retrospective study of early versus delayed initiation of home dose basal insulin in the acute management of diabetic ketoacidosis. Stephen Rappaport, PharmD[1], Jeffrey Endicott, PharmD[1], Matthew Gilbert, DO[2], Joshua Farkas, MD[3], Ryan Clouser, DO[3], Wesley McMillian, PharmD[1]; (1) Department of Pharmacy, The University of Vermont Medical Center, Burlington, VT (2) Department of Medicine, Division of Endocrinology, Diabetes and Metabolism, The University of Vermont Medical Center, Burlington, VT (3) Department of Medicine, Division of Pulmonary Disease and Critical Care Medicine, The University of Vermont Medical Center, Burlington, VT
INTRODUCTION: Insulin via continuous intravenous infusion (ICII) is a mainstay of diabetic ketoacidosis (DKA) treatment. Once DKA is resolved, ICII is usually transitioned to subcutaneous insulin therapy (SQI). However, recent guideline statements recommend continuation of home dose subcutaneous basal insulin (HDBI) in patients with acute DKA being treated with ICII.
RESEARCH QUESTION OR HYPOTHESIS: Do DKA treatment outcomes differ in patients who received early versus delayed HDBI?
STUDY DESIGN: Retrospective cohort study.
METHODS: Patients aged 16 years and older admitted to the medical intensive care unit between July 1, 2012 and June 30, 2015 with a primary diagnosis of DKA who received ICII and HDBI were included. Patients were stratified into early or delayed groups if they received HDBI before or after resolution of DKA, respectively. The primary outcome was incidence of ICII to SQI transitional failure between groups. Transitional failure was defined as resumption of ICII after initial discontinuation or recurrence of DKA while on SQI. Categorical variables were compared among groups using a Fisher exact test and continuous variables were compared using a two-group t-test or Mann-Whitney U test.
RESULTS: A total of 106 patients were included for analysis; 33 (31.1%) received early HDBI. The groups were similar at baseline. The incidence of transitional failure was similar between the early and delayed groups (odds ratio [OR] 0.60; 95% confidence interval [CI], 0.26–1.44; $p=0.72$). In the early group, the ICII

duration was shorter, 13.8 h (IQR 10.1–16.5) versus 17.1 h (IQR 12.6–21.1) (p=0.04) and there was a trend towards lower rates of hypoglycemia (OR 0.41; 95% CI, 0.16–1.05; p=0.058).
CONCLUSION: There was no significant difference in incidence of transitional failure between early and delayed HDBI. Early HDBI was associated with less time on ICII and a trend towards lower rates of hypoglycemia. A prospective analysis is needed to confirm these exploratory findings.

60. The effects of albumin in patients with septic shock in intensive care units. Yi-yun Lee, PharmD, Man-Tzu Wu, PharmD[2]; (1) Department of Pharmacy, Wan Fang Hospital, Taipei Medical University, Taipei, Taiwan
INTRODUCTION: Septic shock is one of leading causes of death in the ICU. Timely fluid resuscitation is crucial. The effects of fluid resuscitation with albumin from previous studies are inconsistent.
RESEARCH QUESTION OR HYPOTHESIS: What are the effects of albumin in patients with septic shock in intensive care units?
STUDY DESIGN: Single-center, retrospective study.
METHODS: ICU patients with a ICD-9 diagnosis of septic shock from Jan to Dec, 2015 were eligible for review. Patient characteristics were collected from electronic chart. Based on albumin ever used, patients were divided into albumin and non-albumin group and each group was further divided into albumin > 2 g/dL or ‰¤ 2 g/dL. The primary outcomes were the 14-day and in-hospital mortality. The secondary outcomes included length of hospital and ICU stay, day-14 SOFA scores, the vasopressors usage, the net fluid balance in the first 7 days of shock, and day-14 and in-hospital mechanical ventilator support and renal replacement therapy.
RESULTS: A total of 96 patients were included. There were no significant differences between groups in 14-day and in-hospital mortality, the length of ICU or hospital stay, the net fluid balance, the use of vasopressors, mechanical ventilation support, and receiving renal replacement therapy. There was a significant difference in 14-day SOFA scores with 13.8 ± 4.94 in the albumin group and 9.82 ± 5.38 in the non-albumin group (p=0.004). When baseline serum albumin level was >= 2 g/dL, the 14-day and in-hospital mortality were significantly higher in albumin group with OR of 8.620 and 7.481. (p=0.010 and 0.018).
CONCLUSION: There is no statistically significant difference in terms of mortality, new organ failure, hospitalization, the vasopressor usage, the net fluid balance, mechanical ventilation support and renal replacement therapy. However, trends of worsening clinical outcomes in the albumin group are observed. The use of albumin in septic shock patients cannot be routinely recommended especially when albumin level is greater than 2 g/dL.

61. Analysis of the safety of adjunctive continuous infusion ketamine for maintenance sedation in critically ill patients. Jolie Gallagher, PharmD[1], Peter Lyu, MSPH[2], Deepa Patel, MD[3], Mark Caridi-Sheible, MD[3], David Grenda, MD[3], James Blum, MD, FCCM[3], Christopher Paciullo, PharmD, BCCCP, FCCM[4]; (1) Department of Pharmacy, Emory Univeristy Hospital, Atlanta, GA (2) Emory Healthcare (3) Department of Anesthesiology, Emory Unveristy School of Medicine, Atlanta, GA (4) Department of Pharmaceutical Services, Emory University Hospital, Atlanta, GA
INTRODUCTION: Ketamine is a nonbarbiturate anesthetic with sedative and analgesic properties. Despite a recent increase in the utilization of ketamine across the country, there is a limited amount of data evaluating its use for maintenance sedation in critically ill patients.
RESEARCH QUESTION OR HYPOTHESIS: Is the use of ketamine as an adjunct for maintenance sedation in the intensive care unit (ICU) safe?
STUDY DESIGN: Retrospective, cohort study.
METHODS: This study included critically ill patients > 18 years old receiving adjunctive continuous infusion ketamine (ketamine group) or either two high-dose or three continuous infusion sedatives at any dose (standard therapy group) for > 6 h. Exclusion criteria included history of seizure, outpatient antipsychotic or antiepileptic use, use of ketamine for status epilepticus, or pregnancy. Primary outcome was a composite safety outcome of rate of new onset seizure, malignant arrhythmia, malignant hypertension, and emergence phenomenon. Secondary outcomes were each component of the primary outcome, duration of mechanical ventilation, and length of ICU and hospital stay. Outcomes were compared utilizing appropriate statistical tests.
RESULTS: A total of 616 patients were included in this analysis (ketamine=160, standard therapy=456). Significantly more ketamine patients were located in the cardiothoracic and general surgery ICUs. Ketamine patients were more likely to meet the primary composite safety outcome compared to standard therapy patients, 28.1% versus 14.2% (p<0.0001), respectively. This was driven by an increase in the rate of seizure (3.1% versus 0.7%, p=0.03) and emergence phenomenon (19.4% versus 7.6%, p<0.0001). Ketamine patients also had a significantly longer length of ICU (15.5 days versus 12.7 days, p=0.01) and hospital stay (24.8 days versus 19.4 days, p=0.003).
CONCLUSION: Adjunctive ketamine for maintenance sedation may have worse outcomes compared to standard therapy. Additional analysis on patient selection, monitoring, and efficacy are needed.

62. Comparison of the incidence of pneumonia in patients with multi-trauma and TBI versus those without TBI. Ashley Turk, Bachelor of Biomedical Science, Pharm. D Candidate 2018[1], Kaitlin McGinn, Doctor of Pharmacy[1], Noelle Davis, CRNP[2], Sidney Brevard, MD[2], Jon Simmons, MD[2]; (1) Auburn University Harrison School of Pharmacy, Mobile, AL (2) Department of Surgery, University of South Alabama Medical Center, Mobile, AL
INTRODUCTION: Ventilator-associated pneumonia (VAP) is a significant cause of morbidity and mortality in polytrauma patients. Previous studies have identified head injuries as a risk factor for the development of VAP in polytrauma patients. However, the incidence of VAP has not been directly compared between polytrauma patients with traumatic brain injury (TBI) to those without.
RESEARCH QUESTION OR HYPOTHESIS: The purpose of this study was to compare the rates of VAP in multi-trauma patients with TBI versus multi-trauma patients without TBI.
STUDY DESIGN: Single-center, retrospective, observational cohort study.
METHODS: Adult (> 19 years old) polytrauma patients mechanically ventilated for > 48 h were identified through the institution's trauma registry. Pneumonia was defined as organism growth of > 10,000 cfu/mL on bronchoalveolar lavage and/or > 100,000 cfu/mL on tracheal aspirate. The diagnosis of TBI was pulled from trauma registry data and Abbreviated Injury Scale (AIS) head scores were collected if patients were diagnosed with a TBI. The following were also collected: patient demographics, Injury Severity Scores (ISS), ICU and length of stay (LOS), ventilator days and in-hospital mortality.
RESULTS: A total of 561 patients met inclusion criteria. Overall the patients who developed pneumonia had significantly longer durations of mechanical ventilation (17 ± 13.1 days vs 8.5 ± 7.6 days; p=0.0001) and a longer ICU (24.1 ± 17.9 days vs 13.7 ± 10.7 days; p=0.0001) and hospital LOS (37.6 ± 35.8 vs 22.5 ± 21.7; p=0.0001). Of the 351 patients with TBI, 115 (32.8%) developed pneumonia. ISS scores of those with TBI who developed pneumonia versus those without TBI that developed pneumonia were similar (30.0 ± 14.1 vs 26.2 ± 16.8; p=0.117). The VAP rate for patients with TBI was 31 VAPs/1000 ventilator days versus 23 VAPs/1000 ventilator days in patients without TBI (p=0.031). There was no difference in ICU or hospital LOS, average number of ventilator days or mortality between these two groups.

CONCLUSION: Patients diagnosed with TBI are at increased risk of VAP when compared to similar multi-trauma patients without TBI.

63. Tolerance of enteral nutrition co-administered with vasopressors in surgical and trauma intensive care unit patients. Ben Pullinger, PharmD[1], Kerry Mohrien, PharmD, BCPS[1], Sharon Del Bono, RD, CNSC[2], Elaine Chan, MD[3], Kimberley Harris, PharmD, BCPS[1]; (1) Department of Pharmacy Services, Temple University Hospital, Philadelphia, PA (2) Department of Hospitality and Nutrition Services, Temple University Hospital, Philadelphia, PA (3) Department of Surgery, Temple University Hospital, Philadelphia, PA
INTRODUCTION: Enteral nutrition (EN) is the preferred method of nutrition support in critically ill patients, but there is concern for intolerance to EN in patients receiving vasopressor support. Post-operative patients may be at an increased risk of intolerance, but have been underrepresented in prior studies.
RESEARCH QUESTION OR HYPOTHESIS: Prior abdominal surgery and high-dose vasopressor therapy will result in increased EN intolerance
STUDY DESIGN: Retrospective chart review.
METHODS: This study included adult patients admitted to the surgical/trauma intensive care unit (ICU) who received concomitant EN and vasopressors for > 4 h. Up to two separate episodes during the same admission were included. The primary endpoint was intolerance to EN, defined as one or more of the following: gastric residuals greater than 250 mL; abdominal distention; emesis; bloody diarrhea; or bowel ischemia, necrosis, or perforation on imaging. Following univariate analysis, risk factors for intolerance were evaluated in a multivariate analysis using backwards stepwise logistic regression. All analysis was performed using SPSS software (IBM SPSS Statistics, Version 22.0. Armonk, NY).
RESULTS: Forty-three episodes of overlap were included, with 17 (40%) episodes of intolerance. Within the cohort, 58% of patients had a prior abdominal surgery and 30% received elevated vasopressor doses (greater than 12.5 μg/min norepinephrine equivalents). The median duration from previous abdominal surgery to overlap was 15 days (IQR 8–21). On univariate analysis there was no significant association between intolerance and recent abdominal surgery, vasopressor dose, or EN feeding rate. Using logistic regression, phenylephrine was associated with intolerance (odds ratio 6.36 [95% CI 1.27–31.92]) after adjusting for recent abdominal surgery, duration of EN-vasopressor overlap, and exposure to other vasopressors.
CONCLUSION: The results of this study did not confirm that prior abdominal surgery or use of high-dose vasopressors is associated with EN intolerance. Vasopressor choice may be associated with intolerance, although confirmation in a larger population is necessary.

66E. Crisaborole topical ointment, 2%, demonstrates improvement in the quality of life of patients with mild to moderate atopic dermatitis. Eric Simpson, MD[1], Amy Paller, MD[2], Mark Boguniewicz, MD[3], Lawrence Eichenfeld, MD[4], Steven Feldman, MD, PhD[5], Jonathan Silverberg, MD, PhD, MPH[2], Sarah Chamlin, MD[6], Lee Zane, MD, FAAD[7]; (1) Oregon Health and Science University, Portland, OR (2) Northwestern University, Feinberg School of Medicine, Chicago, IL (3) National Jewish Health, Denver, CO (4) Rady Children's Hospital, San Diego, CA (5) Wake Forest School of Medicine, Winston-Salem, NC (6) Ann and Robert H. Lurie Children's Hospital of Chicago, Northwestern University, Feinberg School of Medicine, Chicago, IL (7) Anacor Pharmaceuticals, Inc., Palo Alto, CA
Presented at the European Society of Pediatric Dermatology 13th ESPD Congress; Paris, France; May 26–28, 2016.

Education/Training

68. Assessing first-year pharmacy student and faculty perceptions of objective structured clinical examinations. Elias Chahine, PharmD, BCPS [AQ-ID], Anne Harring, PharmD, Jamie Fairclough, MPH, PhD, MSPharm, Dana Brown, PharmD, BCPS, Aisha Shokoya, PharmD Candidate; Lloyd L. Gregory School of Pharmacy, Palm Beach Atlantic University, West Palm Beach, FL
INTRODUCTION: The use of performance-based assessments such as objective structured clinical examinations (OSCEs) to assess achievement of students' educational outcomes is encouraged in the 2016 ACPE standards.
RESEARCH QUESTION OR HYPOTHESIS: At least 70% of students will pass the OSCE. Student and faculty perceptions of the OSCE will be favorable.
STUDY DESIGN: A one-station OSCE consisting of two different blood pressure-related cases utilizing standardized patients was developed for first-year pharmacy students. Two Likert scale surveys were administered to students and faculty to assess their perceptions of case content, assessment and logistics.
METHODS: The median change in total survey score was used to determine changes in perceptions of students and faculty before and after administering the OSCE. The Wilcoxon Signed Rank test was used to determine statistical differences in the students' perceptions.
RESULTS: A total of 76 students took the OSCE, 78.9% passed and 21.1% will undergo remediation. Of the 76 students, 74 students completed both the pre- and post-surveys. The median total score for students was 97.0 ± 13.2 in the pre-survey group versus 105.0 ± 12.8 in the post-survey group ($p<0.0001$). The median total score for faculty was 68.0 ± 3.0 in the pre-survey group versus 69.0 ± 1.5 in the post-survey group. After completing the OSCE, 82.7% of students agreed the OSCE is the best examination style to assess their clinical skills, and 92.1% agreed the OSCE measures application of clinical skills and abilities required in pharmacy practice. However, 54.0% agreed the OSCE is more stressful than written examinations. After administering the OSCE, all faculty agreed the OSCE is an effective way to test competencies and it should be part of the assessment program.
CONCLUSION: More than 70% of students passed the OSCE. Student and faculty perceptions of the OSCE were favorable highlighting the importance of incorporating OSCEs into assessment efforts.

69E. Assessment of pharmacy student didactic and clinical preparedness surrounding LGBT and mental illness patient populations. Mark A. Douglass, PharmD[1], Kevin DeLeonardo, Doctor of Pharmacy Candidate[2], Alyssa Long, Doctor of Pharmacy Candidate[2]; (1) Northeastern University Department of Pharmacy Practice/Boston Medical Center, Boston, MA (2) School of Pharmacy, Northeastern University, Boston, MA
Presented at American Association of Colleges of Pharmacy annual meeting, Anaheim, CA, July 23–27, 2016.

70. Differences in student evaluations of teaching between a main and a regional school of pharmacy. Kurt Wargo, PharmD, Lindsy Meadowcraft, PharmD; Hendersonville Regional Campus, Wingate University School of Pharmacy, Hendersonville, NC
INTRODUCTION: According to the Accreditation Council for Pharmacy Education, schools of pharmacy with a regional campus should provide similar student experiences. At regional campuses of schools of pharmacy, learning experiences are oftentimes a combination of live, in-person instruction and real-time videoconferencing. For many students and faculty alike, this is their first experience with videoconferencing technology. Faculty teaching in programs with a regional campus need to learn methods to actively engage students through this technology in order to be effective.

RESEARCH QUESTION OR HYPOTHESIS: Does a difference exists between student evaluations of faculty members who teach the majority of their classes from a regional campus?
STUDY DESIGN: Retrospective observational cohort study.
METHODS: This study received IRB approval and was conducted at a school of pharmacy (Campus A) with a regional campus (Campus B) 150 miles away from the primary site. Courses from 2013 to 2015 where a significant portion of the class (greater than 50%) was taught from Campus B were included in the final analysis. Courses were excluded from the analysis if less than 20% of students completed faculty evaluations. A student's t-test was utilized in order to compare the mean scores (± SD) of student evaluations of faculty.
RESULTS: A total of eight courses were analyzed. Students on Campus A consistently scored faculty on Campus B lower than their student colleagues on Campus B. When data from these eight courses were combined, the average score given from the Campus A students to Campus B faculty (n=484) was 3.61 ± 1.04, compared to the average score given from the Campus B students (n=78) of 4.51 ± 0.64; $p<0.0001$, 95% CI (−1.14 to −0.66).
CONCLUSION: Differences exist between students' evaluations of faculty teaching from a regional campus versus those who teach on-site.

71E. Community education by advanced pharmacy practice experience students: increasing electronic cigarette awareness amongst teens. Amanda M. Morrill, PharmD[1], Cheryl Abel, PharmD[2]; (1) Department of Pharmacy Practice, School of Pharmacy-Worcester/Manchester, MCPHS University, Manchester, NH (2) Pharmacy Practice, Massachusetts College of Pharmacy and Health Sciences, Manchester, NH
Presented at American Association of Colleges of Pharmacy Annual Meeting. Anaheim, CA. July 24–25, 2016.

72. Student versus residency program perceptions of a high-quality PGY1 residency applicant. Caitlin Gibson, PharmD, Shara Elrod, PharmD; Department of Pharmacotherapy, University of North Texas System College of Pharmacy, Fort Worth, TX
INTRODUCTION: Obtaining a PGY1 residency position is highly competitive. Studies have been conducted to characterize desired qualities of highly competitive residency applicants. However, no study has been conducted to determine if students have a good understanding of these qualities.
RESEARCH QUESTION OR HYPOTHESIS: How well are pharmacy student perceptions of high-quality residency applications aligned with preferences of residency programs?
STUDY DESIGN: Factors used by residency programs to select applicants for onsite interviews and rank lists were adapted from a previously published survey and administered to pharmacy students at our institution.
METHODS: Students were selected based on enrollment in a residency preparatory elective or involvement in select student organizations. The tool surveyed student perception of the importance of factors in (1) granting an interview and (2) ranking of applicants. To determine if student and program perceptions of factors considered important in the residency application process aligned, student results were compared to results of the previously published residency survey.
RESULTS: Fifty-two students interested in residency completed the survey. Students and programs were in close or very close agreement on 88.2% of factors important for securing an interview. Students, but not programs, perceived NAPLEX scores as important for securing an interview. Students and programs were in close or very close agreement on 81.3% of factors important for ranking. When analyzed by professional year, perceptions of factors important for securing an interview were similar among all professional years; however, perceptions of important ranking factors were in closer alignment among P3s than P2s and P1s.
CONCLUSION: Pharmacy student and residency program perceptions of high-quality residency candidates are similar for the majority of factors considered in our study. Student and program perceptions of important ranking qualities appear to converge over time. More studies are needed to determine if similar perceptions between students and programs are important for matching.

74. Healthcare provider attitudes regarding student involvement during international healthcare experiences. Jon P. Wietholter, PharmD, BCPS[1], Beth Nardella, MA, MFA[2], Renier Coetzee, PharmD[3]; (1) Department of Clinical Pharmacy, West Virginia University School of Pharmacy, Morgantown, WV (2) West Virginia University, Morgantown, WV (3) University of the Western Cape, Cape Town, South Africa
INTRODUCTION: Many health professions schools are increasing global content and International Healthcare Experience (IHE) opportunities. However, there is limited data on the impact on international healthcare providers interacting with students during an IHE. There is a concern that students could potentially burden the local healthcare system as many settings are already short-staffed.
RESEARCH QUESTION OR HYPOTHESIS: There will be positive impacts noticed regarding workload and patient care as rated by healthcare providers who interact with West Virginia University (WVU) students completing an IHE.
STUDY DESIGN: This was a survey-based study using a 5-point Likert scale to assess WVU student impact during IHEs in Santarém, Brazil or Cape Town, South Africa during 2015–2016. Demographic information and comments were also collected.
METHODS: After obtaining IRB approval, 32 nurses, doctors, pharmacists, and dentists interacting with US students, were asked to complete a survey. Survey questions evaluated student impact on international healthcare providers during IHEs regarding patient care, workload, efficiency, clinical skill development, and professional development. Additionally, the survey evaluated whether students were culturally sensitive and whether or not providers felt their patients thought more highly of them due to involvement with US students.
RESULTS: Data revealed international providers agreed that US student involvement had a positive impact on patient care (91%), efficiency (78%), and clinical skill development (78%). Additionally, 75% agreed that students were culturally sensitive around patients. Responses were more neutral towards impact on both professional development (50%) and workload (62%).
CONCLUSION: During IHEs, WVU students were able to aid in patient care, clinical skill development, and efficiency as rated by the international healthcare providers they interacted with. Future research is needed to investigate how to make student involvement during IHEs more productive and to qualitatively evaluate the impact of these IHEs on healthcare providers.

75. Evaluating student success and confidence relating to Choose All That Apply (CATA) style questions. Krystal KC Riccio, PharmD, BCACP, CDE, C. Leiana Oswald, PharmD, David Kogan, PharmD Candidate 2017; College of Pharmacy, Roseman University of Health Sciences, Henderson, NV
INTRODUCTION: Within health science education and licensure examination, there has been an increasing prevalence of Choose All That Apply (CATA) format questions; however, evidence surrounding the benefits and risks of using this question format is currently lacking in literature.
RESEARCH QUESTION OR HYPOTHESIS: How does student performance compare when presented with single-answer multiple choice, 2/5 correct answer CATA, 3/5 correct answer CATA, and 4/5 correct answer CATA questions and how does this affect the students' level of confidence and ability to self-assess?
STUDY DESIGN: This blinded, randomized, prospective study included all first year (P1) and second year (P2) students enrolled

in the College of Pharmacy at Roseman University of Health Sciences, during May 2015.
METHODS: Student performance and confidence data was collected for sixteen test questions administered as part of the End of Year assessments. Statistical analysis was performed using ANOVA and confirmed with a Generalized Linear Mixed Model; correlating test version and demographic questions.
RESULTS: A total of 483 students were included in the primary outcome of performance analysis. The P1 performance declined with increasing answer choices; 65% correct on single-answer multiple choice; 49% on 2 answer CATA; 45% on 3 answer CATA; and 31% on 4 answer CATA (p=0.005). The P2 performance data also declined with increasing answer choices; 72% correct on single-answer multiple choice; 33% on 2 answer CATA; 28% on 3 answer CATA; and 17% on 4 answer CATA (p<0.0001). Further, students' overall level of confidence declined when comparing a single-answer multiple choice with CATA questions.
CONCLUSION: Students perform better on standard single-answer multiple choice compared to the same question asked in CATA format. Students' confidence is highest with a single-answer multiple choice and confidence, as well as their ability to self-assess, decreases as correct answer choices increase from single-answer multiple choice to 2/5, 3/5, and 4/5 CATA format questions.

76. Does personality type influence the selection of doctor of pharmacy candidates for a PGY1 residency?. Frank Paloucek, BS Pharm, PharmD[1], Nicholas Popovich, PhD[2], Chintan Patel, PharmD[3], Shaveta Khosla, BS, MS[4]; (1) Department of Pharmacy Practice, Unievrsity of Illinois at Chicago College of Pharmacy, Chicago, IL (2) Office of Professional Development M/C 874, University of Illinois at Chicago College of Pharmacy, Chicago, IL (3) Department of Pharmacy Practice M/C 886, University of Illinois College of Pharmacy, Chicago, IL (4) Division of Epidemiology and Biostatistics M/C 923, University of Illinois School of Public Health, Chicago, IL
INTRODUCTION: Interviews are a significant component in candidate evaluation for residencies. No data exists on whether personality types influence this subjective process. At our institution, a modified Myers-Briggs Personality Type Indicator (MBTI) survey has been part of on-boarding since 2000. Analysis showed an overrepresentation of the EP personality type over 10 years.
RESEARCH QUESTION OR HYPOTHESIS: Does personality type of interviewees or interviewers influence subsequent "matching" into a PGY1 Pharmacy Residency.
STUDY DESIGN: This was a prospective IRB-approved study utilizing a web-based service to administer a modified 54 question MBTI inventory, post-interview, to consenting PGY1 Pharmacy Residency applicants and their interviewees.
METHODS: All interviewees were sent a consent form via application email addresses. Upon consenting, a link to the survey was sent via Survey Monkey. Interviewers were contacted directly for consent, then sent the link via email. A statistician/author recruited from the School of Public Health Biostatistics and Epidemiology section selected and performed appropriate statistical tests.
RESULTS: 91 of 117 (77%) interviewees consented and completed the survey. Of these, 34 did and 57 did not "match" into the program. All interviewers (26) consented and completed a survey. Unexpectedly only 61 (66%) of candidates fell within a specific personality type, 33% had equal percentages of two or more types, called "intermediate" for analysis. This phenomenon has not been previously reported in MBTI research. The distribution of 91 samples over 35 personality "types" lead to significant issues with sample size power when trying to compare specific types. There was no statistical significance found between personality types and subsequent matching success.
CONCLUSION: An unexpected result of "intermediate" personalities resulted in an underpowered study incapable of answering the research question. Future investigation with larger sample sizes should also address comparison of the recognized (more polarized) types versus "intermediate" types.

77. Interprofessional collaborative practice through an adult medicine based simulation. Jon P. Wietholter, PharmD, BCPS[1], Carl Grey, MD[2], Aletha Rowlands, PhD, MSN, RNFA, CNOR[3]; (1) Department of Clinical Pharmacy, West Virginia University School of Pharmacy, Morgantown, WV (2) West Virginia University School of Medicine, Morgantown, WV (3) West Virginia University School of Nursing, Morgantown, WV
INTRODUCTION: There is limited data on the effect of interprofessional collaborative practice (IPCP) in clinical settings with licensed medical professionals. A simulation was designed that brought practicing nurses, physicians, and pharmacists together in a rounding environment to evaluate an adult medicine patient.
RESEARCH QUESTION OR HYPOTHESIS: A single simulation-based IPCP scenario involving practicing physicians, pharmacists, and nurses in a rounding environment will improve nurses' Interprofessional Socialization and Valuing Scale (ISVS) scores.
STUDY DESIGN: This was a matched pre/post survey-based study evaluating IPCP simulation survey scores utilizing the ISVS instrument.
METHODS: Nurses were asked to complete the ISVS instrument prior to the experience. Next, they participated in a simulation centered on an adult medicine patient with pain control and functional status issues. The nurses completed a thorough nursing assessment followed by interprofessional rounds with a physician and a clinical pharmacist. Upon completion, nurses completed the ISVS instrument again and the pre/post simulation scores were compared and statistically evaluated. Demographics and attitudinal survey data were also collected.
RESULTS: Sixty-two nurses completed the simulation. A comparison of survey data showed that 16/24 items on the ISVS had significant improvement on the post-simulation survey. Items that showed significant improvement ranged from comfortability debating issues with a team, to awareness of the roles of other professions on a team, to the ability to share and exchange ideas in a team discussion. Additionally, 84% of participants agreed that the simulation was valuable for their professional growth.
CONCLUSION: An interprofessional simulation containing practicing pharmacists, physicians, and nurses resulted in statistically significant improvements in 2/3 of ISVS items as rated by licensed registered nurses. This demonstrates that beliefs on IPCP can be altered by a single experience and improved scores can be attained in a simulated environment.

78. Evaluation of a flipped classroom approach in a pharmacology-based anatomy and physiology course. Cody Moore, PharmD, Ashley Fancher, BS, Heather J. Johnson, PharmD, Randall Smith, PhD, Thomas D. Nolin, PharmD, PhD, James Coons, PharmD, Michael Shullo, PharmD, Susan Parnell, BS, Christopher Ensor, PharmD; University of Pittsburgh, Pittsburgh, PA
INTRODUCTION: The flipped classroom (FC) approach is meant to shift learning from instructor-centered to a learner-centered model. Value of FCs has not been validated in the basic science pharmacology coursework.
RESEARCH QUESTION OR HYPOTHESIS: The FC approach in an anatomy and physiology course will enhance first-year pharmacy student learning and confidence in applying physiologic drug mechanisms.
STUDY DESIGN: An IRB-approved survey that assessed perceptions and self-efficacy was given at each half of the semester. The survey used dichotomous, Likert scale (1 = strongly agree, 5 = strongly disagree), and open-ended responses. Paired ordinal data was analyzed using Wilcoxon signed rank test. Paired nominal data was analyzed using McNemar's test.
METHODS: Students learned course material in a traditional lecture-centric fashion for the first half of the course and

transitioned to FC for the second half. The FC approach required students to watch online lectures and complete short quizzes to assess understanding. In class, students worked in groups to solve cases that focused on application of physiologic drug mechanisms.
RESULTS: 104 (91.2%) students completed both surveys. 65 (62.5%), 31 (29.8%), and 8 (7.7%) students identified themselves as visual, kinesthetic, and auditory learners. 51 (49%) students felt that the kinesthetic learning method dominated the FC approach vs. 1 (1%) in the traditional classroom ($p<0.01$). There were no differences in perceived student engagement between the traditional and FC approaches (mean Likert score: 2.12 (SD=1.01) vs. 2.34 (SD=1.094), p=0.18) and in perceived student confidence in applying physiologic drug mechanisms (1.80 (SD=0.805) vs. 1.96 (SD=0.835), p=0.11). 62 (59.6%) vs. 75 (72.1%), (p=0.05), students stated that the teaching method enhanced learning in the flipped and traditional classroom, respectively.
CONCLUSION: This is the first study to describe that an FC approach resulted in similar student learning and confidence in the application of physiologic drug mechanisms compared to traditional methods in basic science pharmacology coursework. Exploring mixed FC and traditional teaching methods appears warranted.

79. Impact of teaching OSCE implementation on student performance in a pharmacotherapy course. Kylie Barnes, PharmD, Maqual Graham, PharmD; Division of Pharmacy Practice and Administration, University of Missouri Kansas City School of Pharmacy, Kansas City, MO
INTRODUCTION: To investigate the impact of incorporating a telephone-based teaching objective structured clinical examination (OSCE) in the pharmacotherapy curriculum prior to the high-stakes OSCE at the end of the fifth semester of the professional degree program.
RESEARCH QUESTION OR HYPOTHESIS: Incorporation of a telephone-based teaching OSCE prior to the high-stakes OSCE will improve overall student performance on the OSCE.
STUDY DESIGN: A retrospective review of students' performance following completion of a telephone-based OSCE was analyzed to compare differences in student scores pre (fall 2013, n=124) and post (fall 2014, n=119 and fall 2015, n=123).
METHODS: An analytical checklist with three distinct sections (information gathering, therapeutic management strategies, and monitoring/follow-up) was used to evaluate the students' abilities to assess and provide care for patients. In addition, evaluation of the students' abilities to effectively interact with patients was accomplished using a global communication assessment tool. Scores from both evaluations forms are combined to determine pass/failure of the case.
RESULTS: During the fall of 2013, a total of 55 students (44.4%) passed the telephone-based OSCE. After addition of a teaching OSCE in fall of 2014, a total of 103 students (87%) passed the OSCE, and in fall of 2015, 106 students (86.2%) passed ($p<0.0001$ for both years post implementation). More than 90% of students passed the global communication assessment for all three years (96%, 91.6%, and 96% in fall 2013, 2014, and 2015 respectively). Therefore, the teaching OSCE helped students better assess patients and recommend therapy.
CONCLUSION: Incorporation of a teaching OSCE enhanced student performance on the OSCE. The teaching OSCE oriented students to the telephone-based simulation process as well as enabled students to focus on areas needing improvement in the patient care process.

80. Do faculty and residents grade differently? Evaluation of grades in a therapeutics seminar course series. Michael Gonyeau, BS Pharm, PharmD, MEd, FNAP, FCCP, BCPS[1], Francesca Napolitano, BS Pharmacy Studies[2], Margarita V. DiVall, PharmD, MEd, BCPS[1]; (1) Department of Pharmacy and Health Systems Sciences, Northeastern University, Boston, MA (2) School of Pharmacy, Northeastern University, Roxbury Crossing, MA
INTRODUCTION: Student feedback through course evaluations revealed perceived inconsistencies in grading between sections in a Therapeutics seminar course series. The course series is taught in small sections facilitated by faculty or residents from practice partners. Seminar course grade is comprised of weekly homework, midpoint and final participation, and project grades, all evaluated using standardized rubrics.
RESEARCH QUESTION OR HYPOTHESIS: To examine variability in grading multiple sections of seminar graded by facilitators with varying academic experience.
STUDY DESIGN: A retrospective analysis of 15 sections (250 students) of CDM Seminar in 2015–2016.
METHODS: Evaluated mean homework, midpoint and final participation, and final seminar grades. Therapeutics didactic course grades (a co-requisite) were compared to determine if seminar grade differences could be attributed to academic performance. Facilitators were compared based on their experience in an academic setting. Mann Whitney U and Kruskal-Wallis tests were used for group comparisons.
RESULTS: When data were grouped by eight sections facilitated by residents (n=129) and seven sections facilitated by faculty (n=121), there were significant differences in average homework grades (93.36 vs. 93.77%, respectively, p=0.02), midpoint participation (93.75 vs. 89.26, $p<0.01$), and final participation grades (95.10 vs. 92.53, p=0.01). However, final seminar grades (93.61 vs. 92.53%, p=0.1) and didactic course grades (81.28 vs. 81.15, p=0.77) were similar. When we compared sections taught by residents, statistically significant differences in grading were seen, however, actual grade differences were small. The same was true when faculty graders were compared to each other. Junior faculty (< 5 years experience) tended to assign slightly lower grades than experienced faculty (> 5 years).
CONCLUSION: Despite small and statistically significant differences in grading for individual course components, final seminar grades did not differ between resident and faculty graders. With appropriate training and availability of standardized rubrics, residents can facilitate and grade seminars without impacting students' overall letter grades.

81. Student-led educational sessions: participant perceptions. Kristin M. Janzen, PharmD[1], Lauren Kormelink, PharmD[2], Lindsay Saum, PharmD, BCPS, CGP[3], Sarah A. Nisly, PharmD, BCPS[1]; (1) Butler University College of Pharmacy and Health Sciences & Indiana University Health, Indianapolis, IN (2) Indiana Univeristy Health, Indianapolis, IN (3) Butler University College of Pharmacy and Health Sciences & St. Vincent Health, Indianapolis, IN
INTRODUCTION: With the geriatric population in the United States expected to double by 2050, it is essential that pharmacy students are comfortable interacting with elderly. While several studies have been published regarding student perceptions of the elderly, little literature examines the impact of interaction over a longitudinal period.
RESEARCH QUESTION OR HYPOTHESIS: The goal of this study was to determine changes in student perceptions of the elderly following participation in focused educational sessions in a community group setting.
STUDY DESIGN: This was a prospective, single-center study held in collaboration with Butler University College of Pharmacy and Health Sciences and the Catholic Charities of Indianapolis Senior Companion Program.
METHODS: Three educational sessions focused on separate topics (memory/learning retention, sleep hygiene, and arthritis pain) were held over a period of 4 months. Students were consented prior to each event. Students and elderly participants were given a pre-event survey after the session topic was introduced. After an approximately 2-h long interactive educational session, student participants were asked to complete a post-event survey. Both the pre- and post-survey were student-generated and based on a 5-point Likert scale.

RESULTS: There were a total of 41 individual responses from students collected over the course of the study. Student comfort in working with the geriatric population increased following the events, with an average pre- and post-survey rating increasing from a median of 4 [IQR 4–4] to 5 [IQR 4–5], respectively (p=0.005). Students additionally reported increased comfort in teaching the geriatric population (p=0.008).
CONCLUSION: Participation in student-led educational sessions benefitted student participants. Overall, students felt increased comfort in working with and teaching the geriatric population.

82. Outcomes of a teaching certificate program offered to practicing pharmacists. Gwendolyn Wantuch, PharmD, BCPS, Jaclyn Cole, PharmD, BCPS, Melissa Ruble, PharmD, BCPS; Department of Pharmacotherapeutics and Clinical Research, University of South Florida, College of Pharmacy, Tampa, FL
INTRODUCTION: Robust literature demonstrates advantages and success of teaching certificate programs targeting residents, but little for programs directed towards practicing pharmacists. As precepting contains components of evaluation, assessment, and teaching, we established a teaching certificate program not limited to pharmacy residents. The program comprised of five half-day workshops providing a total of 15 live CE-hours. The curriculum incorporated aspects of academia, teaching and learning theory, preceptor development, and research. Accompanying program requirements included assignments, hands-on application at the University, and self-development. Each participant was matched with a faculty member for personalized feedback on assignments.
RESEARCH QUESTION OR HYPOTHESIS: To evaluate the success of a university-integrated teaching certificate program offered to practicing pharmacists through evaluation of participant confidence and knowledge in educational skill sets.
STUDY DESIGN: Evaluation of program confidence surveys and knowledge assessments.
METHODS: Pre- and post- online survey tools evaluated participant confidence. Written assessments were provided prior to each module and at the end of the program to evaluate knowledge and retention. All data was analyzed through Microsoft Excel®, utilizing paired t-tests to evaluate significance.
RESULTS: All 13 participants completed the program, survey tools, and knowledge assessments (n=100%). Reported confidence increased in all categories (p<0.001), with the largest improvements noted in "Developing a teaching philosophy", "Successfully completing an IRB application", and "Developing a well-designed grading rubric". Overall knowledge increased significantly from baseline (p<0.001). Individual topics demonstrating significance incorporated lecture delivery, assessment, precepting, and research (p<0.05). Quantitatively, the largest percent improvement in knowledge was seen in "Grant writing" (29%, 58%) and "Assessment measures" (34%, 64%); pre and post scores listed respectively. Only two topics did not demonstrate an increase in knowledge: curricular alignment and generational differences.
CONCLUSION: Practicing pharmacists demonstrated an increase in confidence, knowledge, and retention of educational skill sets through engagement in a Teaching Certificate Program. Targeting preceptor development through these types of programs may be beneficial.

84. Comparison of two didactic presentation methods on pharmacy student knowledge and confidence in smoking cessation. Jeanna Sewell, PharmD[1], Justin J. Sherman, MCS, PharmD[2]; (1) Department of Pharmacy Practice, University of Mississippi School of Pharmacy, Jackson, MS (2) School of Pharmacy, The University of Mississippi School of Pharmacy, Jackson, MS
INTRODUCTION: APPE ambulatory care rotation discussions can be conducted in different formats, having differing effects on student knowledge and confidence. Interactive discussions have been shown to improve student engagement and knowledge retention.
RESEARCH QUESTION OR HYPOTHESIS: Interactive, case-based, "Choose Your Adventure" (CYA) topic discussions improve student knowledge and confidence to a greater degree than traditional topic discussions.
STUDY DESIGN: Prospective, cohort study.
METHODS: Ambulatory Care APPE students participate in topic discussions on several topics. Smoking Cessation were conducted from June 2015 through May 2016. Surveys included 14 knowledge-based questions and four confidence questions. Students were given a pre-discussion survey and a participant number prior to the discussion, and a post-survey afterwards. Students participated in a Traditional discussion or a CYA discussion, which were conducted in an alternating format. The CYA discussion was case-based and encouraged group interactions to decide on a choice during the scenario, with the consequences of each choice revealed. After completion of the topic discussion, students were given a post-survey to determine changes in knowledge and confidence. The primary outcome was difference in change in knowledge and confidence scores pre- and post-discussion between the two groups. Changes in knowledge and confidence were analyzed using paired or *t*-tests (alpha=0.05), as appropriate.
RESULTS: Fifteen students completed Traditional and 10 students completed the CYA discussion pre- and post-discussion surveys. There was not a significant difference in the change in total knowledge scores nor confidence between groups. There was a significant improvement in total score on the knowledge questions pre- and post-discussion in both groups, traditional (p<0.0001) and CYA (p=0.0225).
CONCLUSION: Smoking Cessation topic discussions improved student knowledge and confidence in both interactive discussions. There was not a difference in change in knowledge or confidence based on the type of topic discussion. Interactive discussions are important for student learning regardless of whether cases are included in a CYA type format.

85. The importance of grit in pharmacy residents: residency program directors' perceptions of residents who matched compared to residents who scrambled. Blake Holland, MS, Sean Smithgall, PharmD, Katelyn Alexander, PharmD, Jessica Burchette, PharmD, BCPS, David Cluck, PharmD, BCPS, AAHIVP, Rajkumar Sevak, PhD, RPh; Department of Pharmacy Practice, Bill Gatton College of Pharmacy, East Tennessee State University, Johnson City, TN
INTRODUCTION: Research on medical residents suggests that grit, a psychological factor defined as perseverance and passion for long-term goals, is important in predicting well-being and success within residency programs. No study has evaluated grit in pharmacy residents and whether it differs between matched and scrambled residents. Such research could inform new strategies to implement during recruitment for enhancing performance and retention in programs. We evaluated residency program directors' (RPDs) perceptions of grit-like qualities in pharmacy residents.
RESEARCH QUESTION OR HYPOTHESIS: Do RPDs perceive a difference in grit between scrambled and matched residents?
STUDY DESIGN: We conducted a quantitative web-based survey using Dillman's Tailored Design Method. Participants were all pharmacy RPDs in the US.
METHODS: A brief survey was emailed to RPDs on four occasions between January and March of 2016. One portion included questions on three traits that came directly from Duckworth et al's Grit Scale. A mean grit score was calculated from these questions and was compared between the matched and scrambled residents with independent-samples t test using SPSS (alpha = 0.05).
RESULTS: From 1817 RPDs contacted, 392 completed the survey, yielding a 21.6% response rate. Although responses evaluating matched residents (n=335) were more prevalent than evaluations of scrambled residents (n=160), the proportion of residents in PGY1, PGY2, or combined programs did not differ

significantly between the scramble and match groups ($Ï‡^2_{(3, 495)}$ = 2.4, p>0.05). The mean grit score of scrambled residents (4.32 ± 0.06 [mean±SEM]) was significantly greater than that of matched residents (4.16 ± 0.04, $t_{(493)} = -2.2$, p<0.05).
CONCLUSION: Scrambled residents were perceived by their RPDs to have a greater extent of grit-like qualities than those matched. The study renders useful insights on perceived differences in grit among pharmacy residents and provides a basis for conducting larger studies that directly compare the grit personality trait between scrambled and matched residents.

86. Development and pilot of a standardized pharmacy residency in-service examination. Veena Venugopalan, Doctor of Pharmacy, Evangelia Davanos, Doctor of Pharmacy, Robert Digregorio, Doctor of Pharmacy; College of Pharmacy, University of Florida, Gainesville, FL
INTRODUCTION: While in-service examinations have been widely used among medical residents and fellows, to our knowledge, written examinations have not been previously used in a similar formalized manner in pharmacy resident training. In this study, we describe the development, implementation, and results of a multiple choice pharmacy resident examination.
RESEARCH QUESTION OR HYPOTHESIS: The purpose of the study was to develop and pilot a standardized multiple choice examination that could be used to individualize residency training.
STUDY DESIGN: A 60-item, 100-point examination was developed as three domains. Domain I comprised 75% of the examination as it included core areas of pharmacy practice which reflected majority of the daily clinical activities. Multiple choice questions were categorized based on Bloom's taxonomy as lower order cognitive skills (LOCS) or higher-order cognitive skills (HOCS). To assess difficulty and discriminating level, a correct response fraction (CRF) and discrimination index (point-biserial (PBS) correlation coefficient) for each test question were determined.
METHODS: The examination was administered to eight pharmacy residents (5 PGY1s and 3 PGY2s) in January, 2014.
RESULTS: The mean PBS and CRF for all multiple choice questions were 0.19 ± 0.31 and 0.71 ± 0.23 respectively. Overall, mean score on the examination was 75.8 ± 8.4. The mean CRF with HCOS was 0.69 ± 0.04 vs. 0.73 ± 0.05 with LCOS. Of the available 75 points in Domain I, the mean score was 52.8 ± 7.6. Evaluation of performance in individual therapeutic areas revealed less than 40% of residents correctly responded to questions related to anticoagulation and nutrition support. In general, we also observed poor performance in items assessing knowledge of general statistics principles.
CONCLUSION: In summary, residents scored lower on HCOS items. Analysis of resident performance in therapeutic areas was useful in identifying areas of weakness, focusing educational efforts, and most importantly developing a customized training plan. Additionally, performance in core areas such as Domain I aided preceptors in gauging readiness to engage in clinical activities.

87. Pre- and post- adult medicine rotation assessment of pharmacy student learning. Scott Wilkie, PharmD; Pharmacy Department, Mission Hospital, Asheville, NC
INTRODUCTION: Assessment of student performance on an advance pharmacy practice experience can be challenging. Quality assessment should include an objective assessment to support a preceptor's subjective assessment of students' abilities. Unfortunately, assessments are generally subjective in nature which may be influenced by preceptor's attitudes rather than a student's ability. By implementing a pre and post rotation exam, preceptors will have information to support their formal assessment as well as information that can help direct their teaching efforts.
RESEARCH QUESTION OR HYPOTHESIS: Exam scores are significantly higher at the end of rotation compared to exam scores at the beginning of an adult medicine rotation.
STUDY DESIGN: Students' clinical knowledge in adult medicine was assessed on the first day of the rotation (pre-assessment) and the last day of the adult medicine rotation (post-assessment).
METHODS: The adult medicine pre- and post-exam were compiled by a clinical pharmacist not associated with the study subjects. The exam was composed of 56 questions (multiple choice and fill in the blank) which were reflective of disease states regularly observed on rotation. The study preceptor was blinded to the questions and exam results during the study period. The study period was two years. The pre- and post-exam scores were statistically compared using a paired t-test.
RESULTS: The average pre- and post-rotation exam scores were 68.3 ± 15.4 and 80.2 ± 12.0 respectively (p<0.0001).
CONCLUSION: Pre- and post-rotation examinations are tools which could provide valuable information to assist preceptors in assessing their students. In addition, the results of these exams may be used to help direct student learning early in the rotation as knowledge gaps can be identified earlier rather than later in the rotation.

88. Introduction of reflective learning in a cardiovascular therapeutics course. James D. Hoehns, PharmD, BCPS, FCCP[1], Emily Beckett, PharmD, BCPS[2], Lynn Rich, Student Pharmacist[3]; (1) University of Iowa College of Pharmacy and Northeast Iowa Family Practice Center, Waterloo, IA (2) University of Iowa College of Pharmacy, Broadlawns Family Medicine Residency Program, Des Moines, IA (3) University of Iowa College of Pharmacy, Iowa City, IA
INTRODUCTION: Active learning techniques are encouraged in pharmacy education. Critical reflection is a well-recognized active learning method.
RESEARCH QUESTION OR HYPOTHESIS: Pharmacy students completing pre- and post-class reflections would improve learning.
STUDY DESIGN: Pre-post survey.
METHODS: Second-year doctor of pharmacy students (N=108) completed 3 reflection items for each class session. One pre-class reflection (document one point of uncertainty after completing an assigned reading/recording) and two post-class reflections were assigned. Post-class reflections consisted of discussing one item learned during lecture and one item of continued uncertainty. Reflections were submitted electronically, collated, and shared with course instructors within 24 h before and after each class. Students completed a pre- and post-course evaluation pertaining to the reflection assignments. Course faculty completed a survey regarding the usefulness of reflections. Descriptive statistics were utilized.
RESULTS: There were 73 (67.6%) pre- and 76 (70.4%) post-course surveys completed by students and 5 (71%) completed faculty surveys. Minimal changes in pre- and post-course student responses were noted. Based upon post-course surveys, reflection completion was high (91.6%), however students had mixed responses regarding their usefulness. Only 32.9% agreed that reflections would help instructors better understand students' learning and 40.8% were confident reflections were reviewed by instructors. A majority of students (67.1%) felt it was fair to use reflections as part of grading. The 24 h completion window was viewed as too restrictive by 52.6% of students. Receiving student reflections was very helpful to faculty for their teaching and most reported spending 16–30 min reviewing them. All faculty reviewed reflections and responded to pre-class reflections during class time. Faculty also felt that 24 h was inadequate time for reviewing reflections prior to lecture.
CONCLUSION: Students were accepting of completing reflections related to cardiovascular therapeutics, but reported mixed usefulness overall. Faculty highly valued obtaining pre-class reflections and incorporated learning points during instruction. A longer time period for completion and review is recommended.

89. Comparison of critical care board certification examination domains and ASHP PGY2 critical care residency standards: a single institution's perspective. Ann Biesboer, PharmD[1], Kristin Bialkowski, PharmD[2], Cathyyen Dang, PharmD[2], Joel Feih, PharmD[2], Alison Glienke, PharmD[2], Kim Haldeman, PharmD[2], Susan Horsman, PharmD[2], Michael Katz, PharmD[2], Meghann Luc, PharmD[2], Sarah Peppard, PharmD[1], Matthew Stanton, PharmD[2], Gregory Stilin, RPh[2], Joseph Rinka, PharmD[2], William Peppard, PharmD[2]; (1) Concordia University Wisconsin School of Pharmacy, Mequon, WI (2) Froedtert and the Medical College of Wisconsin, Milwaukee, WI
INTRODUCTION: As the number of PGY2 specialty residencies and specialized board certification examinations increase, it is necessary to evaluate the ability of specialty residencies to prepare graduates for successful completion of specialized board certification.
RESEARCH QUESTION OR HYPOTHESIS: What inconsistencies exist between the critical care board certification examination domains and the American Society of Health-System Pharmacists' (ASHP) PGY2 critical care residency program standards, and how can a residency program improve resident preparation for board certification?
STUDY DESIGN: A gap analysis was performed.
METHODS: PGY2 critical care preceptors compared the ASHP PGY2 critical care standards to the critical care board certification examination domains. Each preceptor was assigned a portion of the standards to evaluate and determine the most comparable examination domain(s). At least two preceptors independently evaluated each standard. Discrepancies were resolved via a third preceptor. The results were compiled to identify areas of proficiency and deficiency within the standards.
RESULTS: All of the examination domains are covered within the ASHP PGY2 critical care residency standards with the exception of Domain 2.3, "monitor and evaluate compliance with, and impact of, policies and guidelines". Domain 2 (practice administration and development) coverage is dependent on the resident's project. Both the examination domains and the ASHP standards provide a similar list of organ system topics candidates must be familiar with (e.g. renal, pulmonary, etc.), with the exception of dermatology and toxicology. The examination domains require more in-depth knowledge of organ system topics. The examination domains also describe twenty-one additional knowledge topics that are not specifically addressed within the ASHP standards.
CONCLUSION: The majority of the examination domains are well covered with the standards. There is a gap in the specific knowledge topics that candidates should be familiar with. PGY2 residency programs should incorporate this content in to the resident's learning experience in order to appropriately prepare them for board certification.

91. Readiness for and perception of interprofessional education among second-year pharmacy students. Anne Marie Liles, PharmD, BCPS[1], Anastasia Jenkins, PharmD[1], Kim Adcock, PharmD[1], Michael Warren, PharmD[1], Emmy Parkes, MS, RDN, CDE[2], Neeli Kirkendall, MSN, RN, FNP-C[3], Eva Tatum, PhD, RN[3], Lesley Thweatt, MSN, RN[3], Robin Wilkerson, PhD, RN[3]; (1) The University of Mississippi School of Pharmacy (2) The University of Mississippi School of Applied Sciences (3) University of Mississippi Medical Center School of Nursing, Jackson, MS
INTRODUCTION: The 2016 Accreditation Council for Pharmacy Education (ACPE) Standards require pharmacy curricula to prepare students for interprofessional practice. Early incorporation is valuable to engage students with other future healthcare professionals. The University of Mississippi School of Pharmacy joined with the Schools of Nursing and Applied Sciences to develop interprofessional education (IPE) activities for second-year pharmacy students, first-semester accelerated Bachelor of Science-Nursing students, and senior nutrition and dietetics students. Activities incorporated into existing courses for each School included problem-based learning, skills laboratory and simulation exercises focused on diabetes.
RESEARCH QUESTION OR HYPOTHESIS: Participation in interprofessional problem-based learning, skills laboratory, and simulation exercises will improve readiness for and perception of IPE among second-year pharmacy students.
STUDY DESIGN: Pre/post survey.
METHODS: Participants completed the Readiness for Interprofessional Learning Scale (RIPLES) and Interdisciplinary Education Perception Scale (IEPS) prior to the initiation and at the conclusion of IPE activities. RIPLES is a 19-item survey asking participants to rank items on a scale of 1–5 (strongly disagree to strongly agree). IEPS is an 18-item survey asking participants to rank items on a scale of 1–6 (strongly disagree to strongly agree). Pre- and post-rankings on individual items were compared using a t-test for both surveys.
RESULTS: Mean rankings on RIPLES differed on three items for pharmacy students: "shared learning with other health-care students will increase my ability to understand clinical problems" (4.23 vs 4.44, p=0.049), "shared learning will help me think positively about other professions" (4.04 vs 4.33, p=0.031), and "shared learning will help me to understand my own limitations" (4.06 vs 4.39, p=0.0047). However, mean scores on IEPS differed on 10 of the items ($p<0.05$).
CONCLUSION: Incorporation of IPE into existing courses early in the pharmacy curriculum can improve student perception and understanding of the importance of interprofessional practice as they continue in school and into practice.

93E. Adopting transitions of care within the doctor of pharmacy curriculum. My-Oanh Nguyen, PharmD Candidate 2017[1], David Leon, PharmD Candidate[2], Sara Eltaki, PharmD, BCPS[3], Heather Jarvis, PharmD[2], Marlene Calix, PharmD[2], William Wolowich, PharmD[4], Devada Singh-Franco, PharmD, CDE[1]; (1) Department of Pharmacy Practice, Nova Southeastern University College of Pharmacy, Fort Lauderdale, FL (2) College of Pharmacy, Nova Southeastern University, Davie, FL (3) Department of Pharmacy Practice, College of Pharmacy, Nova Southeastern University, Davie, FL (4) Nova Southeastern University, Fort Lauderdale, FL
Presented at the American Association of Colleges of Pharmacy, July 2016.

94. Peer recognition perceived as greatest actualized benefit of the AAHIVP credential. Milena M. McLaughlin, PharmD, MSc[1], Lori Gordon, PharmD[2], Thomas J. Kleyn, PharmD[3], James Scott, PharmD, M.Ed[4]; (1) Department of Pharmacy Practice, Midwestern University Chicago College of Pharmacy, Downers Grove, IL (2) Xavier University of Louisiana, New Orleans, LA (3) Eskenazi Health, Indianapolis, IN (4) Western University of Health Sciences, Pomona, CA
INTRODUCTION: In 2011, the American Academy of HIV Medicine (AAHIVM) created a designation for HIV pharmacist specialists (AAHIVP) who meet specific criteria and pass an online examination. While many pharmacists are encouraged to pursue such credentials, their actualized benefits are largely unknown. The objective of this study was to ascertain the reasons for and benefits of obtaining the AAHIVP designation.
RESEARCH QUESTION OR HYPOTHESIS: What benefits have AAHIVP credentialed pharmacists received as a result of this designation?
STUDY DESIGN: Web-based survey.
METHODS: An invitation to participate in a 14-question survey was emailed to pharmacist members of AAHIVM that currently hold the AAHIVP credential (n=495). The survey assessed demographics, concurrent credentials/certifications, and factors influencing the pursuit of and benefits gained from having the AAHIVP credential.
RESULTS: There were 192 survey participants (survey response rate 38.8%). A plurality of participants were aged 35–44 (n=76, 39.6%), female (n=123, 74.1%), and practicing in community or ambulatory care settings (n=139, 72.4%). Approximately one-

third completed residencies (n=69, 35.9%) and 57 (29.7%) are board-certified. Overall, participants reported that healthcare providers including pharmacists, physicians, nurse practitioners, and physician's assistants are aware of the significance of the AAHIVP credential. However, despite high employer awareness of the significance of the credential (53.4%), only 20.4% of employers reimburse for the credential and only 5.7% of credentialed participants report additional compensation. Instead, the majority of participants sought AAHIVP for recognition from pharmacist (n=174, 90.6%) and physician peers (n=162, 84.4%) as an HIV expert, and to serve as an example to peers and/or trainees (n=140, 72.9%). Almost all plan to renew their AAHIVP (92.7%) and 78.7% plan to encourage a colleague to pursue AAHIVP.
CONCLUSION: AAHIVP credentialing is largely sought and maintained based on intangible benefits, such as peer recognition, over tangible benefits, such as for reimbursement of salary and time.

95. Barriers to AAHIVP credentialing are connected to lack of reimbursement, not awareness, among HIV pharmacist specialists. Milena M. McLaughlin, PharmD, MSc[1], Lori Gordon, PharmD[2], Thomas J. Kleyn, PharmD[3], James Scott, PharmD, MEd[4]; (1) Department of Pharmacy Practice, Midwestern University Chicago College of Pharmacy, Downers Grove, IL (2) Xavier University of Louisiana, New Orleans, LA (3) Eskenazi Health, Indianapolis, IN (4) Western University of Health Sciences, Pomona, CA
INTRODUCTION: Many pharmacists pursue board-certification; however, many HIV pharmacist specialists (HIVPharm) find that their specialty is not adequately covered in existing credentialing examinations. In 2011, the American Academy of HIV Medicine (AAHIVM) developed a credentialing process for HIVPharms (AAHIVP) who meet specific criteria and pass an online examination. It is estimated that only a modest proportion of eligible pharmacists hold this credential. The objective of this study was to ascertain the barriers to pursuing the AAHIVP credential.
RESEARCH QUESTION OR HYPOTHESIS: What barriers have prevented qualified pharmacists from attaining AAHIVP credentialing?
STUDY DESIGN: Web-based survey.
METHODS: An invitation to participate in a 15-question survey was emailed to members of key HIV/ID organizations. In case of overlapping memberships, participants were asked to complete the survey only once to prevent duplicate responses. AAHIVP pharmacists were excluded from the study.
RESULTS: There were 212 survey participants. Most participants were between the ages of 25–44 years-old (n=154, 73.3%), female (n=114, 54%), and practicing in community or hospital settings (n=170, 80.2%). Twenty-seven percent (n=58) are board-certified and 20.8% (n=44) completed specialty residencies. Half of the participants consider themselves as HIVPharms (n=115); however, only one-third (n=71) were eligible to sit for the exam. Of these eligible participants, 85.9% consider themselves as HIVPharms. The most common reason for ineligibility was incomplete fulfillment of continuing education requirements. Approximately 80% of participants were aware of and interested in the AAHIVP credential. Of those aware of the AAHIVP credential, reasons for not pursuing credentialing included concern about passing/lack of time to prepare for the exam (n=46, 26.6%), lack of employer incentive (n=46, 26.6%), and no reimbursement for fees (n=38, 22%); these reasons were similar among those eligible to sit for the exam.
CONCLUSION: Despite high awareness and interest, lack of employer incentive and reimbursement are main barriers to AAHIVP credentialing among HIVPharms.

96. Identifying health care perceptions among sub-Saharan African immigrants in the United States. Ferealem Assefa, PharmD, Lauren Jonkman, PharmD, MPH, Sharon Connor, PharmD, Martha Ndungu, PharmD Candidate, Doreen Foy, PharmD Candidate; University of Pittsburgh School of Pharmacy, Pittsburgh, PA
INTRODUCTION: Over the past decade, the number of sub-Saharan African immigrants has increased 8-fold. When African immigrants arrive in the U.S. their overall health status and health beliefs are rarely evaluated as a separate group of people from other black populations; this is even more important as research suggests that African immigrants may have worse health outcomes than African Americans.
RESEARCH QUESTION OR HYPOTHESIS: To identify common health care perceptions among sub-Saharan African immigrants in the United States.
STUDY DESIGN: This qualitative study used in-depth, one-on-one, semi-structured interviews of African immigrants in Pittsburgh.
METHODS: Participants were recruited through health centers, community gathering places, and word of mouth. Questions were based on constructs from the Health Belief Model and the Theory of Planned Behavior addressing three domains: perceived barriers to health care access, perceived strategies for managing health, and perceived strategies to increase health engagement. Interviewing continued until thematic saturation. Codes were developed from the transcribed interviews and themes were generated using Grounded Theory. This study was approved by the Institutional Review Board.
RESULTS: Sixteen interviews were conducted, representing seven countries in sub-Saharan Africa. All participants emigrated for school, work, or to join a family member. Identified themes include: 1) African immigrants require support and guidance to navigate the U.S. health care system; 2) African immigrants value the greater accountability in health care services, but also perceive a reliance on excessive testing over relationship-building; 3) African immigrants perceive providers do not always address their specific context or health beliefs; and 4) African immigrants describe a deep faith in a Higher Power that informs health decision-making.
CONCLUSION: This study offered insights about African immigrants' perceptions on health care in the U.S. The themes identified provide a foundation for future works including implementing interventions to achieve better health engagement leading to improved health outcomes among African immigrants.

97. Publication records of pharmacy practice chairpersons: a 5-year analysis. Hua Ling, PharmD[1], Sri Topalli, PharmD Student[1], Fang Li, PhD[2], Francis Ndemo, PharmD[1], David Ombengi, PharmD[1]; (1) Department of Pharmacy Practice, Hampton University, Hampton, VA (2) School of Pharmacy, Yancheng Institute of Health Science, Yancheng, China
INTRODUCTION: Pharmacy practice faculty are expected to pursue scholarship to advance the pharmacy profession and science. Chairpersons are considered role models and mentors in their departments, thereby their publication records could serve as a benchmark for faculty members.
RESEARCH QUESTION OR HYPOTHESIS: What are the publication records and citation numbers of current chairpersons at colleges and schools of pharmacy in the USA?
STUDY DESIGN: This was a quantitative observational study.
METHODS: Pharmacy practice chairpersons were identified through the websites of colleges and schools of pharmacy. Google scholar was used to conduct comprehensive search for 1) numbers of peer-reviewed articles authored by chairpersons published from 2006 to 2010 and 2) corresponding citation numbers in the following five years after publication. In this study peer-reviewed articles were original research, case study, letter to the editor, and literature review. Two persons independently conducted this search, and any conflicting results were rechecked and evaluated by all authors. Data were analyzed using descriptive statistics in Microsoft Excel 2016.

RESULTS: Although there were 135 colleges and schools of pharmacy in 2016, a total of 118 chairpersons were identified with 659 publications from 2006 to 2010. The mean, median and mode numbers of publications per chairperson were 5.58, 3, and 0 respectively. The mean, median and mode numbers of citation numbers per article in the following five years after publication were 13.01, 9.08 and 0 respectively. There were 26 (22.03%) chairpersons published more than eight articles during the 5-year study period, 35 (29.66%) chairpersons published 3 to 8 articles, and 57 (48.31%) chairpersons published 0 to 2 articles. Notably, the 26 chairpersons who published more than eight articles produced 421 (63.88%) articles with 17.9 citation numbers per article.
CONCLUSION: Our study provided the data of publication records from 2006 to 2010 of current pharmacy practice chairpersons, which could be used as a benchmark for faculty members, especially junior faculty.

Emergency Medicine

98. The relationship between diltiazem dosing, rate control and body composition in patients with atrial fibrillation and rapid ventricular response. Lindsey Jachim, PharmD Candidate[1], Christine Brun, PharmD[2], Jordan R. Covvey, PharmD, PhD, BCPS[1], David E. Zimmerman, PharmD, BCPS[1]; (1) Duquesne University Mylan School of Pharmacy, Pittsburgh, PA (2) Allegheny General Hospital, Pittsburgh, PA
INTRODUCTION: Diltiazem is a non-dihydropyridine calcium channel blocker indicated for atrial fibrillation (Afib) with rapid ventricular response (RVR). Guidelines recommend 0.25 mg/kg IV bolus by total body weight followed by a 5–15 mg/h infusion. However, there is lacking data on the influence of different body composition upon clinical outcomes.
RESEARCH QUESTION OR HYPOTHESIS: The objective was to assess the relationship between diltiazem dosing and body composition for patients with new onset Afib with RVR.
STUDY DESIGN: Retrospective cohort analysis in a single-center emergency department setting.
METHODS: The sample included adult patients from January 2013 to December 2015 with a diagnosis of new onset Afib treated with IV diltiazem. Exclusion criteria were receipt of rate/rhythm control within 72 h of presentation, diltiazem for other indications or sustained emergent cardioversion. The primary endpoint was the total dose of diltiazem and timeframe to achieve goal heart rate, as stratified by BMI < or >= 30. IBM SPSS Statistics 22 was used for statistics with chi-square and t-tests for categorical and continuous comparisons, respectively. The study was IRB-approved.
RESULTS: A total of 222 patients were included. The cohort was 54.1% male and predominantly (78.4%) Caucasian with a mean age of 67.6 years. On average, patients required 33.7 mg of diltiazem and 2.3 h to reach a goal heart rate of <100 bpm. Patients with BMI >= 30 were younger (64.5 vs. 73.0 years, $p<0.001$) and had a higher presentation heart rate (141.9 vs. 135.0 bpm, $p=0.028$). However, the total dose of diltiazem required to reach goal was similar for BMI < or >= 30 (30.7 vs. 38.0 mg) as was the time to reach goal (2.2 vs. 2.5 h). No correlation between total dose, total time and BMI was detected.
CONCLUSION: Obese patients did not require a larger amount of diltiazem to reach goal HR after Afib with RVR compared to non-obese patients.

99. Novel strategy to increase insulin initiation in the Emergency Department (ED). Maryam Fazel, PharmD, BCPS, BCACP, CDE[1], Anna Waterbrook, MD[2], Osamah Alfayez, PharmD[1], Merri Pendergrass, MD, PhD[3]; (1) Department of Pharmacy Practice and Science, University of Arizona College of Pharmacy, Tucson, AZ (2) Deptartment of Emergency Medicine, University of Arizona College of Medicine, Tucson, AZ (3) Department of Medicine/Endocrinology, University of Arizona College of Medicine, Tucson, AZ
INTRODUCTION: Many patients with uncontrolled hyperglycemia seek care in emergency departments (EDs), especially if access to primary care is limited. Emergency physicians (EPs) commonly do not initiate long-term insulin. Uncertainty of appropriate insulin dosing and follow-up may be contributing factors.
RESEARCH QUESTION OR HYPOTHESIS: Would an insulin initiation protocol with a strategy for timely follow-up increase ED insulin initiation?
STUDY DESIGN: Retrospective pre-post surveys conducted following physician supplemental education sessions.
METHODS: A basal insulin initiation protocol for patients with uncontrolled T2DM (BG > 300) was developed in our academic institution by an interprofessional team consisting of an endocrinologist, an emergency physician, and a pharmacist. The protocol included an EMR order set for bedtime NPH insulin, supplies, and a referral to the diabetes clinic within 7 days of ED visit for one free follow-up visit. At follow-up, a clinical pharmacist and an endocrinologist evaluated patients during a conjunct visit. Survey results were analyzed using Wilcoxon Signed rank to evaluate the EPs' perception of the protocol. The protocol use was analyzed with descriptive analysis.
RESULTS: Results of the protocol use are shown in the table. A survey of 35 emergency medicine attending physicians and residents showed significant increase in comfort and likelihood of insulin initiation in the ED ($p<0.01$).

	Number of patients (% of total)
Total referred	35
Attended follow-up	14 (40)
Newly diagnosed with T2DM	15 (43)
Protocol followed correctly	11 (31)
Protocol followed except for obtaining A1c	13 (37)
Other protocol violations	11 (31)
- Patient already on insulin	5 (14)
- No diabetes	1 (3)
- BG <300	4 (11)
- Metformin initiated	1 (3)

CONCLUSION: Results suggest using a protocol may increase insulin initiation and follow-up planning in the ED. Educational sessions appear to facilitate acceptance by EPs. Further studies will be necessary to evaluate health and operational outcomes.

100. The relationship between nicardipine dosing, blood pressure and body composition in patients with intracranial bleeding. Bridget Batykefer, PharmD Candidate, Jordan R Covvey, PharmD, PhD, BCPS, David E Zimmerman, PharmD, BCPS; Duquesne University Mylan School of Pharmacy, Pittsburgh, PA
INTRODUCTION: Nicardipine is a dihydropyridine used to lower systolic blood pressure (SBP) during intracranial bleeds. Guidelines recommend to acutely SBP to 140 mmHg in patients who present with SBP of 150–220 mmHg with no contraindications to acute treatment. Package labeling recommends initiating nicardipine IV infusion at 5 mg/h and increasing the rate by 2.5 mg/h every 5–15 min up to a maximum of 15 mg/h. There is no guidance on whether larger doses of nicardipine are needed in patients with higher body mass index to reach the same SBP goal.
RESEARCH QUESTION OR HYPOTHESIS: The objective was to assess the relationship between nicardipine dosing and body composition for patients with intracranial bleeding.
STUDY DESIGN: Retrospective cohort analysis in a single-center emergency department setting.

METHODS: Patients diagnosed of intracranial bleeding who received IV nicardipine between January 2013 to December 2015 were included. The primary endpoint was the total dose of nicardipine and timeframe to achieve goal SBP, as stratified by body mass index < or >= 25. IBM SPSS Statistics 22 used for analysis with chi-square and t-tests used for categorical and continuous data comparisons, respectively. The study was IRB-approved.
RESULTS: A total of 75 patients were included. The cohort was 48.0% male, 72.0% Caucasian with a mean age of 69.4 years. The most common type of intracranial bleed was intracerebral (78.7%) and the mean SBP at presentation was 178 mmHg (SD: 32 mmHg). On average, patients required 12.9 mg of nicardipine and 1.5 h to reach a goal systolic blood pressure of <140 mmHg. No statistical differences were present for dose (9.8 vs. 14.9 mg) or time (1.1 vs. 1.8 h) to reach goal as stratified by BMI < or >= 25.
CONCLUSION: Low sample size for patients experiencing intracranial bleeds complicates conclusions regarding nicardipine in this single-center study. These results fail to suggest a relationship between body mass index and nicardipine dose needed to reach goal SBP.

101. Pharmacist-managed bacteremia treatment compared to the historical standard of care in a community hospital emergency department. Annie Torosyan, PharmD, Dustin Waters, PharmD, BCPS, Kevin Myers, PharmD, BCPS, Bryce Bitton, PharmD, BCPS; Department of Pharmacy, Intermountain Healthcare – McKay-Dee Hospital, Ogden, UT
INTRODUCTION: Clinical pharmacist involvement in the emergency department (ED) has recently increased. Although studies have shown better antimicrobial management with pharmacist involvement in the ED, there are currently no studies specifically demonstrating the benefits of an ED pharmacist in the management of bacteremia.
RESEARCH QUESTION OR HYPOTHESIS: Does pharmacist involvement in the management of bacteremia in the ED lead to increased rates of appropriate therapy?
STUDY DESIGN: Retrospective, cohort study.
METHODS: This study was approved by the institutional review board. The authors reviewed all patients who had a positive blood culture drawn in the ED. Antibiotic therapy was compared between a physician-managed cohort (January 2006 to July 2009) and a pharmacist-managed cohort (January 2012 to July 2015). The primary outcome was appropriate antibiotic therapy according to the isolated pathogen. Secondary outcomes were 90-day attributable readmission to the ED and 90-day mortality related to an infectious disease complication. Through www.graphpad.com and Excel, categorical variables were analyzed via the Chi-square test and the Mann-Whitney U test was used for continuous data that was not normally distributed. A p-value of <0.05 was considered statistically significance.
RESULTS: A total of 758 patient cases were reviewed with 107 cases in the physician-managed group and 138 cases in the pharmacist-managed group meeting the inclusion criteria. There was a significant increase in the rate of appropriate antibiotic therapy in the pharmacist-managed cohort compared to the physician-managed cohort (95% vs. 47%, respectively; p<0.0001). There was also a decrease in the rate of 90-day attributable readmission in the pharmacist-managed cohort than in the physician-managed cohort (4% vs. 12%, respectively; p=0.0086).
CONCLUSION: Pharmacist involvement in the management of bacteremia was associated with a significant increase in the rate of appropriate antibiotic therapy and a significant decrease in the 90-day attributable readmission rate.

102. Multicenter retrospective review comparing two different kcentra dispensing practices. Tameka Lewis, PharmD[1], Abby Bailey, PharmD[2], Regan Baum, PharmD[2], Amy Schultz, PharmD[3], Stephanie Thompson, PhD[4], Stephanie Justice, PharmD[5]; (1) Department of Pharmacy, Charleston Area Medical Center, Charleston, WV (2) Department of Pharmacy Services, University of Kentucky HealthCare, Lexington, KY (3) Charleston Area Medical Center (4) CAMC Health Education and Research Institute, Charleston Area Medical Center, Charleston, WV (5) Department of Pharmacy, St. Claire Regional Medical Center, Morehead, KY
INTRODUCTION: Anticoagulants are indicated for a wide variety of medical conditions including atrial fibrillation and venous thromboembolism. Bleeding is a potential adverse event and is a major cause of morbidity and mortality. Factor products used for reversal are either dispensed from the blood bank or the inpatient pharmacy. At the Charleston Area Medical Center (CAMC), Kcentra® is dispensed from the blood bank, whereas at the University of Kentucky Chandler Medical Center (UK) Kcentra® is dispensed directly from pharmacy. There are currently no studies comparing the two dispensing practices.
RESEARCH QUESTION OR HYPOTHESIS: The primary objective was to determine whether there was a difference in the time from order entry to administration of Kcentra®. Secondary outcomes included time from dispensing to administration, total amount used and in-hospital and 28-day mortality.
STUDY DESIGN: Multicenter, retrospective review of patients who presented to the Emergency Departments of CAMC and UK between September 1, 2013 and August 25, 2015.
METHODS: Patients were included if they received Kcentra® for anticoagulation reversal and were at least 18 years of age. Only transfers from outside facilities who had received blood products, vitamin K or any another reversal agent prior to arrival were excluded.
RESULTS: A total of 131 patients met inclusion criteria. Warfarin reversal was the most common indication for Kcentra® at both institutions (64.8% at CAMC vs. 68.3% at UK). The median time from order entry to drug administration between CAMC and UK were 1.35 h (IQR 1.02–2.05) and 0.38 h (IQR −0.13–0.72), respectively (p<0.001). The median time from dispensing to drug administration between CAMC and UK were 0.72 h (IQR 0.40–1.08) and 0.15 h (IQR −0.23–0.55), respectively (p<0.001).
CONCLUSION: There is a significant decrease in time to Kcentra® administration when the medication is dispensed from the pharmacy as opposed to the blood bank.

103. Treatment of cellulitis in patients discharged from the emergency room: appropriateness of single versus dual antimicrobial therapy. Henry Lederer, PharmD, Yelena Atlasevich, PharmD, Eva Sullivan, PharmD, Harminder Sikand, PharmD, FCSHP, FASHP; Department of Pharmacy, Scripps Mercy Hospital, San Diego, CA
INTRODUCTION: Cellulitis is commonly caused by ß-hemolytic streptococci, and less frequently *Staphylococcus aureus*. Methicillin-resistant *Staphylococcus aureus* (MRSA) is not a usual cause of cellulitis. Current guidelines do not recommend agents targeting MRSA for mild or moderate cellulitis without the presence of patient risk-factors. Nonetheless, there is an increased practice of prescribing agents that target MRSA for uncomplicated cellulitis. The primary objectives of this study were to determine the efficacy and safety of single antimicrobial therapy (ST) versus dual antimicrobial therapy (DT) for the treatment of cellulitis in the outpatient emergency department (ED) setting.
RESEARCH QUESTION OR HYPOTHESIS: ST is non-inferior to DT with respect to clinical cure of uncomplicated cellulitis, and is associated with less adverse effects.
STUDY DESIGN: Retrospective, concurrent pilot study.
METHODS: Clinician education was provided prior to study initiation. Patients 18 years and older, discharged from the ED on a minimum of one oral antibiotic were screened for inclusion. Patients were contacted 10 days post discharge. To determine differences between treatment groups, Mann-Whitney U test and Student's t-test were used for continuous data, and Fisher's Exact test was used for categorical data.

RESULTS: Two hundred thirty two patients were screened for inclusion and 57 patients had baseline data analyzed for intent-to-treat analysis. Of these, 26 patients had data points for outcome analysis. Baseline characteristics were well matched between single and dual therapy groups. For 46% of the patients reached at 10 days, clinical cure was achieved in 75% (9/12) of the ST group, and 79% (11/14) of the DT group (p=0.99). Eight percent (1/12) of patients experienced an adverse event in the ST group compared to 50% (7/14) of patients in the DT group (p=0.03).
CONCLUSION: In patients discharged from the ED with a diagnosis of cellulitis, the addition of a second antibiotic targeting MRSA did not improve clinical cure and was associated with more adverse events.

104. Evaluation of the impact of weight estimations on anticoagulation reversal with 4-factor prothrombin complex concentrate (4F-PCC) in the emergency department. Jennifer Vidal, PharmD[1], Gabrielle Procopio, PharmD[2], Brian Faley, PharmD[1]; (1) Hackensack University Medical Center, Hackensack, NJ (2) Ernest Mario School of Pharmacy, Rutgers, The State University of New Jersey, Piscataway, NJ
INTRODUCTION: The approved dosing of 4F-PCC is based off of the initial INR and the patient's actual body weight. Often times the patient's actual body weight is not able to be obtained in the emergency department (ED). Healthcare providers are then required to estimate the patient's weight.
RESEARCH QUESTION OR HYPOTHESIS: Do weight estimations in the ED impact successful anticoagulation reversal with 4F-PCC?
STUDY DESIGN: This is a retrospective chart review that was conducted from January 2013 to August 2015.
METHODS: Patients >= 18 years of age who received 4F-PCC in the ED for reversal of warfarin with an initial INR and an indication for anticoagulation reversal were included in this study. Any patient who expired within 60 min of administration or any patient who received FFP or recombinant Factor VII prior to, concomitantly with, or 60 min after administration of 4F-PCC were excluded. Outcomes included INR pre and post administration of 4F-PCC, thrombotic event within 7 and 30 days, and in-hospital mortality. Mean, median, and interquartile ranges were calculated using Microsoft Excel.
RESULTS: A total of 15 patients were included in the study. The average age of the patients was 80.3 years with 12 (80%) patients receiving 4F-PCC for an intracranial bleed. Sixty percent of patients had their weight underestimated. The maximum overestimated weight was 7.7 kg whereas the maximum underestimated weight was 26.8 kg. The average difference from actual weight overall was 6.5 kg. The mean initial INR was 3.2 and the mean repeat INR was 1.4. Two patients in the study required FFP. One patient experienced a thrombotic event. Mortality in this study was 20%.
CONCLUSION: Weight estimations in the ED may not affect successful anticoagulation reversal with 4F-PCCs. The doses provided effectively reversed the anticoagulation in the majority of patients although two patients required FFP to further reverse their anticoagulation.

105. Evaluation of the efficacy and safety of nifedipine modified release tablets in the acute management of hypertensive urgency in the emergency department: a retrospective analysis. Adham Mohamed, PharmD, Hani Abdelaziz, PharmD, Hani Hamad, MD, Ahmed Shible, BPharm, Sara Elhoshee, BPharm, Rasha Al Anany, PharmD, Muayad Ahmad, MD; Hamad Medical Corporation, Doha, Qatar
INTRODUCTION: Nifedipine modified release (MR) tablets is routinely used to manage hypertensive urgency at our hospital's emergency department (ED). However, nifedipine MR tablet formulation has not been evaluated before in the acute management of hypertensive urgency.
RESEARCH QUESTION OR HYPOTHESIS: To evaluate nifedipine MR tablets efficacy and safety in the acute management of hypertensive urgency.
STUDY DESIGN: Retrospective Cohort
METHODS: All patients who received nifedipine MR 20 mg tablets at Al-Wakra Hospital's ED from June, 2015 to May, 2016 were reviewed. The primary end point was the mean reduction in blood pressure (BP) from baseline. Secondary end points were the incidence of complications (stroke, acute coronary syndromes, and hypotension) and ED revisit within 72 h. Descriptive statistics and paired t-test were used for data analysis.
RESULTS: 780 patients were evaluated. Out of those, 425 patients met the inclusion criteria. The mean age ± SD was 48.34 ± 11.83 years and 299(70.35%) were males. 281(66.1%) patients had a history of hypertension and 179(42.1%) were receiving antihypertensives. The mean systolic BP (SBP) and diastolic BP (DBP) ± SD (mmHg) on ED admission were 200.24 ± 16.93 and 109.99 ± 13.8, respectively. Compared to baseline, mean SBP decreased by 33.3 mmHg (16.6%) (95% CI, 30.4–36.2; p<0.0001) at 30 min, by 39.4 mmHg (19.9%) (95% CI, 36.5–42.3; p<0.0001) at 60 min, and by 46.5 mmHg (23.2%) (95% CI, 43.7–49.3; p<0.0001) at 90 min. Similarly, mean DBP decreased by 14.4 mmHg (13.1%) (95% CI, 12.6–16.1; p<0.0001) at 30 min, by 17.4 mmHg (15.9%) (95% CI, 15.4–19.4, p<0.0001) at 60 min, and by 21.11 mmHg (19%) (95% CI, 19.3–22.9; p<0.0001) at 90 min. Two patients experienced hypotension (SBP < 90 mmHg) and 27(6.35%) patients revisited the ED within 72 h.
CONCLUSION: Nifedipine MR significantly decreased both SBP and DBP during the acute management of hypertensive urgency in the ED. It was also relatively safe however; further studies are needed to confirm such finding.

106. Evaluation of fixed dose 4-factor prothrombin complex concentrate administration for urgent warfarin reversal in patients with intracranial hemorrhage. Rachael Scott, BSc, Megan Nadler, PharmD, BCPS, Brian Kersten, PharmD, BCPS, BCCCP; Department of Pharmacy, Buffalo General Medical Center, Buffalo, NY
INTRODUCTION: Warfarin-related intracranial hemorrhage (wICH) is a major event that can lead to significant morbidity and mortality. Urgent administration of a prothrombin complex concentrate provides rapid reversal of the international normalized ratio (INR) although the optimal dosing regimen of 4-factor PCC (PCC4) has not yet been established. In 2015, our institution transitioned from the recommended weight-based dose to a fixed 1000 IU dose for warfarin reversal in intracranial hemorrhage.
RESEARCH QUESTION OR HYPOTHESIS: Does a fixed-dose of PCC4 achieve similar INR reversal as weight-based dosing in patients with wICH?
STUDY DESIGN: A single-center, retrospective, pre- and post-protocol analysis.
METHODS: We compared a weight-based dose versus 1000 IU PCC4 between January 2014 and May 2016. The primary endpoint was achieving a target INR of < 1.5 after administration. Secondary endpoints included time to administration of PCC4 and patient disposition at time of discharge.
RESULTS: We included 35 patients in the weight-based group and 27 in the fixed-dose group with baseline INRs of 2.76 and 2.29, respectively. Twenty-seven (77%) patients achieved INR < 1.5 in the weight-based group versus 16 (59%) in the fixed-dose group (p=0.13). The median time to administration was 108 versus 94 min respectively (p=0.06). There was no difference in the number of patients discharged to home (23% versus 18%; p=0.76) or in-hospital mortality (23% and 37%; p=0.22).
CONCLUSION: Administration of 1000 IU PCC4 as a fixed-dose in wICH does not differ significantly from routine weight-based dosing in achieving an INR < 1.5.

Endocrinology

107. Comparable steady-state total testosterone exposure from intramuscular or subcutaneous administration in transgender males. Tony KL Kiang, BScPharm, PhD, ACPR[1], David Wilson, MD[2], Mary Ensom, BSPharm, PharmD, FASHP, FCCP, FCSHP, FCAHS[3]; (1) Department of Pharmacy, Vancouver General Hospital, Vancouver, BC, Canada (2) Vancouver Coastal Health (3) Faculty of Pharmaceutical Sciences, University of British Columbia, Vancouver, BC, Canada

INTRODUCTION: Intramuscular (IM) testosterone injection is the primary pharmacological tool in gender affirming therapy for transgender males (born female). Due to perceived limitations with IM injection (pain, bleeding, erratic absorption), a trend for using subcutaneous (SC) testosterone is evident in the transgender community. However, data are lacking supporting comparable pharmacokinetic characteristics between the two routes of administration.

RESEARCH QUESTION OR HYPOTHESIS: Transgender males can attain comparable testosterone exposure from SC versus IM administration.

STUDY DESIGN: Prospective, open-label, cross-over study enrolling adult subjects already on weekly testosterone IM injection (cypionate or enanthate). Subjects received testosterone IM for 3 weeks and switched to SC for 8 weeks. Trough testosterone concentrations were determined weekly and serial concentrations (on days 1,3,5) determined at weeks 2 and 7 (steady-state conditions) for exposure determination.

METHODS: Age, body-mass index, hemoglobin (Hgb), and alanine transaminase (ALT) were collected at the first visit. Hgb and ALT were repeated at the last visit. Total serum testosterone concentrations were determined by validated enzyme-linked immunoassay and dose-normalized area-under-the curve (AUC), as a measure of exposure, was calculated using the trapezoid rule. Statistical difference ($p<0.05$) was determined using Wilcoxon signed-rank test (SigmaStat 3.5).

RESULTS: For the entire sample (N=14): age (30 ± 10 yrs) (mean±SD), dose (68 ± 23 mg), body-mass index (27 ± 7 kg/m^2), hemoglobin (160 ± 9 vs. 153 ± 9 g/L, first vs. last visit, $p>0.05$), and alanine transaminase (18 ± 6 vs. 21 ± 10 IU/L, $p>0.05$). Total testosterone exposure from IM injection (1.9 ± 0.6 nmole*day/L/mg) was not significantly different compared to SC (1.7 ± 0.6 nmole*day/L/mg). No apparent trends were observed in trough testosterone concentrations collected at each study week (0.2–0.3 nmole/L/mg).

CONCLUSION: To our knowledge, this is the first study comparing steady-state testosterone AUCs in transgender males using SC and IM administration. Our finding that SC injection produces comparable exposure as IM administration suggests the suitability of using the less invasive SC approach in this population.

108E. Achieving the composite endpoint of A1C, body weight, and systolic blood pressure reduction with canagliflozin in patients with type 2 diabetes. Katherine Merton, PhD, MBA[1], Michael Davies, PhD[1], Ujjwala Vijapurkar, PhD[2], Doreen Inman, PharmD, MBA, BCPS, CDE[1], Gary Meininger, MD[2]; (1) Janssen Scientific Affairs, LLC, Raritan, NJ (2) Janssen Research & Development, LLC, Raritan, NJ

Presented at 25th Annual Scientific and Clinical Congress of the American Association of Clinical Endocrinologists, May 25–29, 2016; Orlando, Florida.

109E. Reduced hypoglycemia and comparable efficacy with insulin glargine 300 U/mL (Gla-300) versus insulin glargine 100 U/mL (Gla-100) in subjects with T2D achieving different levels of pre-breakfast SMPG. Timothy Reid, MD[1], Ola Odugbesan, MD[2], Jasvinder Gill, MD[3], Elena Nikonov, MD[4], Jason Chao, PhD[3], Timothy Bailey, MD[5]; (1) Mercy Diabetes Center (2) North Atlanta Endocrinology and Diabetes, Lawrenceville, GA (3) Sanofi US, Inc. (4) Sanofi, Inc. (5) AMCR Clinic, Escondido, CA

Presented at the 25th Annual Scientific & Clinical Congress of the American Association of Clinical Endocrinologists, Orlando, FL, May 25–29, 2016.

110E. Reduced hypolycemia and comparable efficacy with insulin glargine 300 U/ml in insulin naive subjects with T2D achieving different levels of pre-breakfast SMPG. Timothy Bailey, MD[1], Jason Chao, PhD[2], Jasvinder Gill, MD[2], Elena Nikonov, MD[3], Ola Odugbesan, MD[4], Timothy Reid, MD[5]; (1) AMCR Clinic (2) Sanofi US, Inc. (3) Sanofi, Inc., Escondido, CA (4) North Atlanta Endocrinology and Diabetes, Lawrenceville, GA (5) Mercy Diabetes Center

Annual Scientific & Clinical Congress of the American Association of Clinical Endocrinologists, Orlando, FL, May 25–29, 2016.

111E. Efficacy and safety of the insulin glargine/lixisenatide fixed-ratio combination versus insulin glargine in patients with T2DM: the LixiLan-L trial (NCT02058160). Vanita Aroda, MD PhD[1], Julio Rosenstock, MD[2], Carol Wysham, MD[3], Jeffrey Unger, MD, ABFM, FACE[4], Diego Bellido, MD[5], Guillermo Gonzalez-Galvez, MD[6], Hailing Guo, Msc, MBA[7], Akane Takami, MD[8], Elisabeth Niemoeller, MD[9], Elisabeth Souhami, MD[10], Richard Bergenstal, MD[11]; (1) Medstar Health Research Institute, Hyattsville, MD (2) Dallas Diabetes and Endocrine Center, Dallas, TX (3) Rockwood Clinic, Spokane, WA (4) Catalina Research Institute LLC, Chino, CA (5) Complexo Hospitalario Univ Ferrol, 15405 Ferrol, A Coruna, Spain (6) Jalisco Institute of Diabetes & Obesity, Guadalajara, CP 44600, Mexico (7) BMD Consulting Inc, Somerset, NJ (8) Sanofi, Tokyo, Japan (9) Sanofi, Frankfurt, Germany (10) Sanofi, Paris, France (11) International Diabetes Center, Minneapolis, MN

Presented at the 76th Scientific Sessions of the American Diabetes Association, New Orleans, LA, June 10–14, 1016.

112E. Efficacy and safety across the final dose ranges in patients with T2DM receiving insulin glargine/lixisenatide fixed-ratio combination in the LixiLan-L trial (NCT02058160). Robert Ritzel, MD[1], Josep Vidal, MD, PhD[2], Vanita Aroda, MD PhD[3], Yujun Wu, PhD[4], Elisabeth Souhami, MD[5], Elisabeth Niemoeller, MD[6], Robert R Henry, MD[7]; (1) Klinikum Schwabing, Stędtisches Klinikum Munchen GmbH, Munich, Germany (2) Department of Endocrinology and Nutrition, Hospital Clinic of Barcelona, Spain (3) Medstar Health Research Institute, Hyattsville, MD (4) Biostatistics and Programming, Sanofi-Aventis US, Bridgewater, NJ (5) Sanofi, Paris, France (6) Sanofi, Frankfurt, Germany (7) UC San Diego and Section of Diabetes, Endocrinology, and Metabolism, Veterans Affairs San Diego Healthcare System, Center for Metabolic Research, San Diego, CA

Presented at American Diabetes Association's 76th Scientific Sessions, New Orleans, Louisiana, June 10–14, 2016.

113E. Clinical impact of titratable fixed-ratio combination of insulin glargine/lixisenatide vs each component alone in type 2 diabetes inadequately controlled on oral agents: LixiLan-O trial (NCT02058147). Julio Rosenstock, MD[1], Ronnie Aronson, MD[2], Markolf Hanefeld, MD, PhD[3], Piermarco Piatti, MD[4], Pierre Serusclat, MD[5], Xi Cheng, MD, MPhil[6], Tianyue Zhou, PhD[7], Elisabeth Niemoeller, MD[8], Elisabeth Souhami, MD[9], George Grunberger, MD[10], Melanie Davies, MD[11]; (1) Dallas Diabetes and Endocrine Center, Dallas, TX (2) LMC Diabetes & Endocrinology, Toronto, ON, Canada (3) Center for Clinical Studies, GWT-TUD GmbH, Dresden, Germany (4) Unità Operativa di Medicina Generale a Indirizzo Diabetologico ed Endocrino-Metabolico, Milan, Italy (5) Groupe Hospitalier Mutualiste Les Portes du Sud, Vénissieux, France (6) Sanofi

R&D, Beijing, China (7) Sanofi, Bridgewater, NJ (8) Sanofi, Frankfurt, Germany (9) Sanofi, Paris, France (10) Grunberger Diabetes Institute, Bloomfield Hills, MI (11) University of Leicester, Diabetes Research Centre, United Kingdom
Presented at American Diabetes Association's 76th Scientific Sessions, New Orleans, Louisiana, June 10–14, 2016.

Family Medicine

114. Evaluating metformin based dual therapy of individuals with type 2 diabetes mellitus in a primary care clinic. Kimberly L. Zitko, PharmD[1], Amy M. Drew, PharmD, BCPS[1], Carmen B. Smith, PharmD, BCPS[2]; (1) Mercy Hospital St. Louis, St. Louis, MO (2) St. Louis College of Pharmacy, St. Louis, MO
INTRODUCTION: Current recommendations for type 2 diabetes mellitus (T2DM) do not prioritize a second line medication for those who fail glycemic targets after three months of lifestyle interventions and metformin monotherapy.
RESEARCH QUESTION OR HYPOTHESIS: Which metformin based dual therapy is most efficacious in individuals with T2DM?
STUDY DESIGN: Retrospective cohort study.
METHODS: Patients >= 18 years of age in a primary care clinic taking metformin plus one additional agent for T2DM were included. Primary objective was to identify the mean change in A1c after three months of metformin based dual therapy among different antiglycemic drug class combinations. Secondary outcomes included the mean change in A1c after six, nine, & twelve months among the groups. Statistical tests included descriptive statistics, student's t-test for continuous outcomes, and an ANOVA test for differences among the combinations.
RESULTS: A total of 105 patients met inclusion criteria. Of these 75% were on a sulfonylurea, 15% basal insulin, 6% DPP-IV inhibitor, 3% GLP-1 receptor agonist, and 1% thiazolidinedione. After three months of metformin based dual therapy, 12 patients were controlled to an A1c < 7%.Of those controlled, 36% (8/12) were controlled on a sulfonylurea, 43% (3/7) on basal insulin and 33% (1/3) on a DPP-IV inhibitor. The difference from baseline A1c at three months was −0.09 for sulfonylureas (p=0.81), −0.9 for basal insulin (p=0.18), and −0.7 for DPP-IV inhibitors (p=0.24). No significant difference in A1c between treatment groups was found after three months (p=0.91).
CONCLUSION: Basal insulin was associated with the greatest reduction in A1c at three months. The majority of patients were taking a combination of metformin plus sulfonylurea. This group also experienced the least A1c reduction. These results may influence greater utilization of the other dual therapy combinations.

115. Student pharmacist contributions in Rutgers student-run free clinics. Daniel Dipsia, Student[1], Megan Maroney, PharmD[2], Justin Lim, Student[1]; (1) Rutgers University, Ernest Mario School of Pharmacy, Piscataway, NJ (2) Department of Pharmacy Practice, Rutgers University, Ernest Mario School of Pharmacy, Piscataway, NJ
INTRODUCTION: The Interdisciplinary Education (IPE) Student Clinic Program initiative at Rutgers University allows pharmacy students to participate in clinical care within student doctor teams and gain interdisciplinary clinical experience. This study assessed how students utilized opportunities to make interventions and measured how often their recommendations were accepted and suggested by their teams.
RESEARCH QUESTION OR HYPOTHESIS: The student doctor teams will accept student pharmacist suggestions 70% of the time, the attending physician will accept suggestions 30% of the time, and preceptors will accept suggestions about 50% of time.
STUDY DESIGN: A voluntary and anonymous survey was distributed to P2, P3 and P4 pharmacy students from Rutgers University Ernest Mario School of Pharmacy. It was distributed to every student who participated in a clinic session between October 20, 2015 to May 12th, 2016.
METHODS: Students who volunteered at the Robert Wood Johnson or New Jersey Medical School-affiliated student-run free clinics submitted the electronic survey consisting of ten questions assessing how often students made interventions and how often they were accept by their peers. Descriptive analysis was used to summarize the data.
RESULTS: There were a total of 34 students who participated in the clinics (survey response rate of 67.6%). About 65.2% of the students who responded to the survey presented prescribing recommendations to the physician. The survey also showed that 93.3% of the students' recommendations were accepted by their medical student doctor teams; 93.3% of students' preceptors agreed with the student doctor team recommendations; and 73.3% of the students' recommendations were accepted by the physician.
CONCLUSION: This survey indicated that pharmacy students actively contributed to the student doctor teams to provide recommendations for the patients at the clinics. This survey shows that when given the opportunity, pharmacy students can make significant clinical interventions and have an impact in a healthcare team.

116. Association of obesogenic medications with weight gain during a weight loss intervention. Ashley Crowl, PharmD, BCACP[1], Annie Harvey, PhD[2]; (1) Pharmacy Practice Department, University of Kansas School of Pharmacy, Wichita, KS (2) Via Christi Health Family Medicine Residency Program, Wichita, KS
INTRODUCTION: A weight-loss program was designed by faculty of a large family medicine residency program to assist obese, indigent, adults. The target was loss of 5% of body weight over a 6-month interval, but majority of subjects did not achieve this goal. There were no exclusions based on medication use. This study sought to identify medications associated with weight-gain or weight-loss that may have impacted a patient's ability to lose weight.
RESEARCH QUESTION OR HYPOTHESIS: Were patients participating in a weight-loss intervention program who gained 5% weight over the 6-month study, as compared to those who lost 5%, prescribed more obesogenic medications?
STUDY DESIGN: Secondary data-analysis of a cohort of obese indigent outpatients referred to a lifestyle intervention program. This study was approved by Via Christi IRB in December 2015.
METHODS: Medications were documented at the time of enrollment into the weight-loss program during the patient's initial clinic visit and were identified retrospectively via the electronic health record. Medications were classified as obesogenic if weight gain was listed in the medication's package insert. Each patient's weight change was categorized as: lost 5% and gained 5%. A non-parametric rank test was applied to compare the number of obesogenic medications prescribed to gainers and losers of 5% body weight.
RESULTS: The 18 patients who lost 5% were prescribed a median 1.0 obesogenic medications (IQR: 0.5 - 3.0). The 12 patients who gained 5% were prescribed a median 1.5 obesogenic medications (IQR: 0 - 2). Mann-Whitney nonparametric test detected no statistically significant difference between the two groups (p=.86).
CONCLUSION: In this weight-loss intervention program, the number of medications associated with weight gain did not differ between patients who lost 5% or more of weight compared with those that gained 5% or more.

117. Integration of clinical pharmacists in family medicine residency programs. Jody Lounsbery, PharmD, BCPS[1], Jennie Jarrett, PharmD, BCPS, MMedEd[2], Lori Dickerson, PharmD, FCCP[3], Stephen Wilson, MD, MPH, FAAFP[4]; (1) Department of Pharmaceutical Care & Health Systems, University of Minnesota College of Pharmacy, Minneapolis, MN (2) UPMC St. Margaret Family Medicine Residency Program, UPMC St. Margaret, Pittsburgh, PA (3) Department of Family Medicine, Medical

University of South Carolina, Charleston, SC (4) UPMC St. Margaret Family Medicine Residency Program, Pittsburgh, PA
INTRODUCTION: Clinical pharmacists are valued educators and practitioners within family medicine residency programs (FMRPs). Since the last survey of clinical pharmacists within FMRPs in 2002, there have been significant advancements to pharmacy education and training as well as growth of interprofessional education and collaborative practice within family medicine.
RESEARCH QUESTION OR HYPOTHESIS: To describe the integration of clinical pharmacists within FMRPs.
STUDY DESIGN: Cross-sectional study.
METHODS: All 480 Accreditation Council for Graduate Medical Education (ACGME)-approved FMRPs were contacted to identify clinical pharmacists involved with their programs. An electronic survey was distributed to those identified pharmacists in September 2015. Questions addressed educational, clinical, scholarly, and administrative activities. Descriptive statistics were used to summarize the data.
RESULTS: Of 396 FMRPs reached, 208 (52.5%) FMRPs reported 253 clinical pharmacists within their programs. Survey responses were received from 142 (56.1%) clinical pharmacists. Academic appointments in colleges/schools of pharmacy and medicine were held by 105 (75.5%) and 69 (50.0%) respondents, respectively. Eighty-nine (64.0%) respondents reported a single source of salary. Of those, 35 (39.3%) respondents reported full funding support from the college/school of pharmacy and 17 (19.1%) respondents reported full support from the FMRP. Clinical pharmacists dedicated 50.4% of their overall time to the FMRP, and 14.5% of respondents reported being fully dedicated to the FMRP. Average time within the FMRP included patient care (52.9%), teaching (31.6%), research/scholarship (7.5%), administrative activities (5.9%), and drug distribution (0.7%).
CONCLUSION: Prevalence of clinical pharmacists within FMRPs has increased since 2002. However, the amount of time dedicated to the FMRPs has decreased. In addition, the focus of has shifted from teaching to a more clinical role, supporting the growth of patient-centered, interprofessional care. Clinical pharmacists becoming recognized by the ACGME as faculty may augment their administrative and educational roles in the future.

Gastroenterology

118E. Relative bioavailability, effect of food, and swallowability of a new, age-appropriate, delayed-release mesalamine formulation in healthy volunteers. Abhijeet Jakate, PhD[1], Brian McNamee, PhD[2]; (1) Allergan plc, Jersey City, NJ (2) Clinical Pharmacology, Allergan Biologics Limited, Liverpool, United Kingdom
Presented at World Congress of Pediatric Gastroenterology, Hepatology and Nutrition, Montreal, Canada, October 5–8, 2016.

Geriatrics

120. The relationship of cognitive function on disease outcomes in older hispanics with type 2 diabetes: a pilot study. Joshua Caballero, PharmD[1], Raymond Ownby, MD, PhD[2], Robin Jacobs, PhD[3], Naushira Pandya, MD[4], Patrick Hardigan, PhD[5]; (1) Nova Southeastern University, College of Pharmacy, Davie, FL (2) Department of Psychiatry; College of Osteopathic Medicine, Nova Southeastern University, Ft. Lauderdale, FL (3) Department of Psychiatry & Behavioral Medicine, Nova Southeastern University College of Osteopathic Medicine, Ft. Lauderdale, FL (4) Department of Geriatrics, College of Osteopathic Medicine, Nova Southeastern University, Ft. Lauderdale, FL (5) Health Professions Division, Nova Southeastern University, Fort Lauderdale, FL
INTRODUCTION: Type 2 diabetes (T2D) can be associated with cognitive impairment. It is unknown if cognitive difficulties impede patients' ability to follow treatment instructions, particularly older Hispanics who typically experience higher levels of non-adherence. It is unclear which cognitive tests, if any, are more sensitive in determining adherence and health outcomes. Pharmacists, who are on the forefront of providing comprehensive medication management, seldom assess cognitive function in their patients.
RESEARCH QUESTION OR HYPOTHESIS: The primary objective was to determine if cognitive impairment is associated with medication adherence and health outcomes in Hispanic older adults with T2D. Secondary objectives assessed additional factors that may contribute to a greater risk of non-adherence or adverse health outcomes.
STUDY DESIGN: After Institutional Review Board approval, a prospective cross-sectional pilot study in ambulatory Hispanic participants aged 65 years or older was conducted.
METHODS: Glycosylated hemoglobin (HbA1c) was measured using point of care testing (DCA Vantage Analyzer). Cognitive function was measured by the Executive Interview (EXIT 25) and the Executive Clock Drawing Task (CLOX1). Medication adherence was assessed using the visual analog scale. Descriptive statistics, Fisher's exact test, or correlation analysis were conducted using a p-value of 0.05.
RESULTS: Thirty-eight participants with a mean age of 75 years ($\pm$ 7.3) participated. CLOX1 scores were correlated with medication adherence (df=36, $r = 0.335$); greater cognitive impairment was associated with lower medication adherence. Cognition and adherence were not associated with health outcomes (e.g., HbA1c); however, 90% of those with poor cognition (CLOX scores < 10) used a pill box or had help with taking medications.
CONCLUSION: The CLOX1 may be helpful with older Hispanics with T2D to determine medication adherence. Employing a pill box may be useful for those with cognitive impairment. Further research is needed to corroborate findings and develop cogent strategies to increase adherence when cognitive impairment is identified.

121. A prevalence study of potentially inappropriate medications use in hospitalized Pakistani elderly. Faizan Mazhar, PharmD, Mphil, BCPS[1], Shahzad Akram, PharmD, BCPS[2], Nafis Haider, BPharm, PhD[1], Saima Mahmood Malhi, BPharm, PhD[3], Saima Mahmood Malhi, BPharm, PhD[3]; (1) King Fahad Military Medical Complex, Dhahran, Saudi Arabia (2) Pharmaceutical Care, King Abdulaziz Medical City, Riyadh, Saudi Arabia (3) Pharmacy practice, Dow College of Pharmacy, Karachi, Pakistan
INTRODUCTION: Inappropriate prescribing in elderly patients is a widespread health problem and associated with increased adverse reactions and increased health spending.
RESEARCH QUESTION OR HYPOTHESIS: To determine the prevalence and types of potentially inappropriate medications (PIMs) according to census validated criteria in the polypharmacy elderly admitted in an Internal Medicine Department and the factors associated with their use.
STUDY DESIGN: A cross-sectional study conducted among 228 hospitalized polypharmacy elderly patients in a tertiary care teaching hospital of Karachi city
METHODS: Based on previously published criteria (Beers and STOPP) a list of 32 PIMs was developed using a Delphi technique which was used as a tool to detect the prevalence of PIMs. Age, gender, comorbidity, functional status, complete medication history recorded, and the prevalence of PIMs identified. The association between PIMs used and independent variables were also analyzed
RESULTS: The prevalence rate of PIMs was 64%. PIMs use according to ST0PP criteria was identified in 44% of patients whereas Beers' listed PIMs were identified in 50% of patients. The most frequently observed PIMs were the combination of NSAIDs with antihypertensive and long term NSAIDs, which accounts for more than 90% and 75% of the total observed PIMs, respectively. Patients with age >= 85 years were more likely to prescribe PIMs. High co-morbidity was found to be an independent predictor of PIM use. Polypharmacy >= 10 drugs predicted the presence of PIMs

CONCLUSION: The study demonstrates a very high prevalence of utilization of PIMs in hospitalized elderly patients. The consensus-validated list of PIMs proves to be a useful tool for screening inappropriate prescribing in this particular patient population. Our findings support the need for measures to improve the quality of drug treatment in the Pakistani elderly population especially on dependent patients with polypharmacy.

122. Relationships between Antihypertensive Medication Adherence, Age, Comorbidities, and Blood Pressure Control in Elderly Patients with Diabetes. Marsha Raebel, PharmD[1], Gregory Nichols, PhD[2], Wendy Dyer, MS[3], Julie Schmittdiel, PhD[3]; (1) Institute for Health Research, Kaiser Permanente Colorado, Denver, CO (2) Center for Health Research, Kaiser Permanente Northwest, Portland, OR (3) Division of Research, Kaiser Permanente Northern California, Oakland, CA

INTRODUCTION: Studies demonstrate adherence to antihypertensive medications is associated with blood pressure (BP) control in patients with diabetes, but most studies had few patients aged > 65 or with multiple comorbid conditions.

RESEARCH QUESTION OR HYPOTHESIS: What is the relationship between older age or comorbidities and antihypertensive medication adherence? What is the effect of a defined level of adherence on BP control in a Medicare-aged population?

STUDY DESIGN: Retrospective, observational cohort study of patients with diabetes aged > 65 from three Kaiser Permanente regions.

METHODS: The data source was the SUrveillance PREvention and ManagEment of Diabetes Mellitus (SUPREME-DM) DataLink, a multisite diabetes registry. We calculated proportion of days covered (PDC) for antihypertensives, considering PDC > 0.8 adherent. BP control was defined as < 130/80 mm/Hg (target recommended during study period). We used modified Poisson regression to assess relationships.

RESULTS: This cohort included 129,040 patients: 24% aged > 80; 27% had > 4 comorbidities. Antihypertensives were dispensed to 84,452; 81% had PDC > 0.8. Systolic BP was <130 in 61%. Ages > 85 was associated with lower adherence: Risk Ratio (RR) 0.99, 95% Confidence Interval (CI) 0.97–0.99 vs. ages 65–59. High comorbidity (all elderly ages) was associated with lower adherence: > 4 comorbidities RR 0.88 (0.87–0.89) vs. no comorbidity. Among patients with PDC > 0.8, an association between adherence and BP control was not present among very elderly (ages > 85 RR 0.95 [0.90–1.01], ages 65–69 RR 1.06 [1.04–1.09]), or those with multiple comorbidities (> 4 comorbidities RR 1.01 [0.96–1.05]), 0 comorbidity RR 1.05 [1.02–1.08]).

CONCLUSION: Very elderly patients with diabetes are less likely to achieve antihypertensive adherence than younger elderly. Patients > 65 with diabetes and multiple comorbidities are also less likely to be adherent to antihypertensives than those without comorbidity. Adherence is not tightly linked to BP control in very elderly patients or in elderly patients of any age with multiple comorbidities.

123. Haloperidol versus non-haloperidol antipsychotics for the management of delirium in an inpatient geriatric palliative care population. Maria Felton, PharmD[1], Jennie Jarrett, PharmD, BCPS, MMedEd[2], Richard Hoffmaster, MD[3], Heather Sakely, PharmD, BCPS[4], Frank D'Amico, PhD[5], Jennifer Pruskowski, PharmD, BCPS, CGP, CPE[6]; (1) Department of Medical Education, UPMC St. Margaret, Pittsburgh, PA (2) UPMC St. Margaret Family Medicine Residency Program, UPMC St. Margaret, Pittsburgh, PA (3) Geriatric Care Center, UPMC St. Margaret, Pittsburgh, PA (4) Graduate Medical Education, UPMC St. Margaret, Pittsburgh, PA (5) UPMC St. Margaret (6) Palliative and Supportive Institute (PSI), University of Pittsburgh Medical Center, Pittsburgh, PA

INTRODUCTION: Palliative care aims to improve the quality of life for patients with life-threatening illnesses by managing patient-specific symptoms. Delirium is a commonly distressing symptom and is associated with increased healthcare costs, length of stay, and mortality. The objective of this study was to evaluate the use of haloperidol compared to non-haloperidol antipsychotics (olanzapine, risperidone, quetiapine) for the management of delirium in older adults (>= 65 years old) receiving inpatient specialist-driven palliative care in nine academic and community hospitals.

RESEARCH QUESTION OR HYPOTHESIS: Patients receiving haloperidol would experience a shorter length of stay than non-haloperidol group.

STUDY DESIGN: Retrospective chart review.

METHODS: Hospitalized patients >= 65 years old with a diagnosis of non-alcohol withdrawal delirium defined by ICD-9 coding and with palliative care consultation between September 2014–2015 were included (n=319). Patient demographic information was compiled using descriptive statistics. The primary outcome was length of stay after delirium diagnosis. Secondary outcomes included delirium symptom length, sedation score 72 h post-treatment, and corrected QT interval. Parametric statistical analysis including one-way ANOVA testing was used to analyze the results.

RESULTS: The length of stay in the haloperidol and non-haloperidol groups was 12.12 (4.7–19.5) and 8.6 (5.1–12.3) days, respectively. Delirium length in the haloperidol and non-haloperidol groups was 6.8 (5.3–8.0) and 5.3 (4.7–6.0) days, respectively. The corrected QT interval was prolonged (> 500 ms for males or > 480 ms for females) in 15.0% of haloperidol recipients and 8.4% in the non-haloperidol group (p=0.09). A validated tool documented in the EHR for sedation score of 2 or 3 (slightly arousable to unarousable) occurred in 24.2% of the haloperidol recipients and 6.3% in the non-haloperidol group (p=0.001).

CONCLUSION: There was no difference in the length of stay, delirium length, or QTc prolongation between haloperidol and non-haloperidol antipsychotics. Those receiving haloperidol were significantly more likely to experience sedation. Future research should focus on comparing outcomes between individual antipsychotics.

124E. Maintaining glycemic control on Gla-300 while decreasing hypoglycemia in an aging type 2 diabetes (T2D) population: 12-month results (edition2, edition 3). Medha Munshi, MD[1], Meenakshi Patel, MD[2], Jason Chao, PhD[3], Elena Nikonov, MD[4], Jasvinder Gill, MD[3]; (1) Joslin Diabetes Center, Boston, MA (2) Valley Medical Primary Care (3) Sanofi US, Inc., Escondido, CA (4) Sanofi, Inc.

Presented at AACE 2016.

125. Comparison of opioid-treated nursing home residents (NHR) with and without opioid-induced constipation (OIC). Barbara Zarowitz, PharmD[1], Terrence O'Shea, PharmD[2], Carrie Allen, PharmD[3], Catherine Datto, MD, MS[4], Tope Olufade, PhD, MPH[5]; (1) Geriatric Center of Clinical Excellence, CVS Health, Livonia, MI (2) Geriatric Center of Clinical Excellence, CVS Health, Englewood, OH (3) Geriatric Center of Clinical Excellence, CVS Health, San Antonio, TX (4) AstraZeneca Pharmaceuticals LP, Wilmington, DE (5) Health Economics and Outcomes Research, Astra Zeneca, Delaware, RI

INTRODUCTION: Management of chronic pain in NHR is complex due to age-related changes in pain perception and risk for adverse consequences of drug therapy. Of these consequences, OIC presents an ongoing challenge in NHR; thus, a better understanding of OIC in NHR is needed.

RESEARCH QUESTION OR HYPOTHESIS: NHR with OIC are more likely to have severe pain, falls, delirium, underlying conditions and receive non-opioid medications that contribute to constipation.

STUDY DESIGN: A retrospective, cross-sectional, database analysis was conducted to compare characteristics of NHR with OIC with an age range- and gender-matched cohort of NHR without OIC.

METHODS: De-identified Minimum Data Set (MDS) assessments were linked to prescription claims for the period of 10/1/

2010 – 9/30/2012 for NHR ≥ 18 years old, without cancer, prescribed routinely scheduled opioids. NHR had at least 1 full MDS assessment following opioid initiation. NHR with constipation documented on the MDS (item H0600 = yes and/or or ICD-9 code 564.0X) were matched by age range and gender to NHR without documentation of constipation. Clinical characteristics and drug therapy were compared. Chi-squared testing with SAS version 9.4 was used to assess differences for categorical variables with alpha set *a priori* at 0.05.
RESULTS: The prevalence of OIC in 56,471 NHR was 8.9% (n=5,036). NHR with OIC had more falls with injuries (4.8% vs. 2.5%, p=0.023), surgical wounds (30.6% vs. 23.9%, p<0.001), severe pain (31.3% vs. 29%, p<0.001), cognitive impairment (27.3% vs. 23.8%, p<0.001), delirium (12.3% vs. 9.6%, p<0.001), moderate-severe depression (12.8% vs. 9.3%, p<0.001), and urinary incontinence (59.1% vs. 54.9%, p<0.001). More NHR with OIC received strong opioids (54.7% vs. 47.1%, p<0.001) and anticholinergic medications (76.7% vs. 70.0%, p<0.001).
CONCLUSION: NHR with OIC, as defined in this analysis, are more likely to have comorbidities and receive medications that further-complicate the management of OIC.

126. Assessment of cost of urinary tract infections in older dementia patients residing in assisted living facility. Sheetal Dharia, PharmD, PhD[1], Kristy Shaeer, PharmD[2], Sheeba Varghese-Gupta, MPharm, PhD[3]; (1) Clinical Pharmacokinetics and Pharmacodynamics, Abbvie, North Chicago, IL (2) Department of Pharmacotherapeutics and Clinical Research, University of South Florida College of Pharmacy, Tampa, FL (3) Department of Pharmaceutical Sciences, University of South Florida College of Pharmacy, Tampa, FL
INTRODUCTION: Urinary tract infections (UTI) are the second most common type of infection in elderly and a common reason for hospital admission.1,2 The estimated annual cost of community-acquired UTI is approximately $1.6 billion3 with the cost in dementia predicted to be higher due to increased risk of hospitalization, morbidity, and mortality.
RESEARCH QUESTION OR HYPOTHESIS: Aim of this study is to assess the cost of UTI in older dementia patients residing in a mid to low income memory care ALF
STUDY DESIGN: Retrospective chart review
METHODS: A 5-year retrospective chart review was conducted to assess the cost of UTI by estimating the average wholesale price (AWP) of antibiotics used to treat the UTI, cost of urinalysis, culture, and sensitivity. Relevant data collected included demographics, date of diagnosis, relevant laboratory testing, antibiotic regimen, and complications associated with UTI. Estimated Medicare costs were obtained from 2015–2016 billing.
RESULTS: From 2011–2015, there were 85 documented UTI in 38 residents, 65 were in women. In 46.7% of cases, urinalysis and/or culture and sensitivity were ordered, of which 51.1% were positive urine cultures. The estimated cost of urinalysis with culture and sensitivity is $1106.44 for all cases. Treatment was prescribed and taken in 83.5% of residents, with the majority receiving ciprofloxacin (28.2%). The average duration of therapy was 7.35 days with an average cost of $92.50 for antibiotic treatment.
CONCLUSION: The average diagnosis and medication cost for a dementia resident at a mid- to low- socioeconomic memory care ALF was $118.23 per case. This cost is an underestimation as at least two patients were hospitalized during their treatment. Additionally, this amount does not include the cost of one-to-one skilled nursing, care products (i.e. adult diapers), medication for increased behavioral symptoms, and other related complications. The total cost of a UTI for a patient on Medicare can be significant.

127. The impact of outpatient clinical decision support on high risk medication prescribing in the elderly. Erin Neal, PharmD[1], Shane Stenner, MD, MS[2], Scott Nelson, PharmD, MS[2], Joseph LeGrand, PharmD[2]; (1) Vanderbilt Health Affiliated Network, Nashville, TN (2) Vanderbilt University Medical Center, Nashville, TN
INTRODUCTION: High risk medications (HRMs), such as those with high anticholinergic and antihistaminergic activity are associated with increased morbidity and mortality in the elderly. The American Geriatrics Society recommends avoiding HRMs in older adults to improve safety and quality of care. Several interventions have targeted HRM prescribing in the elderly with inconsistent results, and only a few have incorporated clinical decision support (CDS) at the point of prescribing.
RESEARCH QUESTION OR HYPOTHESIS: What impact does CDS have on outpatient prescribing of high risk medications in the elderly?
STUDY DESIGN: Retrospective Observational
METHODS: Evidence-based CDS for HRMs was developed and incorporated into the electronic prescribing system in December 2015. CDS triggers a Potentially Safer Medication (PSM) alert within the e-prescribing workflow when an HRM prescription is initiated for a patient 65 years or older. The alert displays a list of PSMs organized by possible indication, and also gives the user an option to continue with the current HRM. Prescribing rates of HRMs before and after implementation of the CDS were compared using negative binomial regression to evaluate for significance
RESULTS: The most commonly prescribed HRMs before and after the intervention include sedative hypnotics, muscle relaxants, and tricyclic antidepressants. Following implementation of CDS, the proportion of HRM prescriptions written in the elderly decreased by 11% (p<0.001). Medications significantly impacted by the intervention include megestrol (−36.3%, p=0.006), estrogens (−12.8%, p=0.043), and muscle relaxants (−10.9%, p=0.006). The proportion of prescriptions for all other HRM classes decreased as well; however, the decrease was not statistically significant.
CONCLUSION: CDS at the point of prescribing effectively reduces the incidence of HRM prescribing in the elderly, though the impact is variable across medication classes. Other methods to decrease prescribing of the most frequently prescribed HRMs such as sedative hypnotics and tricyclic antidepressants should be evaluated in future studies.

128. Community outreach programs to enhance health knowledge in the elderly. Sum Lam, PharmD; College of Pharmacy and Health Sciences, St. John's University, Queens, NY
INTRODUCTION: Older adults are more likely to experience drug related problems. Medication education is important for seniors and their caregivers.
RESEARCH QUESTION OR HYPOTHESIS: Community outreach programs provide a platform for Doctor of Pharmacy students to enhance patient knowledge on pharmacy and health topics.
STUDY DESIGN: Prospective evaluation of the perception and benefits of community outreach programs for older adults.
METHODS: Six community outreach programs on healthy lifestyle/fall prevention, drug safety, and therapy options for Alzheimer disease/Parkinson Disease, were conducted at community partner sites between June and November of 2015. The presentations consisted of lectures, discussions and medication review sessions by a clinical pharmacy faculty and trained student pharmacists. Program attendees were asked to fill out a standardized questionnaire to evaluate the presentations and to report the perceived benefits. The seniors rated each survey question on a scale of 0 (poor/poorly) to 10 (excellent/very well). They also checked the statements that expressed their perceived benefits of attending the programs.
RESULTS: A total of 69 program attendees returned the questionnaires. The seniors reported an increase of knowledge on the health/drug topics presented (before program score 7.0 ± 2.5 vs. after program score 9.3 ± 1.0). The content of the programs were relevant to the role as a patient or caregiver (9.0 ± 1.5). The programs (presentations, discussions, handouts) were perceived to be

close to excellent (9.4 ± 1.0). A majority of the seniors thought that the programs helped them to achieve better health outcomes; reported that the programs satisfied their expectations; thought that the programs were helpful, and would recommend the programs to a friend.
CONCLUSION: Community outreach programs for health and medication education in older adults are feasible and beneficial for attendees.

129. Evaluating medication discrepancies and potentially inappropriate medications in a geriatric population. Raya Manship, PharmD Candidate 2017[1], Megan Carr, PharmD[1], Crystal Burkhardt, PharmD, MBA, BCPS[2], Brittany Melton, PhD, PharmD[2], Deon Cox Hayley, DO[2]; (1) University of Kansas School of Pharmacy, Lawrence, KS (2) University of Kansas Medical Center, Kansas City, KS
INTRODUCTION: Geriatric patients have a higher rate of chronic conditions, polypharmacy, and potentially preventable hospitalizations. Interprofessional teams have the potential to manage these. In this study, an Interprofessional Chronic Care Management (IP-CCM) team consisting of a pharmacist, nurse educator, social worker, and physician/nurse team, delivered healthcare to geriatric patients.
RESEARCH QUESTION OR HYPOTHESIS: In the geriatric population, pharmacists in IP-CCM are uniquely positioned to identify and manage medication discrepancies, inappropriate medication use, and reduce potentially preventable hospitalization and emergency department (ED) visits.
STUDY DESIGN: A prospective cohort study was designed to evaluate a geriatric population enrolled in the care of an IP-CCM service.
METHODS: Patients' demographics, severity of comorbidity, self-reported functionality (SF-12v2), level of health literacy, potentially inappropriate medication (PIM) use, medication discrepancies, and possibly preventable hospitalizations and/or ED utilization were collected. PIMs were defined using the Medication Appropriateness Index (MAI). Medication discrepancies were identified upon initial medication reconciliation and further broken down into 1) documented medications not currently taken; 2) documented medications taken differently; and 3) medications not previously documented. Potentially preventable hospital or ED visits included falls, sepsis, hypertension, heart failure, pneumonia/respiratory infection, UTI, COPD and skin ulcers/cellulitis.
RESULTS: 58 patients were enrolled with a median age of 73.5, 55.2% were female, and 29% had cognitive impairment (CI). The median Charleston Comorbidity Index (CCI) was 6. The MAI identified at least one PIM in all study patients. Among the 342 medication discrepancies identified, analysis showed a significant difference between those with a high and low CCI score (p=0.002). There was no significant association between medication discrepancies and SF-12v2, MAI, or preventable ED/hospital visits. More than 50% of ED visits and more than 33% of hospitalizations were potentially preventable.
CONCLUSION: Pharmacist administered medication reconciliation effectively identified medication discrepancies and PIMs in geriatric patients. Opportunities exist that may allow pharmacists to reduce potentially preventable ED or hospital visits.

Health Services Research

130. Physician-pharmacist collaborative management: narrowing the socioeconomic gap. Tyler Gums, PharmD, MS[1], Barry Carter, PharmD[2], Maxwell Anderegg, BS[3], Liz Uribe, MS[4], Christopher Coffey, PhD[5]; (1) Department of Pharmacy Practice & Science, University of Iowa College of Pharmacy, Iowa City, IA (2) Pharmacy Practice and Science, University of Iowa College of Pharmacy, Iowa City, IA (3) Pharmacy Practice and Science, University of Iowa (4) Department of Biostatistics (5) University of Iowa-Department of Biostatistics, Iowa City, IA
INTRODUCTION: Previous studies have found physician-pharmacist collaboration improves blood pressure (BP) in primary care practices. However, there is little information on whether this intervention model can reduce the gap in health care disparities for at risk populations.
RESEARCH QUESTION OR HYPOTHESIS: The purpose of the present analysis was to evaluate if the pharmacist intervention could reduce health care disparities by improving BP control in high risk racial and socioeconomic subjects compared to the control group
STUDY DESIGN: The Collaboration Among Pharmacist and Physicians to Improve Blood Pressure Now (CAPTION) trial enrolled patients from 32 medical offices in 15 states.
METHODS: At least one clinical pharmacist was embedded within the office and a member of the care team. Pharmacists in intervention offices communicated with patients and made recommendations to physicians about changes in therapy. Demographic information, blood pressure (BP), medications, and physician visits were recorded.
RESULTS: The 9-month visit was completed by 539 patients, 345 of which received the intervention and 194 were in the control group. BP was lower at 9 months in both the control and intervention group in all sociodemographic categories when compared to baseline. However, at 9 months, mean systolic BP was 7.3 mm Hg (95%CI= 2.4, 12.3) lower in subjects from racial minority groups who received the intervention compared to the control group (p=0.0042). Subjects with < 12 years of education in the intervention group had a SBP 8.1 mm Hg (95% CI=3.2,13.1) lower than the control group with lower education (p=0.0001). Similar reductions in BP occurred in patients with low incomes, those receiving Medicaid or those without insurance.
CONCLUSION: This study demonstrated that a pharmacist intervention reduced racial and socioeconomic disparities in the treatment of SBP. While disparities in BP were reduced by the intervention, there were still non-significant gaps in mean SBP when compared to intervention subjects outside the at-risk populations.

131. Evaluation of a multidisciplinary care transition program with pharmacist-provided home-based medication review for elderly Singaporeans at high risk of hospital readmissions. Hua Heng McVin Cheen, BSc PharmHons, CGP, BCACP[1], Chong Ping Goon, BSc(Pharm)(Hons)[1], Giat Yeng Khee, PharmD, BCPS[1], Wan Chee Ong, PharmD, CGP, BCPS[1], Choon Nam Wan, BSc Pharm, CGP[1], Mei Yan Leong, BSc Nursing, AdvDip (Gerontology)[2], Fei Qiu, BSc (Nursing)[2], Paik Shia Lim, PharmD, BCPS[1]; (1) Department of Pharmacy, Singapore General Hospital, Singapore, Singapore (2) Agency for Integrated Care, Nursing Division, Singapore General Hospital, Singapore, Singapore
INTRODUCTION: Drug-related problems are the most common postdischarge complication in the elderly, often leading to readmissions and increasing the risks of morbidity and mortality. Postdischarge home-based medication review (HBMR) by pharmacists can help to close this care gap. However, its benefits have not been established.
RESEARCH QUESTION OR HYPOTHESIS: Pharmacist-provided postdischarge HBMR can reduce hospital readmissions and healthcare utilization in the elderly.
STUDY DESIGN: Retrospective cohort study.
METHODS: The study was conducted using data from the Aged Care Transition program, a nationwide program to reduce postdischarge complications, from 1st March 2011 to 31st March 2015. Patients visited by nurses and pharmacists were included if they were taking more than five medications and had at least two unplanned hospital admissions within three months preceding the index home visit. Records were dichotomized into HBMR and non-HBMR based on the involvement of a pharmacist in the home visit. Incidence rates of hospital readmissions 6 months after the index home visit were compared. In addition, emergency attendance, outpatient visits and mortality were evaluated.

Multivariate incidence rate ratios (IRRs) and hazard ratio (HR) were calculated, with adjustments for potential confounders.
RESULTS: The study included 97 HBMR patients (49.5% male, mean age 73.6 years) and 402 non-HBMR patients (45.8% male, mean age 74.8 years). Baseline incidence rate of unplanned hospital admissions was higher in the HBMR group (2.80 vs. 2.42, p=0.032). The adjusted IRR for hospital readmissions among HBMR patients over the 6-month follow-up period was 0.76 (95% CI 0.59 - 0.92). Adjusted IRRs for emergency attendance and outpatient visits among HBMR patients were 0.80 (95% CI 0.66 - 0.98) and 1.16 (95% CI 0.95 - 1.41) respectively. The adjusted HR for mortality among HBMR patients was 0.73 (95% CI 0.29 - 1.81).
CONCLUSION: The findings suggest that pharmacist-provided postdischarge HBMR can reduce hospital readmissions and emergency attendance in the elderly. Larger studies are necessary to confirm these findings.

132. Application of statin medication adherence trajectory models in an integrated financing and care delivery system. Caitlin K. Frail, PharmD, MS, BCACP[1], Avis J. Thomas, MS[2], Pamala A. Pawloski, PharmD[2]; (1) Pharmaceutical Care and Health Systems, University of Minnesota College of Pharmacy, Minneapolis, MN (2) HealthPartners Institute, Bloomington, MN
INTRODUCTION: Group-based trajectory models have been applied to classify patients based on medication adherence patterns over time, rather than a single summary measure (e.g., proportion of days covered). Previous studies of trajectory group membership used claims data to predict trajectory group inclusion.
RESEARCH QUESTION OR HYPOTHESIS: The study objective was to classify 12-month statin medication adherence patterns and develop prediction formulas for forecasting individual patients' adherence trajectories using baseline claims and EMR-based clinical data.
STUDY DESIGN: Retrospective descriptive analysis
METHODS: Members of a Midwestern health plan who initiated new statin therapy in 2012 were included. Members were partitioned into six group-based trajectory models of utilization using latent class analysis. Logistic regressions were conducted with membership in each adherence group as the outcome. Demographic, clinical, and healthcare utilization variables were explored as possible predictors of inclusion into adherence groups. Akaike Information Criterion (AIC) was used to determine the best multivariate predictive model for each group.
RESULTS: Six adherence trajectory groups were defined with distinct adherence and persistence patterns over 12 months; including ongoing persistence, early discontinuation, and fluctuation in utilization. The trajectory most easily predicted was discontinuation at approximately two months (C-statistic = 0.74). Predictors for this group included: black or Hispanic race/ethnicity; Charlson score; diagnosis of a chronic lung condition, chronic kidney disease, obesity, or depression; the use of multiple prescribers or multiple pharmacies; and total number of chronic prescription medications.
CONCLUSION: Baseline clinical and claims-based characteristics may be used to identify new statin users likely to follow one of six specific adherence trajectories. This information may support early targeted interventions to improve adherence in high-risk groups.

133. Attitudes and perceptions towards patient-centered mobile health applications that support dynamic, interdisciplinary interventions. Rowshan Chowdhury, PharmD Candidate c/o 2017[1], Christopher Konig, PharmD Candidate c/o 2018[1], Aimon C. Miranda, PharmD, BCPS[2]; (1) University of South Florida College of Pharmacy, Tampa, FL (2) Department of Pharmacotherapeutics and Clinical Research, University of South Florida, College of Pharmacy, Tampa, FL
INTRODUCTION: In the wake of the Internet of Things, healthcare practitioners face big data and its immediate potential to optimize patient outcomes. Mobile health (mHealth) technologies provide unprecedented opportunities for patients to actively take charge of their health. These applications give healthcare providers the ability to monitor and observe changes and trends of key markers in patients with chronic diseases. Pharmacists and physicians may capitalize on rich, longitudinal data by mining for actionable insights in the context of patient-centered, interdisciplinary interventions.
RESEARCH QUESTION OR HYPOTHESIS: What are patients', pharmacists', and physicians' attitudes and perceptions within USF Health towards mHealth applications that support dynamic, interdisciplinary interventions?
STUDY DESIGN: A descriptive survey study to conduct a baseline assessment
METHODS: Online surveys were developed based on the AHRQ's Health IT Survey Compendium, administered via Qualtrics, and distributed electronically. Three different surveys were created for each study population (i.e. patients, physicians, and pharmacists). The surveys utilized a 7-point Likert scale (1 = absolutely disagree, 7 = completely agree) addressing areas of use including willingness and ability, comfort, frequency, and sharing of information. The primary outcome was to provide a descriptive analysis of these survey questions. A descriptive statistical analysis (including median, Range, Q_1, $Q_3$and IQR) was conducted in Microsoft Excel 2016.
RESULTS: Among the 26 total participants, 44% of physicians are completely willing to recommend an mHealth application (n=16), 50% of patients are completely willing to use an mHealth application to help collect their health information (n=4), and 83% of pharmacist feel that they have the proper knowledge to interpret and evaluate mHealth data (n=6).
CONCLUSION: These results indicate strong positive attitudes and perceptions towards mHealth applications in clinical practice.

134. Development of a predictive model for targeting clinical pharmacist intervention for high-risk patients in extended care facilities. Linda Weffald, PharmD, Thomas Delate, PhD, MS, Lauren Heath, PharmD, Sheryl Herner, PharmD, Dwight Paulson, PharmD, Julia Sanchez, PharmD; Department of Pharmacy, Kaiser Permanente Colorado, Aurora, CO
INTRODUCTION: No validated model exists to prioritize extended care facility (ECF) patients for clinical pharmacist (CP) intervention.
RESEARCH QUESTION OR HYPOTHESIS: The objective of this study was to develop a clinical prediction model for high-risk ECF patients who require CP intervention.
STUDY DESIGN: This was a retrospective study of ECF patients who received a medication review by a CP between July 1, 2013 and June 30, 2015.
METHODS: Patients were randomly assigned to derivation and validation cohorts. Multivariable logistic regression modeling was performed using SAS v9.4 to predict patients who required an intervention (i.e., dose adjustment, medication interchange, initiation, or discontinuation) vs. no intervention (i.e., medication review only). Patient-specific factors (e.g., medication dispensings, demographics, diagnoses) were collected from administrative databases. Risk indices (e.g., Charlson Comorbidity Index, Chronic Disease Score) were calculated, also. A parsimonious model based on clinical judgment was calibrated until goodness-of-fit and an area under the curve (AUC) > 0.70 were achieved. Model diagnostics were performed. The predictive ability of the model was confirmed with the validation cohort.
RESULTS: Sixty factors were assessed initially. The parsimonious model from the derivation cohort (n=3937) comprised 32 factors (AUC=0.73, 95% confidence interval [CI] 0.70–0.76), the model fit the data well (Hosmer and Lemeshow Test p=0.539), and influence diagnostics were within parameters. A dispensing of insulin (odds ratio [OR]=2.11) and a fall (OR=1.99) in the 180 days prior to CP review were factors most strongly associated

with requiring an intervention. Modeling with the validation cohort (n=3975) provided an AUC=0.77 (95% CI 0.74–0.80).
CONCLUSION: Administrative data were utilized to develop a successful predictive model for CP intervention on ECF patients. Application of this model in real-time could result in significant CP time-savings and improved pharmacy services through more directed CP patient care. Future study will demonstrate the value of the current model in real-time.

Hematology/Anticoagulation

135. Accuracy of CoaguChek XS in patients with Antiphospholipid Syndrome (APLS). James Taylor, PharmD[1], Chris Richter, PharmD[2], Chris Lindamood, PharmD[3], Xinyue Liu, PhD[3], Marc Zumberg, MD[4], Bradley Fletcher, MD, PhD[5]; (1) Department of Pharmacotherapy and Translational Research, University of Florida College of Pharmacy, Gainesville, FL (2) UF and Shands Hospital, Gainesville, FL (3) University of Florida College of Pharmacy, Gainesville, FL (4) Department of Medicine, University of Florida College of Medicine, Gainesville, FL (5) Department of Medicine, University of Florida College of Medicine, Gainesville, FL
INTRODUCTION: The Coaguchek XS is an INR point of care monitor that has been shown to provide clinically acceptable accuracy. APLS is an autoimmune disorder diagnosed by the persistent presence of moderate to high titer antiphospholipid antibodies or detection of a lupus anticoagulant, in conjunction with a thrombotic event or pregnancy loss. However, due to a potential interaction between the antiphospholipid antibodies and the reagent used in the prothrombin time (PT) INR assay, there is uncertainty as to the reliability of using the CoaguChek XS in these patients.
RESEARCH QUESTION OR HYPOTHESIS: Does presence of antiphospholipid antibodies affect accuracy of the Coaguchek XS meter?
STUDY DESIGN: A quasi-experimental research design conducted at a pharmacist-managed anticoagulation clinic.
METHODS: Patients diagnosed with APLS and receiving warfarin had their INR measured, at two consecutive visits, by finger stick with the CoaguChek XS point of care meter and venous draw. Patients receiving warfarin for any reason other than APLS underwent the same procedure. Thirteen patients with a diagnosis of APLS and 28 non-APLS patients participated in the study providing a total of 57 INR pairs (CoaguChek XS plus lab) for each group.
RESULTS: The overall mean difference in INR between the CoaguChek XS and lab was not significantly different between the APLS and control groups (0.6772 vs 0.5456, p=0.2). In the APLS group, 31/57 (54%) INR values showed a difference of more than 0.5 between CoaguChek XS and lab, compared to 18/57 (32%) in the control group ($p<0.05$).
CONCLUSION: While mean differences in INR between the CoaguChek XS and lab were comparable between the two groups, significantly more INR values were divergent in the APLS group.

138. Descriptive analysis of thrombophilia testing in an academic medical center. Nicholas Cox, PharmD[1], Stacy Johnson, MD[1], Sara Vazquez, PharmD, CACP[1], Ryan Fleming, PharmD[1], Daniel Witt, PharmD, FCCP, BCPS[2]; (1) University of Utah Health Care, Salt Lake City, UT (2) Department of Pharmacotherapy, University of Utah College of Pharmacy, Salt Lake City, UT
INTRODUCTION: Clinical guidelines recommend against the indiscriminate use of thrombophilia testing as there is no clinical evidence that confirming thrombophilia status prevents subsequent thromboembolisms. In general, thrombophilia testing is recommended only in limited situations. Although previous studies have investigated testing practices in specific patient populations, the testing practices across all patients are not well characterized. The purpose of this study was to describe thrombophilia testing patterns in an academic medical center and quantify the proportion of tests associated with minimal clinical utility.
RESEARCH QUESTION OR HYPOTHESIS: What are current thrombophilia testing practices at an academic medical center, and what proportion of tests are associated with minimal clinical utility?
STUDY DESIGN: This is a descriptive, retrospective study.
METHODS: Patients who received thrombophilia testing in emergency department and inpatient settings between July 1, 2014 and December 31, 2014 were identified electronically. Patient and testing characteristics and clinical utility variables were collected during manual chart reviews. Thrombophilia tests occurring in situations associated with minimal clinical utility were defined as tests meeting at least one of the following criteria: discharged before results available for review; test type not recommended by consensus guidelines or Thrombosis Service physicians; testing in situations associated with decreased accuracy; duplicate testing; and testing following a provoked thrombotic event.
RESULTS: Over six months, 1451 thrombophilia tests were performed and 163 patients were tested. The most common diagnoses prompting testing were stroke (50% of tests; 35% of patients), VTE (21% of tests; 21% of patients), and pregnancy-related diagnoses (15% of tests; 25% of patients). Overall, 63% of tests occurred in situations associated with minimal clinical utility.
CONCLUSION: The majority of tests were for patients with stroke and most occurred in situations associated with minimal clinical utility. Strategies to improve thrombophilia testing practices are needed.

140. Evaluation of a bivalirudin nomogram in adult patients. Vi Gilmore, PharmD[1], John Lindsley, PharmD[2], Jessica Crow, PharmD[2]; (1) Department of Pharmacy, The Johns Hopkins Hospital, Baltimore, MD (2) Department of Pharmacy, The Johns Hopkins Hospital, Baltimore, MD
INTRODUCTION: Patients with untreated heparin-induced thrombocytopenia (HIT) have a 30–50% risk of developing thromboses. Use of non-heparin anticoagulants, like direct thrombin inhibitors (DTI), reduce this risk by 50–70%. Therefore, rapid initiation and attainment of therapeutic activated partial thromboplastin times (aPTTs) in patients with suspected or confirmed HIT is imperative. Bivalirudin is the formulary DTI at the Johns Hopkins Hospital (JHH). A weight-based dosing nomogram was developed and implemented in 2011 with initial dosing and timing for aPTTs stratified based on renal function. The performance of this nomogram has not been evaluated since its implementation.
RESEARCH QUESTION OR HYPOTHESIS: Is the bivalirudin nomogram at JHH achieving therapeutic aPTTs within 24 h?
STUDY DESIGN: Retrospective chart review
METHODS: Patients were included if they were admitted to JHH between July 1, 2014-June 30, 2015, received bivalirudin for at least 24 h for presumed, confirmed, or history of HIT and at least 18 years of age. Patients were excluded if bivalirudin was prescribed for percutaneous coronary intervention or first aPTT was drawn within 6 h of receiving a heparin infusion. Data are represented as mean (SD) or median (IQR) when appropriate.
RESULTS: Of the 50 patients evaluated, 31 (62%) achieved a therapeutic aPTT within 24 h of bivalirudin initiation. Median doses for therapeutic patients with CrCl > 60 ml/min (n=22), 30–60 ml/min (n=6), and <30 mL/min or dialysis (n=3) were 0.141 mg/kg/hr (0.04 mg/kg/hr), 0.08 mg/kg/hr (0.091 mg/kg/hr), and 0.032 mg/kg/hr (0.055 mg/kg/hr), respectively. Overall median time to first therapeutic aPTT was 7.72 h (10.52 h).
CONCLUSION: Median doses to achieve therapeutic aPTTs in patients with CrCl < 60 mL/min are consistent with initial nomogram recommendations. The median dose in patients with CrCl > 60 ml/min is higher than nomogram recommendations. Increasing the initial dose in these patients may improve our rate of achieving therapeutic aPTTs within 24 h.

141. Comparison of hospital length of stay in patients treated with direct oral anticoagulants or parenteral agents plus warfarin for venous thromboembolism. Catherine A. Saint, PharmD, Michelle R. Castelli, PharmD, Andrew J. Crannage, PharmD, BCPS, Zachary A. Stacy, PharmD, BCPS, Erin K. Hennessey, PharmD, BCPS; St. Louis College of Pharmacy/Mercy Hospital St. Louis, St. Louis, MO

INTRODUCTION: The direct oral anticoagulants are recommended agents for the treatment of venous thromboembolism (VTE) per the 2016 CHEST guidelines. Existing literature suggests that rivaroxaban may offer the additional benefit of reducing hospital length of stay in atrial fibrillation; however, there is limited data demonstrating this impact in patients with VTE.

RESEARCH QUESTION OR HYPOTHESIS: Does initiation of the direct oral anticoagulants apixaban or rivaroxaban impact hospital length of stay compared to initiation of parenteral agents plus warfarin for the treatment of VTE?

STUDY DESIGN: Retrospective cohort study

METHODS: This study was conducted at a 979 bed academic medical center. Adult patients admitted for a primary diagnosis of VTE between November 1, 2012 and August 31, 2015 and treated with direct oral anticoagulants (apixaban or rivaroxaban) or parenteral anticoagulation plus warfarin were included. Individuals using anticoagulation therapy prior to admission or discharged directly from the emergency department were excluded. The primary outcome was the absolute difference in hospital length of stay. Parametric statistical tests were used for data analyses with an alpha of 0.05 determined a-priori for statistical significance.

RESULTS: A total of 160 patients were included. Patient characteristics, including renal function, were similar between study groups. Treatment for VTE with apixaban or rivaroxaban, as compared to parenteral anticoagulation plus warfarin, was associated with a reduced hospital length of stay (48.5 h vs. 98 h; $p<0.05$). Additionally, direct oral anticoagulant therapy was associated with a reduced total hospital cost, adjusted to 2015 dollars ($21,584.77 vs. $39,246.77; $p=0.008$).

CONCLUSION: Treatment with the direct oral anticoagulants apixaban or rivaroxaban may significantly reduce hospital length of stay and total hospital cost compared to parenteral anticoagulation agents plus warfarin for patients admitted for VTE. As newer agents are becoming preferred for VTE treatment, demonstration of reduced length of stay and reduced costs could further the use of these agents.

143. Comparison of apixaban and rivaroxaban trough anti-Xa activity. David Bookstaver, PharmD[1], Kimberly Sparks, PharmD[1], Brandon Pybus, PhD[2], Dustin Davis, MD[3]; (1) Department of Pharmacy, Eisenhower Army Medical Center, Fort Gordon, GA (2) Department of Pathology, Eisenhower Army Medical Center, Fort Gordon, GA (3) Department of Medicine, Eisenhower Army Medical Center, Fort Gordon, GA

INTRODUCTION: There is not an established method for monitoring the anticoagulant effect of apixaban and rivaroxaban. Numerous small studies have shown linear correlation between serum levels of both agents and anti-Xa activity with r^2 values ranging from 0.91–0.99. Therefore, anti-Xa activity may be a useful measure of the anticoagulant effect. The differences in the half-life and dosing interval of the drugs may result in a difference in anticoagulant effect at the end of the dosing interval.

RESEARCH QUESTION OR HYPOTHESIS: The trough anti-Xa activity for apixaban will be greater than that of rivaroxaban.

STUDY DESIGN: Prospective open-label

METHODS: All patients receiving apixaban 5 mg twice daily or rivaroxaban 20 mg once daily followed in the hospital Anticoagulation Clinic were eligible. Patients were excluded if they were on an inappropriate dose of either agent based on established criteria, or if they were receiving amiodarone, dronedarone, ketoconazole, or rifampin. Anti-Xa activity was measured 0.5–3 h before the next dose via the Stago© STA-Liquid Anti-Xa assay. Mean anti-Xa activity was compared using a t-test. Pearson's correlation coefficient was calculated for CrCl and age vs. anti-Xa activity.

RESULTS: One-hundred-sixty-nine patients were enrolled (86 apixaban, 79 rivaroxaban). The mean anti-Xa activity was 1.79 + 0.94 IU/ml in the apixaban group and 1.24 + 0.80 IU in the rivaroxaban group ($p<0.01$). The mean time before the next dose that the level was drawn was 1.4 h in the apixaban group and 1.9 h in the rivaroxaban group ($p=0.21$). Age ($r = 0.48$) and CrCl ($r = -0.51$) were more strongly associated with anti-Xa activity for apixaban than they were for rivaroxaban, 0.26 and −0.30, respectively.

CONCLUSION: Trough anti-Xa activity was significantly higher in the apixaban group. The clinical utility of monitoring anti-Xa activity for these agents remains to be established.

144. Antifactor Xa levels compared to activated partial thromboplastin time for heparin monitoring. James Coons, PharmD[1], Emily Whitman-Purves, MD[2], Derek Pae, MD[2], Jeannine DiNella, RN[2], Taylor Miller, PharmD[2], Andrew Althouse, PhD[2], Mark Schmidhofer, MD[2], Roy Smith, MD[3]; (1) University of Pittsburgh, Pittsburgh, PA (2) UPMC, Pittsburgh, PA (3) University of Pittsburgh School of Medicine/University of Pittsburgh Medical Center Cancer Pavillion, Pittsburgh, PA

INTRODUCTION: Unfractionated heparin (UFH) is traditionally monitored by the activated partial thromboplastin time (aPTT). However, several variables can influence the aPTT and lead to suboptimal UFH dosing and response. Anti-Xa monitoring has been proposed as a superior measure of UFH, but limited reports have described its clinical implementation.

RESEARCH QUESTION OR HYPOTHESIS: Anti-Xa monitoring of UFH provides improved therapeutic anticoagulation compared to aPTT monitoring.

STUDY DESIGN: This was a prospective non-randomized study of anti-Xa monitoring with aPTT-based historical control.

METHODS: All patients that received UFH as a continuous IV infusion on the cardiology units of the University of Pittsburgh Medical Center (UPMC) Presbyterian Hospital from March through May 2015 were included. All UFH adjustments were made according to anti-Xa concentrations using institutional nomograms. The historical control group used aPTT-based nomograms. The primary endpoint was time to therapeutic anticoagulation. Secondary endpoints were the number of dose adjustments per 24 h, discordance between anti-Xa and aPTT, length of stay (LOS), and adverse events. Continuous data were analyzed by Wilcoxon rank-sum. Categorical variables were analyzed with Fisher's Exact test.

RESULTS: There were 101 patients in the anti-Xa group and 100 patients in the aPTT historical control group. Baseline demographics, UFH indications, and concurrent medications were similar between groups. The median time to therapeutic range was 16 vs. 24 h in the anti-Xa and aPTT groups, respectively ($p<0.01$). Fewer adjustments in UFH per 24 h were seen in the anti-Xa group (1.2 vs. 1.5, $p<0.01$). The overall discordance rate between the two tests was 49%. No differences were observed in LOS or adverse events.

CONCLUSION: Anti-Xa monitoring for UFH resulted in a faster time to therapeutic anticoagulation and fewer dose adjustments compared to aPTT. Our results led to implementation of anti-Xa monitoring for UFH across the UPMC system, an integrated network of 22 hospitals, in June 2016.

HIV/AIDS

145. Initiation of a treatment switch from a multiple-tablet ART regimen to a single-tablet ART regimen in a non-adherent HIV population. Sarah Lewter, BS, Scott Sutton, PharmD, BCPS (AQ ID); South Carolina College of Pharmacy-USC Campus, South Carolina College of Pharmacy- USC Campus, Columbia, SC

INTRODUCTION: Medication adherence is a critical component in achieving viral suppression in HIV patients. In efforts to lower pill burden and simplify regimens, STRs have been developed to streamline HIV therapy and subsequently demonstrated improved outcomes. The goal is to determine the impact of a treatment switch from MTR to STR in non-adherent patients currently on a MTR.
RESEARCH QUESTION OR HYPOTHESIS: Patients switched to an STR will have an increased adherence rate compared to those that stayed on their MTR.
STUDY DESIGN: Longitudinal retrospective cohort study utilizing a National Veteran database from January 1, 1999 to December 31, 2012 using Chi square, Wilcoxon-rank sum, descriptive statistics and multivariate models.
METHODS: This study was a national retrospective observational cohort evaluating Veterans Affairs patients initially prescribed MTR and switched to STR. All during their first year, patients must have a complete ART regimen, a pharmacy fill during both 6 month periods, at least one viral load measure, and adherence levels less than 80%. Chi square and Wilcoxon-rank sum tests were used to compare categorical and continuous characteristics across the cohorts, respectively. Descriptive statistics and multivariate models were utilized to evaluate differences in adherence between STR and MTR during a 6-month period.
RESULTS: A total of 6817 patients met study criteria. Cohorts were similar in racial composition and baseline viral load, but differed in age, sex, baseline adherence, months in study, Charlson comorbidity, drug/alcohol use, mental health, and index year. Among patients switched from MTR to STR, adherence increased from 63.57% to 78.97%. Additionally, there was a 12% increase ($p<0.001$) in adherence among those that switched.
CONCLUSION: When switched from MTR, STR use was associated with a higher adherence rate when compared to continued MTR use in non-adherent HIV patients. Additionally, STR treatment increased adherence levels compared to baseline adherence among patients that switched.

147E. Medication possession ratio predicts longitudinal HIV-1 viral suppression. R. Chris Rathbun, PharmD, FCCP, BCPS AQ-ID, AAHIVP[1], Michelle Liedtke, PharmD, BCPS, AAHIVP[1], W. Cheng Yuet, PharmD[2], Jamie Miller, PharmD, BCPS, BCPPS[1], Grant Skrepnek, PhD, RPh[1]; (1) Department of Clinical and Administrative Sciences, College of Pharmacy, University of Oklahoma Health Sciences Center, Oklahoma City, OK (2) Department of Pharmacotherapy, University of North Texas Health Sciences Center College of Pharmacy, Fort Worth, TX
Presented at 26th European Congress of Clinical Microbiology and Infectious Diseases, Amsterdam, Netherlands, April 9–12, 2016.

148. Correlation of medication complexity index with adherence and HIV virologic outcomes. R. Chris Rathbun, PharmD, FCCP, BCPS AQ-ID, AAHIVP[1], Yao-Hua Lin, PharmD, BCPS[2], Michelle Liedtke, PharmD, BCPS, AAHIVP[1], Kevin Farmer, PhD, FAPhA[1], Grant Skrepnek, PhD, RPh[1]; (1) Department of Clinical and Administrative Sciences, College of Pharmacy, University of Oklahoma Health Sciences Center, Oklahoma City, OK (2) Department of Pharmacy, CHRISTUS St. Michael Health System, Texarkana, TX
INTRODUCTION: Medication regimen complexity index (MRCI) is a validated tool for quantifying regimen complexity and is proposed as a mechanism to quantify antiretroviral regimen complexity; however, the ability of the MRCI to predict medication adherence and subsequent virologic outcomes is not established.
RESEARCH QUESTION OR HYPOTHESIS: The relationship between MRCI, adherence, and viral suppression was examined in adult HIV-infected patients
STUDY DESIGN: Retrospective observational cohort study
METHODS: HIV-infected patients (> 18 years of age) at the OU Health Sciences Center Infectious Diseases Institute receiving antiretroviral (ARV) therapy for > 6 months between January 2011 and December 2012 were included. MRCI scores were determined from electronic medical record medication lists. Medication possession ratio (MPR) for ARVs was calculated from claims data. Viral load results were collected from electronic medical records. Viral load area-under-the curve [vAUC] was quantified using WinNonLin. A multivariable hurdle regression was used to assess the odds of vRNA suppression (<20 copies/mL, vAUC < 1000 copy-days) using a logit model; a generalized linear model of log transformed vRNA and vAUC was applied for non-suppressed cases. Each regression was controlled for age, sex, race/ethnicity, ARV regimen type, non-ARV medications, MRCI, and MPR.
RESULTS: A total of 611 patients met eligibility criteria; 82% males, 56% Caucasian, with a median age of 41 years (IQR 32–48). Median ARV duration during the study period was 704 days (IQR 630–718). Mean MRCI score was 9.6 (95% CI: 9.0, 10.2). No correlation between MRCI score and MPR was observed ($R=-0.018$, $p=0.663$). The hurdle regression indicated that increasing MPR and NNRTI regimen were associated with viral suppression, defined as vRNA <20 copies/mL and vAUC <1000 copy-days ($p<0.01$). MRCI score was not associated with viral suppression indices.
CONCLUSION: MRCI score did not correlate with adherence and was not predictive of viral response in a large cohort of HIV-infected patients.

149E. Immunologic and virologic outcomes of obese and non-obese HIV-infected incarcerated adults. Melissa E. Badowski, PharmD[1], Kristen Bunnell, PharmD[2], Connor Perkins, PharmD Candidate[2], Arwa Aldossari, PharmD Candidate[2], Mahesh Patel, MD[3], Jeremy Young, MD, MPH[3]; (1) College of Pharmacy, University of Illinois at Chicago, Chicago, IL (2) University of Illinois at Chicago, College of Pharmacy, Chicago, IL (3) University of Illinois at Chicago, College of Medicine, Chicago, IL
Presented at European Congress of Clinical Microbiology and Infectious Diseases.

150. Use of dolutegravir in patients with the human immunodeficiency virus receiving chemotherapy. DaleMarie Vaughan, Doctorate of Pharmacy, Patricia Fulco, Doctorate of Pharmacy, Patricia Corrigan, Doctorate of Pharmacy; Department of Pharmacy Services, Virginia Commonwealth University, Richmond, VA
INTRODUCTION: Antiretroviral therapy (ART) in patients receiving chemotherapy is challenging due to complex drug-drug interactions (DDIs) affecting both safety and efficacy. Previous data support the successful use of raltegravir-based regimens in patients receiving chemotherapy due to minimal DDIs. The 2014 International Antiviral Society guidelines recommend either dolutegravir- or raltegravir-based regimens in patients receiving chemotherapy. Minimal data for dolutegravir exist in this population.
RESEARCH QUESTION OR HYPOTHESIS: Evaluate the safety and efficacy of dolutegravir in patients receiving chemotherapy at Virginia Commonwealth University Health (VCUH).
STUDY DESIGN: Investigational review board approved exempt retrospective medication use evaluation.
METHODS: Adult patients with any medication order for dolutegravir were identified from August 12, 2013 to May 4, 2015 through the VCUH electronic medical record. Patients with an ICD-9 malignancy code and chemotherapy orders were included. Patients were followed for the duration of the chemotherapy treatment or until death.
RESULTS: 270 patients were identified, with 13 meeting inclusion criteria. Twelve patients (83.3% male) were evaluated (n=1

excluded) with a mean age of 49 years. Anal squamous cell (n=3) and Hodgkin's lymphoma (n=2) were the most common malignancy diagnoses. Eight patients (66.7%) had HIV viral load suppression at chemotherapy completion with 16.7% developing ART genotypic resistance. Six patients experienced a CD4 count reduction. A chemotherapy delay or dose reduction resulted in 33.3% and 58.3% of patients, respectively. Colony stimulating factor was required in five patients. Eight patients experienced an infection, with 75% requiring hospitalization. Nearly half of the patients (n=5) expired during the evaluation.
CONCLUSION: In this small observational study, a dolutegravir-based regimen maintained HIV viral load suppression in the majority of patients. Chemotherapeutic delays and/or infections requiring hospitalizations were common. Due to the wide range of malignant diagnoses with various chemotherapeutic regimens, additional research is needed to determine the best ART regimen for HIV cancer patients.

151. Improving medication adherence by communicating objective adherence data to prescribers. Neha Pandit, PharmD, AAHIVP, BCPS, Hyunuk Seung, MS; Department of Pharmacy Practice and Science, University of Maryland School of Pharmacy, Baltimore, MD
INTRODUCTION: Only 55% of HIV infected patients adequately take their antiretroviral (ARV) therapy. Early detection and communication of nonadherence to prescribers has been found to improve adherence and health outcomes.
RESEARCH QUESTION OR HYPOTHESIS: The hypothesis is that by informing prescribers about ARV adherence with medication possession ratios (MPRs), modified medication possession ratios (mMPRs), and/or proportion of days covered (PDCs), early detection of nonadherence can be made and interventions can be made to help improve overall adherence.
STUDY DESIGN: A prospective, observational study.
METHODS: Inclusion criteria includes Medicaid patients prescribed ARV therapy at the University HIV clinic who filled an ARV medication > 16% past the last refill's day's supply at the University Pharmacy. Maryland Medicaid flags ARV refills that meet these criteria at the time of billing. The pharmacy provided the clinic with a list of these patients. MPRs, mMPRs, and PDCs were calculated for 6 months prior and after the communication to the clinic. Qualitative analysis was performed to identify improvement of adherence.
RESULTS: One-hundred and thirty patients met the inclusion criteria with 78.5% of them havingan HIV RNA level of < 200 copies/ml at the time nonadherence was determined. The median MPR prior to the identification of nonadherence for all patients was 0.73 which increased to 0.85 ($p<0.0001$) after the communication to the clinic. Anincrease in mMPR and PDC were also seen with a $p<0.0001$ and 0.017 respectively. The median MPR for patients with a baseline HIV RNA level of >= 200 copies/ml was 0.60 and 0.76 for < 200 copies/ml. An increase in MPR was seen to a median of 0.77 and 0.86 ($p=0.001$ and 0.0018), respectively.
CONCLUSION: A significant increase in MPRs, mMPRs, and PDCs was seen after nonadherence was communicated to providers. Though adherence is assessed during most medical appointments through patient recall, this study shows that objective medication adherence data could help improve overall adherence.

152. Factors associated with antiretroviral errors in HIV-infected patients in the intensive care unit. Shelby Merchant, PharmD Candidate 2017[1], Taylor Foore, PharmD Candidate 2017[1], Tanvi Mehta, Student[2], Emily Moose, PharmD Candidate 2017[1], Celeste Caulder, PharmD[3], Melanie McDonald, PharmD[4], P. Brandon Bookstaver, PharmD, FCCP, BCPS, AAHIVP[5]; (1) South Carolina College of Pharmacy-USC, Columbia, SC (2) Palmetto Health Richland (3) South Carolina College of Pharmacy, University of South Carolina, Columbia, SC (4) South Carolina College of Pharmacy, Columbia, SC (5) Department of Clinical Pharmacy & Outcomes Sciences, University of South Carolina College of Pharmacy, Columbia, SC
INTRODUCTION: The complexity of antiretroviral therapy (ART) places HIV-infected patients at a high risk for medication errors, which may be increased in the intensive care unit (ICU).
RESEARCH QUESTION OR HYPOTHESIS: What is the antiretroviral (ARV) error rate in HIV-infected patients admitted to the ICU and what are associated risk factors?
STUDY DESIGN: This is a single center, observational, retrospective cohort study.
METHODS: Eligible patients were adult HIV-infected patients admitted to the ICU for 24 h or more between January 1, 2009 and December 31, 2014. Electronic medical records were reviewed for host and medication related data. ARV-related errors were identified and classified as follows: incomplete regimen, incorrect dosage, incorrect ARV ordered, drug-drug interactions, and dose omission. Appropriateness of crushable administration was also calculated. Descriptive statistics were used to calculate the ARV error rate and duration of errors. Patients were grouped by presence or absence of medication error for comparison using Student t-test or Chi-square as appropriate ($p<0.05$).
RESULTS: Of the 2828 patients reviewed, 225 met inclusion criteria. Patients were 50.3 years old, predominantly male (67%) and spent an average of 7.3 days in the ICU. Most patients' primary diagnosis was non-HIV related. Fifty (22%) patients did not continue ARVs during their ICU stay. Approximately 66% of patients experienced an ARV error. About 52% of these patients experienced more than one medication error. The most common error was dose omission (64%), followed by incomplete regimen (34%) and dosing errors (31%). Approximately 41% of the ICU stay resulted in a dose omission. Mean creatinine clearance was significantly lower for patients who experienced a medication error (60.39 mL/min vs 76.81 mL/min, $p=0.0062$).
CONCLUSION: A significant number of HIV-infected patients in the ICU experienced an ART error. Pharmacists have the ability to make a significant impact by assessing ART for appropriate drug selection, dosing, and administration.

Infectious Diseases

153. Synergistic effect of fluconazole and amlodipine against resistant Candida albicans mediated by disruption of calcium homeostasis. Shujuan Sun, PhD[1], Shuyan Liu, Master Degree[2], Xiuyun Li, Bachelor Degree[2]; (1) Pharmacy department, Qianfoshan Hospital Affiliated to Shandong University, Jinan, China (2) Shandong University, Jinan, China
INTRODUCTION: Fungal infection has increased significantly and the number of antifungal drugs on the market is limited, coupled with the increased frequency of fungal resistance, makes it necessary to develop new therapeutic strategies. Combination drug therapy is one of effective strategy to alleviate this problem.
RESEARCH QUESTION OR HYPOTHESIS: Researches showed that some un-antifungal agents can work synergistically with azoles. Calcium regulation is very important in fungal growth, if calcium channel blocker can reverse fungal resistance when combined with FLC?
STUDY DESIGN: This study was designed to evaluate the combined antifungal effect of fluconazole (FLC) with amlodipine (ALM) against *Candida albicans in vitro* and *in vivo*and reveal the potential combined mechanisms.
METHODS: The *in vitro* combined antifungal effect of FLC and AML against *Candida albicans* strains was tested by checkerboard and time-killing method. The *Galleria mellonella* infection model was employed to study the *in vivo* efficacy of this combination. For mechanism study, calcium regulating gene (*CCH1*, *MID1*, *CNA1*, *CNB1*, *YVC1*) expression was analyzed by quantitative PCR after CA10 exposed to drugs.
RESULTS: There was a synergy when FLC combined with AML against resistant strains, with fractional inhibitory concentration index < 0.5. The time-killing curves confirmed the synergism dynamically. The *in vivo* study showed that the survival rates of

G, mellonella larvae infected with *C. albicans* increased significantly, the number of *C. albicans* remained inside the larvae reduced, and the histological tissue of *G. mellonella* damaged when drug combination was given. The mechanism studies revealed that FLC plus AML caused a down-regulating of *CNA1*, *CNB1* (encoding calcineurin) and *YVC1* (encoding calcium channel protein in vacuole membrane).
CONCLUSION: AML could enhance the sensitivity of FLC to resistant *Candida albicans in vitro* and *in vivo*, and the potential synergy was mediated by disruption of calcium homeostasis, with a down-regulation of *CNA1*, *CNB1* and *YVC1*.

154. DNA sequence variation in *Staphylococcus aureus* contributes to decreased effectiveness of daptomycin therapy. Hannah Turner, Pharmacy Student, Andrew Berti, PharmD, PhD, Sue McCrone, BS – Microbiology, Warren Rose, PharmD; School of Pharmacy/Rose Lab, University of Wisconsin - Madison, Madison, WI
INTRODUCTION: Methicillin resistant *Staphylococcus aureus* (MRSA) is a significant healthcare challenge with limited options for antibiotic therapy. Identifying mutations that contribute to daptomycin resistance could lead to better management of MRSA.
RESEARCH QUESTION OR HYPOTHESIS: Mutations frequently observed during serial passage in daptomycin will decrease daptomycin activity when introduced into a daptomycin sensitive strain.
STUDY DESIGN: Novel mutations that frequently occurred during daptomycin serial passage were introduced in isolation into daptomycin-sensitive patient isolate J01 and genetically-related daptomycin-resistant patient isolate J03.
METHODS: Individual genes-of-interest were amplified from chromosomal DNA by PCR, confirmed by gel electrophoresis, digested, ligated into empty vector, transformed into *E. coli*, purified, then introduced into either *S. aureus* strain J01 or J03. Phenotypical characterization of resulting strains included antibiotic susceptibility and kill curve experiments with 3.8 mg/L daptomycin.
RESULTS: Of nine mutations identified, eight have been successfully re-introduced into J01 and J03 and phenotypically characterized. When mutations were introduced to J01, *octB* and *snoF* demonstrated noticeable increases in daptomycin MIC and reduced activity in the kill curves. The four mutations *yhhT*, *rimP*, *rsh*, and *pgpP* did not show these changes when introduced into J01; however, when introduced into J03 daptomycin activity in the kill curves was significantly reduced. There were no phenotype changes associated with mutation in *amaP* or *sspA*.
CONCLUSION: Six mutations (*snoF*, *yhhT*, *rimP*, *octB*, *rsh*, and *pgpP*) that contribute to daptomycin nonsusceptible (DNS) *Staphylococcus aureus* may not have been identified if daptomycin MIC changes were the only measured parameter. Although all six mutations played a role in DNS, it may be possible that *yhhT*, *rimP, rel*, and *pgpP* mutations require an initial mutation before these genes contribute to DNS *S. aureus*. These mutations provide additional routes to obtaining DNS *S. aureus*.

155. Incidence of acute kidney injury during treatment with vancomycin in combination with piperacillin-tazobactam or cefepime. Julia Carrington, PharmD, James Beardsley, PharmD, John Williamson, PharmD, James Johnson, PharmD, Isai Bowline, MD; Wake Forest Baptist Health, Winston-Salem, NC
INTRODUCTION: Acute kidney injury (AKI) is associated with increased length of hospital stay, healthcare costs, and mortality. Vancomycin-associated nephrotoxicity is well documented. Recent evidence suggests a higher incidence of nephrotoxicity when vancomycin is used in combination with piperacillin-tazobactam (PT/V). Nephrotoxicity of cefepime in combination with vancomycin (C/V) is not as well studied.
RESEARCH QUESTION OR HYPOTHESIS: Evaluate the observed incidence of AKI in hospitalized adult patients receiving PT/V or C/V for >= 48 h.
STUDY DESIGN: Retrospective chart review of patients who received PT/V or C/V at a large academic medical center.
METHODS: The primary endpoint was the incidence of nephrotoxicity defined using the Acute Kidney Injury Network criteria. To be included in the study, patients had PT/V or C/V initiated within 48 h of each other and continued for >= 48 h. Patients were followed for 7 days after the start of combined therapy or 48 h after discontinuation, whichever was shorter. Patients with underlying renal insufficiency, structural kidney disease, and AKI prior to antibiotic initiation were excluded. Patients identified as receiving both medications were randomly evaluated until a target of 62 patients in each group was achieved. Data, including demographic information, comorbid conditions, antibiotic doses, duration of beta-lactam infusions, serum creatinine, urine output, and receipt of other nephrotoxic agents, was assessed.
RESULTS: One hundred and twenty-four patients were included in the study. Baseline demographics were similar between groups. The incidence of AKI was higher with PT/V compared to C/V (37.1% vs 8.1%, $p<0.05$). When evaluated by multivariate analysis, the odds of developing AKI with PT/V were 6.1 times higher than with C/V. The mean time to AKI from initiation of combination therapy with PT/V was 2.3 ± 1.3 days compared to 1.5 ± 1.3 days with C/V.
CONCLUSION: Adult patients treated with >= 48 h of PT/V have a higher incidence of AKI than those treated with C/V.

156E. Outcomes of veterans treated for hepatitis C infection with interferon-free regimens. Marisel Segarra-Newnham, PharmD, MPH[1], Timothy Church, PharmD[2], Gail Fox-Seaman, ARNP[2]; (1) Pharmacy Department, VAMC, West Palm Beach, FL (2) VAMC
Presented at the American Society for Microbiology Microbe 2016 meeting, Boston, MA, June 16–20, 2016.

157. Evaluation of sustained virologic response rates after hepatitis C virus treatment among a diverse patient population at an urban academic medical center. Michelle Martin, PharmD, BCPS, BCACP[1], Darby Rosenfeld, PharmD Candidate[2], Lauren Vitrano, PharmD Candidate[2], Grace Go, PharmD Candidate[2], Victoria Ramos, PharmD Candidate[2], Myrna Rivas, PharmD Candidate[2], Todd Lee, PharmD, PhD[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 agents for hepatitis C virus (HCV) offer high sustained virologic response (SVR) rates. Extensive data on SVR rates in minority populations are lacking.
RESEARCH QUESTION OR HYPOTHESIS: Are real-world SVR rates among diverse patients treated with various HCV regimens at an urban academic medical center comparable to those of clinical trials?
STUDY DESIGN: A retrospective chart review was performed to obtain data on characteristics and treatment response for patients treated for HCV under the care of a clinical pharmacist.
METHODS: Data were collected from electronic medical records of patients who started HCV treatment from January 1, 2014 to February 3, 2016, and analyzed using descriptive statistics, Fisher's exact test, and Pearson's chi-square test. The primary endpoint was percent who achieved SVR in each treatment group.
RESULTS: Four hundred ninety-nine patients started treatment; data were not available for 41 who had not yet reached 12 weeks after treatment completion at data collection, or 87 who were missing labs, lost to follow-up, or had transferred care. The remaining 371 patients were 64% male, 55% black, had a mean age of 59 years, and mean BMI of 29. Eighty-nine percent had genotype (GT) 1, 33% were treatment-experienced, 50% were cirrhotic, 17% were post-transplant, 29% had diabetes, and 25% had baseline psychiatric disease. Overall, treatment-naïve, and

treatment-experienced GT1 SVR rates were 65%, 63% and 67% with sofosbuvir and ribavirin; 87%, 93% and 77% with simeprevir and sofosbuvir; and 93%, 94% and 91% with ledipasvir/sofosbuvir; and 93%, 88% and 95% with ledipasvir/sofosbuvir and ribavirin. Overall SVR rates for GT2 and GT3 were 72% and 69% with sofosbuvir and ribavirin.
CONCLUSION: Treatment groups had comparable or numerically lower SVR rates than those reported in clinical trials. The patient population included a high percentage of difficult-to-treat cirrhotic, treatment-experienced, and post-transplant patients. Most patients were black babyboomers; many had diabetes and psychiatric disease.

158. Prescribing patterns of antimicrobials in UTIs pre- and post-intervention. Pramodini Kale-Pradhan, PharmD, FCCP[1], Nathan French, PharmD[2], Raymond Phung, PharmD[2], Susanna Szpunar, PhD[3], Leonard Johnson, MD[4]; (1) Department of Pharmacy Practice, Wayne State University, Eugene Applebaum College of Pharmacy & Health Sciences and St. John Hospital and Medical Center, Detroit, MI (2) Pharmacy, St. John Hospital and Medical Center, Detroit, MI (3) Medical Education, St. John Hospital and Medical Center, Grosse Pointe Woods, MI (4) Department of Infectious Diseases, St. John Hospital and Medical Center and Wayne State University, Grosse Pointe, MI
INTRODUCTION: In May 2014 an educational initiative (EI) was provided to the prescribing staff on unnecessary catheterization and urine cultures as Centers for Medicare and Medicaid Services will not reimburse treatment of hospital acquired catheter-associated urinary tract infections (UTIs).
RESEARCH QUESTION OR HYPOTHESIS: What was the effect of EI on the prescribing patterns of antimicrobials?
STUDY DESIGN: Retrospective pre-post quasi-experimental
METHODS: Antimicrobial prescribing patterns in adult patients with an urinalysis greater than 48 h post admission in March 2014 (pre-EI) and March 2015 (post-EI) were compared. Patients who received antibiotics for other infections or for surgical prophylaxis were excluded. Data collection included: patient demographics, laboratory information including UA and urine cultures, antimicrobials used, duration of therapy and the medical services ordering the antimicrobials. Data were analyzed using the chi-squared test and Student's t-test using SPSS v. 23.0.
RESULTS: 1883 patients were evaluated in both the pre-intervention (March 2014, n=970) and post-intervention (March 2015, n=913) groups. 1688 patients were excluded from the pre-intervention (n=865) and post-intervention (n=823) groups. Urinalysis performed less than 48 h upon admission was the most common reason for exclusion. 105 and 89 patients were included in the pre-post-EI groups respectively. Mean age of patients in the pre-EI and post-EI groups was 64.1 ± 19.8 and 65.1 ± 17.7 years ($p=0.72$), respectively. The number of urine cultures obtained decreased in the post-EI group by 2.2%. 47 of 105 and 40 of 89 patients with UAs and were administered antibiotics for the treatment of UTI in the pre and post-EI groups respectively ($p=0.980$). Median duration of antibiotics was 4 days in both the pre and post-EI groups.
CONCLUSION: EI did not reduce the use of antimicrobials for the treatment of asymptomatic bacteriuria. Further EI efforts are needed for appropriate antimicrobial utilization for treatment of an UTI.

159. Impact of a PCR-based rapid influenza diagnostic test on concomitant antibiotic utilization in patients with suspected influenza. Dustin Linn, PharmD, Trent Towne, PharmD, Molly Grasberger, PharmD; Manchester University College of Pharmacy, Natural & Health Sciences, Fort Wayne, IN
INTRODUCTION: In patients admitted with suspected influenza the ability to rapidly diagnose the disease prior to the availability of rapid reverse-transcriptase polymerase chain reaction (RT-PCR) based tests was limited. This led to many patients with suspected influenza being treated for both bacterial and viral infection. Our institution has historically used a rapid antigen test for influenza diagnosis of influenza, but began using RT-PCR based testing during the 2014–2015 influenza season. We sought to compare antibiotic utilization in the 2013–2014 and 2014–2015 influenza seasons in patients with suspected influenza.
RESEARCH QUESTION OR HYPOTHESIS: Does use of a RT-PCR based rapid influenza test decrease concomitant antibiotic utilization in hospitalized patients with suspected influenza?
STUDY DESIGN: Retrospective chart review.
METHODS: The electronic medical record was used to identify patients who had received at least 48 h of oseltamivir therapy during a 6-month period in the 2013–14 and 2014–15 influenza season, which we considered to be consistent with suspected influenza. The primary outcome was the difference in median antibiotic days of therapy (DOT) between the 2013–14 and 2014–15 influenza season in patients with suspected influenza. A Mann Whitney U test was used to compare differences in median antibiotic days between the two influenza seasons. Multivariate linear regression was used to control for admission location (floor vs. ICU) and use of mechanical ventilation. SPSS Statistics was used to complete all data analysis.
RESULTS: Patients in the 2013–2014 season were younger, more likely to be admitted to the ICU, and more likely to be placed on mechanical ventilation. There were fewer median antibiotic DOT in 2014–15 influenza season in which the RT-PCR test used (6 vs. 10.5 days; $p<0.001$). The result remained significant after controlling for admission location and use of mechanical ventilation. ($p=0.002$)
CONCLUSION: Use of rapid RT-PCR based testing for influenza decreased concomitant antibiotic utilization, likely through earlier identification of a causative pathogen.

160. Impact of a novel antimicrobial stewardship program on reducing the incidence of Clostridium difficile infection and the use of high risk antibiotics in three university hospitals. Albina Ongari, PharmD, Nikunj Vyas, PharmD[1], Shereef Ali, PharmD BCPS, Cindy Hou, DO, MBA[3]; (1) Pharmacy, Kennedy Health, Stratford, NJ (2) Pharmacy, Kennedy Health, Cherry Hill, NJ (3) Kennedy Health, Stratford, NJ
INTRODUCTION: Overutilization of broad spectrum antibiotics (BSA) increases the risk for *Clostridium difficile* infection (CDI). Antimicrobial Stewardship Programs (ASP) have been shown to reduce hospital acquired CDI rates and antimicrobial use.
RESEARCH QUESTION OR HYPOTHESIS: To evaluate the impact of ASP implementation in decreasing CDI rates and BSA utilization
STUDY DESIGN: IRB approved interventional, retrospective review in three university hospitals over a period of nine months.
METHODS: Patients were stratified into pre-ASP and post-ASP groups for analysis. Post-ASP patients were included in the study if they were admitted on one of ASP targeted units (ASPTU) and received BSA. The intervention was a pharmacist led prospective audit on patients on BSA at high risk for CDI not being evaluated by infectious diseases service.
RESULTS: There were 763 patients reviewed, 243 of which were enrolled in the intervention group. The most common infection noted was respiratory tract (44.4%) followed by urinary tract (38.2%). Nine months after the implementation of ASP the overall hospital acquired CDI rates in ASPTU decreased by 30.4% (9.87 vs. 6.87 CDI/1000 patient days (PD), $p=0.03$). There was a total decrease of 19.7% in BSA usage in post-ASP group (463.3 vs. 372.14 DOT/1000PD, $p=0.001$); with levofloxacin having a decrease of 29.6% (131.35 vs. 92.45 DOT/1000PD, $p=0.0001$). Overall, 80% of pharmacist driven recommendations were accepted, with the most commonly accepted interventions being discontinuation of therapy (42%) and de-escalation of therapy (26%). There was no difference seen in length of therapy between the groups, however patients with accepted recommendations showed trends toward shorter length of stay (5.2 vs. 6.6 days, $p=0.41$).

CONCLUSION: The pharmacy driven ASP recommendations led to a decrease in CDI/1000PD and usage of BSA in ASPTU. Biggest impact of ASP on DOT/1000PD was seen on levofloxacin. Patients with pharmacy driven interventions showed trends towards decreased length of stay.

162E. Impact of an infectious diseases consult on *Staphylococcus aureus* bacteremia management. John Edelstein, PharmD[1], Jessica Pakulski, PharmD, BCPS[1], Lindsey Eitniear, PharmD, BCPS, AAHIVP[1], William Helmink, MBA, MT, ASCP[2], Claudiu Georgescu, MD[3], Kelli Cole, PharmD, BCPS[1]; (1) Department of Pharmacy Services, University of Toledo Medical Center, Toledo, OH (2) Department of Pathology, University of Toledo Medical Center, Toledo, OH (3) Department of Infectious Diseases, University of Toledo Medical Center, Toledo, OH
Presented at Impact of an Infectious Diseases Consult on Staphylococcus aureus Bacteremia Management, IDWeek 2016, October 26–30, 2016 in New Orleans, LA.

164E. Evaluation of a 5-day course of levofloxacin in males with a urinary tract infection, a subgroup analysis of a previously published trial. Geoffrey Mospan, PharmD[1], Kurt Wargo, PharmD[2]; (1) School of Pharmacy, Wingate University School of Pharmacy, Hendersonville, NC (2) Hendersonville Regional Campus, Wingate University School of Pharmacy, Hendersonville, NC
Presented at the ACCP Virtual Poster Symposium, May 2016, Best Poster Award, Second Runner-Up.

165. Effect of real-time *Mycoplasma pneumoniae* polymerase chain reaction testing on azithromycin use in a pediatric intensive care unit. Ellie G. Hendricks, PharmD, Amanda L. Hurst, PharmD; Department of Pharmacy, Children's Hospital Colorado, Aurora, CO
INTRODUCTION: *Mycoplasma pneumoniae* is one of the most common bacterial respiratory pathogens in children. Children's Hospital Colorado (CHCO) implemented a PCR-based panel for detection of *M. pneumoniae* in January 2013. The FilmArray® respiratory pathogen panel (RPP), can detect 17 viruses and three atypical bacterial pathogens (*Bordetella pertussis*, *Chlamydophila pneumoniae*, *M. pneumoniae*) from respiratory samples within 3 h. The purpose of this study was to describe azithromycin prescribing in the pediatric intensive care unit (PICU) around implementation of *M. pneumoniae* detection and reporting via RPP.
RESEARCH QUESTION OR HYPOTHESIS: There has been no change in azithromycin use in the PICU since addition of *M. pneumoniae* detection via RPP.
STUDY DESIGN: Single-center, retrospective chart review.
METHODS: De-identified azithromycin use data (days of therapy [DOT] per 1000 patient days [PD]) for the PICU was collected before (2012), during (2013), and after (2015) RPP implementation. Patient-specific data was collected for PICU patients with RPP results from August 2014 - January 2016. The primary outcome was azithromycin DOT/1000 PD in the PICU before, during, and after RPP implementation. Secondary outcomes included rate of azithromycin initiation in response to *M. pneumoniae* (+) RPP results, and rate of discontinuation with *M. pneumoniae* (-) RPP results.
RESULTS: Azithromycin use in the PICU declined throughout the study period - median DOT/1000 PD before, during, and after RPP implementation were 46.4, 48.3, and 34.8 respectively (p=0.027). Azithromycin initiation following a *M. pneumoniae* (+) result occurred 100% of the time, while azithromycin discontinuation following a *M. pneumoniae (-)* result occurred 50% of the time.
CONCLUSION: Overall azithromycin use in the PICU decreased following addition of *M. pneumoniae* detection to the RPP. However, *M. pneumoniae* (+) RPP results may influence antimicrobial prescribing to a greater degree than *M. pneumoniae* (-) results. Further study is necessary to evaluate the clinical impact of azithromycin prescribing in response to RPP results in the PICU.

166. Predictors of ceftriaxone-nonsusceptible urinary tract infections. April Pottebaum, PharmD, Eli Deal, PharmD, FCCP, BCPS; Department of Pharmacy, Barnes-Jewish Hospital, St. Louis, MO
INTRODUCTION: The incidence of infections caused by multidrug resistant bacterial uropathogens is increasing among patients in both the hospital and community settings, so choosing empiric treatment for urinary tract infections (UTIs) has become more challenging. Ceftriaxone is commonly used for empiric treatment of UTIs in hospitalized patients. Nevertheless, a decrease in effectiveness of third-generation cephalosporins has been observed in recent years.
RESEARCH QUESTION OR HYPOTHESIS: This study was designed to determine risk factors and clinical outcomes of ceftriaxone-nonsusceptible UTIs.
STUDY DESIGN: Single-center, retrospective chart review
METHODS: Patients aged 18 years or older who were hospitalized at Barnes-Jewish Hospital between January 1, 2014 and December 31, 2014 with a diagnosis of UTI as well as a positive urine culture (with available susceptibility results) obtained within 48 h of admission were eligible for the study. Multiple patient characteristics were evaluated to identify factors contributing to ceftriaxone nonsusceptibility. Multivariable logistic regression was performed based on univariable comparisons to determine independent risk factors for ceftriaxone-nonsusceptible UTIs.
RESULTS: Among the 200 patients analyzed, 43 (21.5%) patients had ceftriaxone-nonsusceptible UTIs and 157 (78.5%) patients had ceftriaxone-susceptible UTIs. Recent antibiotic use (OR: 4.19; 95% CI: 1.82–9.63), age greater than 60 years (OR: 4.01; 95% CI: 1.51–10.65), and diabetes mellitus (OR: 2.60; 95% CI: 1.19–5.68) were independently associated with the presence of ceftriaxone nonsusceptibility. Patients with ceftriaxone-nonsusceptible UTIs were less likely to receive appropriate antimicrobial therapy within 24 h of urine culture collection (34.9% vs. 87.3%, p<0.001). Furthermore, patients with ceftriaxone-nonsusceptible UTIs had significantly longer median hospital lengths of stay (5 days vs. 3 days, p=0.005) and were more often admitted to the ICU (30.2% vs. 10.8%, p=0.002).
CONCLUSION: Risk factors identified in this study may assist in the selection of empiric antimicrobial therapy for patients with suspected UTIs at Barnes-Jewish Hospital.

167. Comparison of the effectiveness and safety of inhaled Colistin to intravenous Colistin in eradication of respiratory Carbapenem-resistant Acinetobacter baumannii – a tertiary medical center experience in Taiwan. Yun-Ting Peng, MS, Ya-Ting Chuang, MS; Department of Pharmacy, Wan Fang Hospital, Taipei Medical University, Taipei, Taiwan
INTRODUCTION: Colistin is one of few viable options for carbapenem-resistant *Acinetobacter baumannii* (CRAB). However, the use of intravenous colistin was limited by its nephrotoxic effects. Inhaled colistin was an adjunctive therapy to intravenous antibiotics due to less nephrotoxicity and higher concentration in lung. However, the effectiveness and safety of inhaled colistin has not been well established. In order to determine the role of inhaled colistin, we conducted a study to compare the effectiveness and safety of inhaled (INHL) colistin to intravenous (IV) colistin in patients with positive CRAB sputum culture.
RESEARCH QUESTION OR HYPOTHESIS: Inhaled colistin has better effectiveness and safety compared with intravenous colistin in patients with positive CRAB sputum culture.
STUDY DESIGN: A retrospective matched cohort study.
METHODS: Medical records of adult patients with positive CRAB sputum culture receiving INHL or IV colistin for more than 72 h between January 2013 and December 2015 were

reviewed. Primary outcomes were day-7 and post-therapy microbiological success. Secondary outcomes were to assess clinical outcomes such as changes of renal function, incidence of acute kidney injury (AKI) and 30-day mortality. Categorical and continuous variables were analyzed by chi-square test/ Fisher's exact test and Mann-Whitney U test respectively. Statistical significance was considered at $p<0.05$.
RESULTS: A total of 80 patients receiving INHL colistin and 16 patients receiving IV colistin were included in this study. There were no significant differences between groups in baseline characteristics except for higher serum creatinine in INHL group. The day-7 eradication rate was higher in INHL group than in IV group (75.5% vs. 25.0%; p=0.002). Thirty-day mortality (17.5% vs. 43.8%; p=0.041) and development of AKI (18.8% vs. 53.3; p=0.008) were lower in INHL colistin than in IV colistin group.
CONCLUSION: Our results demonstrated that inhaled colistin might have better eradication rate in patients with positive CRAB sputum culture with lower incidence of nephrotoxicity.

168. Outcomes of bacteremia caused by inducible AmpC beta-lactamase producing organisms treated with third generation cephalosporins vs AmpC stable antibiotics. Hana Rac, PharmD[1], Kristen O'Brien, PharmD[2], Jan Pack, PharmD[1], Colleen Kraft, MD[3], Christopher Paciullo, PharmD, BCCCP, FCCM[4]; (1) Emory University Hospital, Atlanta, GA (2) Mercer University College of Pharmacy, Atlanta, GA (3) Emory University School of Medicine, Atlanta, GA (4) Department of Pharmaceutical Services, Emory University Hospital, Atlanta, GA
INTRODUCTION: AmpC beta-lactamases are enzymes that hydrolyze most beta-lactams. The inducible AmpC beta-lactamase producing bacteria most often associated with the emergence of resistance after treatment with third generation cephalosporins (TGC) are *Enterobacter* spp., *Serratia marcescens*, and *Citrobacter freundii,* and this resistance has been associated with a longer length of stay and increased hospital costs.
RESEARCH QUESTION OR HYPOTHESIS: Does definitive treatment of *Enterobacter* spp., *Serratia marcescens*, and *Citrobacter freundii* bacteremia with TGC or AmpC stable antibiotics have an effect on clinical outcomes?
STUDY DESIGN: Retrospective cohort study conducted at Emory University Hospital and Emory University Hospital Midtown from January 2010 to June 2014.
METHODS: Patients with a positive blood culture of *Enterobacter* spp., *Serratia marcescens*, or *Citrobacter freundii* that was susceptible to TGC were included and divided into those who received definitive treatment with TGC vs AmpC stable antibiotics. Patients treated with other gram negative antibiotics, with polymicrobial infections, or with urine, wound, or respiratory sources were excluded. The primary outcome was 30 day all-cause mortality. Secondary outcomes included clinical cure, microbiologic cure, development of resistance, hospital length of stay, in hospital mortality, and relapse rates. When possible, outcomes were adjusted for the Charlson Comorbidity Index.
RESULTS: A total of 49 patients were included: eight in the TGC group and 41 in the AmpC stable antibiotic group. There was no statistical difference found in 30 day all-cause mortality or any of the secondary objectives except clinical cure. 25% of patients in the TGC group and 72.5% in the AmpC stable antibiotic group achieved clinical cure (p=0.0103). The unadjusted odds ratio was 7.91 (p=0.0202), and when adjusted for the Charlson Comorbidity Index, 9.09 (p=0.0170).
CONCLUSION: While there is not enough data to show that the use of TGC in these infections can lead to increased mortality, it is associated with decreased clinical cure.

169. Clinical pharmacist intervention on procalcitonin (PCT) levels in an academic level one trauma center – do we make a difference? Karen Nguyen, PharmD, Eva Sullivan, PharmD, Harminder Sikand, PharmD, FCSHP, FASHP; Department of Pharmacy, Scripps Mercy Hospital, San Diego, CA
INTRODUCTION: Procalcitonin (PCT) is a prohormone of calcitonin that is elevated in bacterial infections. PCT has been studied in sepsis and lower respiratory tract infections (LRTIs) to aid in appropriate antibiotic therapy.
RESEARCH QUESTION OR HYPOTHESIS: The primary objective is to determine if clinical pharmacist intervention on PCT levels resulted in antibiotic therapy modification. The secondary objective was to evaluate the appropriateness of PCT level ordering.
STUDY DESIGN: Retrospective, concurrent study from January 2015 to April 2016. The student t-test, Mann-Whitney U, fisher exact and chi square were used to compare the treatment arms.
METHODS: The Pharmacist Arm and Physician Arm with low PCT (indicative of non-bacterial processes) were evaluated. In the Pharmacist Arm, clinical pharmacists used published PCT-level algorithms to evaluate appropriateness of antibiotic therapy and intervened with physicians. In the Physician Arm, clinical pharmacists determined if physicians utilized the PCT level to guide antibiotic therapy according to the algorithms.
RESULTS: A total of 118 patients were screened and 90 patients met inclusion criteria. All 90 patients were assessed for appropriateness of PCT level ordering. Patient demographics were similar in both arms. In the Physician Arm, 39% of patients with low PCT levels had antibiotics modified. Antibiotics were continued in 61% of patients due to ancillary disease or misinterpretation of PCT values. In the Pharmacist Arm, clinical pharmacists intervened and modified antibiotics in 78% of patients (p=0.006). In 22% of patients, antibiotics were continued due to clinical status and diagnoses other than LRTIs or sepsis. Of 90 patients, 27.8% of PCT levels were ordered inappropriately.
CONCLUSION: When utilized appropriately, PCT levels can guide antibiotic therapy in sepsis and LRTIs. Clinical pharmacist intervention on PCT levels significantly modified antibiotic therapy, which included discontinuation of all antibiotics and de-escalation of broad spectrum antibiotics.

170. Effectiveness of a pharmacist to dose vancomycin consult service in attaining therapeutic trough levels in a teaching hospital. Ellen Robinson, PharmD, Kristi Traugott, PharmD, BCPS, Darrel W. Hughes, PharmD, BCPS, Stephanie Younts, PharmD, BCPS, Daniel Gonzalez, PharmD; Department of Pharmacy Services, University Health System, San Antonio, TX
INTRODUCTION: Previous literature indicates pharmacy dosing services reduce Medicare charges, drug and laboratory costs, and medication errors without significant delays in antimicrobial therapy.
RESEARCH QUESTION OR HYPOTHESIS: Does a pharmacy to dose vancomycin consult service improve therapeutic trough attainment and appropriate lab draws without significant delay in therapy?
STUDY DESIGN: Our study was a retrospective chart review at a level one trauma hospital of two patient groups€"a pre-pharmacy group (before consult service) and a pharmacy group (after consult service implementation).
METHODS: The pre-pharmacy group included patients in our trauma step-down unit with a vancomycin order from July 2015-October 2015. The pharmacy group included patients in our trauma step-down unit with a clinical pharmacy consult from December 2015-March 2016. Exclusion criteria included age < 18 years or pregnancy. Our primary outcome compared initial therapeutic trough attainment (%) between groups. Secondary outcomes included trough attainment at any time during therapy (%), appropriate laboratory troughs (%), incidence of adverse renal events (defined as increase in serum creatinine > 0.3 mg/dL or > 1.5 x baseline over 48 h), and time from initial consult to medication order entry.
RESULTS: We included 63 patients in the pre-pharmacy group and 42 in the pharmacy group. In the pre-pharmacy group 17/63 patients (26.9%) achieved initial therapeutic levels vs. 22/42

patients (52.4%) in the pharmacy group (p=0.01). Three patients (4.8%) in the pre-pharmacy group and two patients in the pharmacy group (4.8%) experienced an adverse renal event (p=1.0). Troughs were drawn appropriately 60% of the time in the pre group and 87.4% of the time in the pharmacy group (p=0.001). Time from initial consult to order entry was < 60 min in 83.4% of patients in the pharmacy group.
CONCLUSION: Our vancomycin consult service significantly increased initial therapeutic trough attainment and appropriate lab draws without significant delays in therapy.

171. An outcome evaluation of computer-prescribing order entry standardized protocol for treatment of clostridium difficile colitis in a teaching tertiary care facility. Linda Nwachukwu, MPH, PharmD, BCPS[1], Courtney Armstrong, PharmD[2], Zachary Mulkey, MD[3], Charles F. Seifert, PharmD, FCCP, BCPS[1]; (1) School of Pharmacy, Texas Tech University Health Sciences Center, Lubbock, TX (2) Pharmacy Department, UMC Health System, Lubbock, TX (3) Department of Internal Medicine, School of Medicine, Texas Tech University Health Sciences Center, Lubbock, TX
INTRODUCTION: Clostridium difficile infection (CDI) continues to be a major public health concern in the U.S. Despite effective treatment options, there continues to be an increase in Clostridium difficile infections, recurrence, and mortality.
RESEARCH QUESTION OR HYPOTHESIS: The purpose of this study was to determine whether a standardized computerized physician order set could improve patient management and outcome as recommended by the recent guidelines.
STUDY DESIGN: Retrospective case-control study of hospitalized adults, between the age of 18 and 89 years, with C. difficile infection presenting to a 454 bed tertiary care referral county teaching hospital was conducted prior to and after the implementation of a CDI order set or protocol.
METHODS: Patients were identified using International Classification of Diseases - 9th and 10th Revision codes. Mortality and infection recurrence of patients with C. difficile infection were measured to determine the effectiveness of the protocol.
RESULTS: Eighty percent of patients were treated in accordance with guidelines prior to and post protocol implementation. Patients treated according to the protocol had a significantly reduced mortality (11/277, 4.0%) compared to 26/332, 7.8% (p=0.0471) of patients where guidelines were followed prior to protocol implementation and 8/71, 11.3% (p=0.0158) not according to the protocol after implementation. Patients with mild/moderate CDI were more likely to be treated according to guidelines compared to patients with severe or severe and complicated CDI both pre- and post- protocol implementation (p<0.0001). As CDI complexity increased, the less likely patients were treated in accordance with guidelines and the higher their rate of total complications and mortality.
CONCLUSION: Our study found that the implementation of a standardized computerized physician order set for the management of Clostridium difficile colitis was associated with a lower mortality. These results suggest that the use of standardized order set for the management of C. difficile should be routinely employed.

172. Negative predictive value of nasal swab polymerase chain reaction screening test in hospitalized patients for Methicillin-resistant *Staphylococcus aureus* culture positive pneumonia. Scott Wilkie, PharmD[1], John Phillips, PharmD[1], Lindsay Harris, PharmD[1], Jared Chiusano, PharmD[1], Clay Otto, PharmD[1]; (1) Department of Pharmacy, Mission Hospital, Asheville, NC
INTRODUCTION: Methicillin-resistant *Staphylococcus aureus* (MRSA) associated pneumonia has been increasing in prevalence in the United States. Unfortunately, respiratory culture results may take up to 72 h to return which may lead to prolonged empiric MRSA coverage. An alternative tool may be the use of MRSA polymerase chain reaction (PCR) nasal swab screening tests which could identify patients with negative MRSA culture pneumonia sooner. However, only a few single-centered studies have demonstrated the utilization of PCR nasal swab screens in identifying patients with negative MRSA culture pneumonia. These negative predictive value for MRSA culture pneumonia in these studies are between 84.4% and 99.2%. The external validity of these published reports to our institution is questionable due to unique populations being served.
RESEARCH QUESTION OR HYPOTHESIS: What is the negative predictive value of the MRSA PCR nasal swab for MRSA culture pneumonia.
STUDY DESIGN: This study was a single-centered, retrospective electronic chart review conducted at a 795 bed community hospital in western North Carolina.
METHODS: Patients were included in the study if they were 18 years old or more, who had a MRSA PCR and respiratory culture collected in the same admission and had an ICD-9 confirmed pneumonia. Patients were excluded if results were indeterminate.
RESULTS: In our study, the negative predictive value of the MRSA PCR nasal swab for MRSA culture pneumonia was 98.9% (n=965) in hospitalized patients and 98.4% (n=475) in ICU patients.
CONCLUSION: Based on these results and those previously published, the MRSA PCR nasal swab screen may be a tool used for rapid de-escalation of empiric MRSA therapy for pneumonia in patients at our institution.

173. Effect of reduced vancomycin loading doses on vancomycin trough concentrations in critically ill and non-critically ill patients. Anwesa Chakrabarti, PharmD, Alydia Snyder, PharmD, Jamie Hopkins, PharmD; Department of Pharmacy, Jackson-Madison County General Hospital, Jackson, TN
INTRODUCTION: The 2009 American Society of Health System Pharmacists/ Infectious Diseases Society of America (ASHP/IDSA) guidelines recommend using vancomycin loading doses to achieve faster goal troughs in seriously ill patients. Although this institution has a pharmacist dosed pharmacokinetic consult service, an ongoing quality assessment showed that first troughs were not within goal range a majority of the time in all patients.
RESEARCH QUESTION OR HYPOTHESIS: The study hypothesized that the addition of a vancomycin loading dose protocol can achieve more goal first troughs in all patients.
STUDY DESIGN: This retrospective, pre- and post-intervention study was conducted at a tertiary care community based hospital. Inclusion criteria were patients 18 years or older who received at least one day of vancomycin with a consult for pharmacy to dose vancomycin. Exclusion criteria were hemodialysis patients, pulse dosed patients, or patients with vancomycin discontinued/dosing assumed by another service prior to obtaining a trough.
METHODS: A 22–25 mg/kg loading dose protocol was implemented for all patients. The primary outcome was mean first trough concentrations. Secondary outcomes included percentage of first troughs at goal, percentage of second troughs at goal, and rates of nephrotoxicity.
RESULTS: The mean initial concentration was 14.6 ($\pm$ 6.5) μg/mL in the pre-intervention group and 16.5 ($\pm$ 7.3) μg/mL in the post-intervention group (p=0.09). The percent at goal was 26.7% in the pre-intervention group and 30.4% in the post-intervention group (p=0.58). Second troughs were at goal in 50% of the pre-intervention group and 58.3% of the post-intervention group (p=0.30). Four patients per group met the definition for nephrotoxicity (p=0.97).
CONCLUSION: Higher mean vancomycin first trough concentrations and percentage of first troughs at goal were observed with the implementation of a vancomycin loading dose protocol. No difference was observed with second troughs or nephrotoxicity.

174. Identification of known and potentially novel resistance determinants by comprehensive whole genome transcriptome sequencing of a large collection of fluconazole-resistant clinical isolates of *Candida albicans*. Andrew Nishimoto, PharmD[1], Michael Dickens, PhD[2], Qing Zhang, BS[3], David Rogers, PharmD, PhD[1]; (1) Department of Clinical Pharmacy, University of Tennessee Health Science Center, Memphis, TN (2) High Performance Research Computing, Texas A&M University, College Station, TX (3) University of Tennessee College of Pharmacy, Memphis, TN

INTRODUCTION: We undertook a whole genome transcriptome analysis of a collection of 63 *Candida albicans* clinical isolates with reduced fluconazole susceptibility in order to identify expression profiles associated with resistance, determine the prevalence of known resistance determinants, and discover potentially novel resistance determinants.

RESEARCH QUESTION OR HYPOTHESIS: Specific transcriptional profiles are associated with fluconazole resistance and are indicative of both known and potentially novel resistance mechanisms.

STUDY DESIGN: The whole genome transcriptional profiles of 63 *C. albicans* clinical isolates with reduced fluconazole susceptibility were compared to a composite profile of six susceptible clinical isolates to identify genes differentially expressed in association with resistance.

METHODS: Next generation sequencing of genomic mRNA was performed on Life Technologies Ion Proton Torrent platform. STAR software was used to align sequenced mRNA.

RESULTS: 40 (63.5%) resistant isolates showed upregulation of genes of the Tac1 regulon and 10 (15.9%) showed upregulation of the Mrr1 regulon. 15 (23.8%) resistant isolates showed upregulation of genes of the Upc2 regulon, including *ERG11*. Interestingly, seven of these are known not to carry an activating mutation in Upc2. Two isolates had increased expression of the *MDR1* drug transporter gene without increased expression of other genes of the Mrr1 regulon. Four fluconazole-resistant isolates did not show any upregulation in Tac1-, Mrr1-, or Upc2-regulated genes. Three of these four isolates, however, highly expressed a novel membrane transporter, orf19.4090. Genes encoding four other membrane transporters (Hgt1, Hgt6, Hgt12, Hgt17) were highly upregulated among resistant isolates lacking overexpression of known resistance genes.

CONCLUSION: Specific transcriptional profiles are associated with fluconazole resistance and are indicative of both known and potentially novel resistance mechanisms. Whole genome transcriptional profiling may eventually be a useful tool for identification of resistant isolates with specific resistance mechanisms.

175. Treatment of *Staphylococcus aureus* bacteremia pre- and post-implementation of rapid diagnostic testing. Mary Naeger, PharmD[1], Emily Welch, PharmD, BCPS[1], Anna Schmidt, PharmD, BCPS[1], Robin Chamberland, PhD, D(ABMM)[2]; (1) Department of Pharmacy Services, SSM Health Saint Louis University Hospital, St. Louis, MO (2) Department of Pathology, Saint Louis University School of Medicine, St. Louis, MO

INTRODUCTION: *Staphylococcus aureus* bacteremia is associated with significant morbidity and mortality. Due to increasing rates of antimicrobial resistance, vancomycin is often started empirically until susceptibility results are available, which may take several days with traditional identification methods. Utilization of rapid identification and susceptibility determination testing may lead to earlier antimicrobial optimization and improved clinical outcomes.

RESEARCH QUESTION OR HYPOTHESIS: Is the time to targeted antimicrobial therapy for the treatment of *Staphylococcus aureus* bacteremia shorter after implementation of rapid identification testing?

STUDY DESIGN: Retrospective, single-center, quasi-experimental cohort study

METHODS: This study included adult inpatients with blood cultures positive for *Staphylococcus aureus*. Blood cultures with coagulase-negative Staphylococcus or mixed organisms were excluded. Based on the date of first positive blood culture, patients fell into a pre-implementation group and a post-implementation group. The primary outcome was time from positive blood culture to initiation of targeted antimicrobial therapy, defined as cefazolin or nafcillin for MSSA and vancomycin or daptomycin for MRSA. Secondary outcomes were time to identification of causative organism, length of hospital stay, and length of ICU stay.

RESULTS: A total of 75 patients were included, 38 pre-implementation and 37 post-implementation. Baseline characteristics were similar, except more patients pre-implementation were admitted to an ICU when cultures were drawn (p=0.015) and more patients post-implementation were intravenous drug users (p=0.038). Mean time to initiation of targeted antimicrobial therapy was significantly shorter in the post-implementation group (10.56 h compared to 40.63 h, p=0.035). Time to identification of causative organism was also significantly shorter post-implementation (4.72 h compared to 46.03 h, p<0.001). Lengths of hospital and ICU stays were similar.

CONCLUSION: Utilization of rapid identification testing on positive blood cultures resulted in significantly shorter time to targeted antimicrobial therapy and identification of causative organism. Rapid identification facilitates quicker narrowing of antimicrobial therapy, optimizing patient care and healthcare resources.

176. Host factors associated with elevated minimum inhibitory concentrations to fosfomycin and doxycycline among vancomycin-resistant enterococcal urine isolates at a tertiary care medical center. Jillian Hayes, PharmD Candidate[1], Brian O'Quinn, PharmD Candidate[1], Kevin Lu, PhD[2], Celeste Caulder, PharmD[2], P. Brandon Bookstaver, PharmD, FCCP, BCPS, AAHIVP[3]; (1) South Carolina College of Pharmacy, University of South Carolina, Columbia, SC (2) Department of Clinical Pharmacy & Outcomes Sciences, South Carolina College of Pharmacy, University of South Carolina, Columbia, SC (3) Department of Clinical Pharmacy & Outcomes Sciences, University of South Carolina College of Pharmacy, Columbia, SC

INTRODUCTION: Antibiotic susceptibility patterns of vancomycin-resistant Enterococcal (VRE) urine isolates to fosfomycin and doxycycline are generally lacking.

RESEARCH QUESTION OR HYPOTHESIS: Which factors are predictors of fosfomycin or doxycycline non-susceptibility among VRE urine isolates?

STUDY DESIGN: This was an observational, retrospective study completed at a tertiary care medical center in Columbia, South Carolina.

METHODS: A susceptibility profile was created from non-repeat VRE urine isolates that underwent Epsilometer testing over a 14-month period to evaluate daptomycin, doxycycline and fosfomycin *in vitro* activity. Routine susceptibilities from automated testing (Vitek II) were collected. FDA-approved Enterococcal breakpoints were used. Isolates were divided into the following groups for evaluation: fosfomycin MIC $\leq$ 64 μg/mL vs. MIC > 64 μg/mL and doxycycline $\leq$ 4 μg/mL vs. MIC > 4 μg/mL. Fisher's exact and Student's t-tests were performed to compare host factors and laboratory parameters between groups (p<0.05 for significance). Multivariate regression was performed to determine predictors of elevated MICs.

RESULTS: Sixty-seven isolates were included in the analysis. The patients were primarily women (66%) and 61 years old. Forty-one isolates (61%) were hospital-acquired. Twenty-six (39%) isolates had an MIC $\leq$ 64 μg/mL to fosfomycin while 31% (n=21) of isolates had an MIC $\leq$ 4 μg/mL to doxycycline. Three isolates (4%) were resistant to daptomycin (MIC > 4 μg/mL). The fosfomycin MIC_{50} was 96 μg/mL and MIC_{90} 128 μg/mL; doxycycline MIC_{50} was 12 μg/mL and MIC_{90} 24 μg/mL. Patients with fosfomycin-susceptible isolates had poorer renal function (CrCl <=30 ml/min) (50% vs 34%, p=0.214), and isolates were more often hospital-acquired (69% vs 56%, p=0.315),

although neither were statistically different. There were no statistical differences in host or laboratory variables detected between the fosfomycin or doxycycline susceptible vs non-susceptible isolates, respectively.
CONCLUSION: Available susceptibility data may substantiate expanded treatment options for multi-drug resistant urinary tract infections. Additional data are needed to conclude definitive risk factors for fosfomycin or doxycycline-resistance among VRE urine isolates.

177. Comparison of outcomes utilizing three different severity scores for Clostridium difficile infections. Natalie Giron, PharmD[1], Christopher Paciullo, PharmD, BCCCP, FCCM[2], Colleen Kraft, MD[3], Kristen O'Brien, PharmD[4]; (1) University of Pittsburgh Medical Center, Pittsburgh, PA (2) Department of Pharmaceutical Services, Emory University Hospital, Atlanta, GA (3) Emory University School of Medicine, Atlanta, GA (4) Mercer University College of Pharmacy, Atlanta, GA
INTRODUCTION: *Clostridium difficile*infection (CDI) is a major source of morbidity and mortality in hospitalized patients. Several scoring systems have been developed to determine severity of illness and predict outcomes of CDI.
RESEARCH QUESTION OR HYPOTHESIS: To determine which scoring system is more accurate in stratifying patients into severe disease based on described outcomes of severe CDI.
STUDY DESIGN: Retrospective chart-review.
METHODS: Patients with a positive *C. difficile* polymerase chain reaction (PCR) admitted between 11/01/2010 and 7/20/2015 were reviewed. Patients with a positive *C. difficile*PCR and non-formed stools were included. Patients were excluded if they were < 18 years; pregnant; prisoners or had recurrent CDI. Eligible patients were scored following the definitions of the ACG Practice Guidelines, SHEA/IDSA Practice Guidelines, and 2015 Clinical Prediction Rule (CPR). The sensitivity and specificity of scoring "severe" for each test was calculated based on development of one of the following outcomes: death due to CDI; intensive care unit admission due to CDI; or surgery due to CDI. The primary statistical analysis compared sensitivity and specificity across each of the three unique pairs of guidelines, adjusting for paired tests and multiple comparisons.
RESULTS: 210 patients were enrolled. The sensitivities for each score were 63.4%, 63.4%, 70.7% and 41.5% for the ACG, SHEA/IDSA, CPR-Low and CPR-High respectively. The specificities were 68.6%, 66.3%, 46.2% and 46.2% for the ACG, SHEA/IDSA, CPR-Low and CPR-High respectively. When adjusting for multiple comparisons, the only difference in sensitivity was CPR-Low vs CPR-High ($p<0.001$). The IDSA and ACG specificity were statistically similar ($p=0.58$), with all other specificity comparisons yielding statistically significant results ($p<0.001$).
CONCLUSION: Both the IDSA and ACG severe criteria appear to be sensitive and specific tools for predicting severe disease. The IDSA and ACG criteria are statistically similar. The CPR, although sensitive, sacrifices specificity.

179. The utility of procalcitonin to support clinical decision making in critically ill pediatric patients. Maya Holsen, PharmD Candidate[1], Shirley Chen, PharmD Candidate[1], Nicholas Fusco, PharmD[1], Amanda Hassinger, MD[2], David Jacobs, PharmD[1]; (1) University at Buffalo School of Pharmacy and Pharmaceutical Sciences, Buffalo, NY (2) University at Buffalo Jacobs School of Medicine and Biomedical Sciences, Buffalo, NY
INTRODUCTION: The biomarker procalcitonin (PCT) has proven useful in predicting bacterial infection; however, there is limited data on its diagnostic power in a general pediatric intensive care unit (PICU) population with a heterogeneous group of diseases.
RESEARCH QUESTION OR HYPOTHESIS: We assessed the hypothesis that PCT has the diagnostic ability to detect serious bacterial infections and may determine antibiotic outcomes in the PICU population.
STUDY DESIGN: Single center, retrospective cohort study conducted in the PICU between January 1, 2013 and June 30, 2015.
METHODS: Patients included were < 18 years of age, had a documented PCT level in the electronic medical record and received < 48 h of antibiotic therapy at the time of PCT. The ability of PCT to predict serious bacterial infections was examined by an AUC-ROC plot, sensitivity, specificity, and predictive values. Comparisons between the SBI and non-SBI group included length of antibiotic therapy, completed course of antibiotics and economic value of PCT testing.
RESULTS: Of the 75 included patients, 28 (37%) had an SBI and 47 (63%) did not have an SBI. A procalcitonin cut-off >= 1.0 ng/mL showed a sensitivity of 82% (95% CI, 63 - 94%), a specificity of 75% (60 - 86%) a positive predictive value of 65% (48 - 81%) and a negative predictive value of 88% (73–96%). Based on the ROC curve, PCT had a good ability to predict bacterial infection (AUC, 0.83; 95% CI: 0.74 - 0.93, $p<0.0001$). The SBI group had a longer duration of antibiotic therapy (5 [3–8] vs 2 [1–6], $p<0.01$) and were more likely to complete the antibiotic course (96% vs 60%, $p=0.001$). The cost of antibiotics in the non-SBI group was $3172 and cost of PCT testing was $10,046.
CONCLUSION: Procalcitonin adequately predicted bacterial infection and may be useful in minimizing antibiotic consumption in thoe wihtout a SBI if available in real-time.

181. Risk factors for *Pseudomonas aeruginosa* to guide empiric therapy for gram-negative infections. Krutika Mediwala, PharmD[1], W. Cliff Rutter, PharmD[2], Donna R. Burgess, RPh[1], Craig A. Martin, PharmD, BCPS[3], Katie Wallace, PharmD[1], David Burgess, PharmD[3]; (1) Department of Pharmacy, University of Kentucky HealthCare, Lexington, KY (2) University of Kentucky College of Pharmacy, Lexington, KY (3) Department of Pharmacy Practice and Science, University of Kentucky College of Pharmacy, Lexington, KY
INTRODUCTION: *Pseudomonas aeruginosa* (PSA) is associated with high morbidity and mortality, and there is no PSA-specific risk factor score to guide empiric therapy.
RESEARCH QUESTION OR HYPOTHESIS: To identify risk factors and develop a PSA-risk score.
STUDY DESIGN: Retrospective, case-control study.
METHODS: Clinical data from 1/1/2010 through 12/31/14 were obtained from the University of Kentucky Center for Clinical and Translational Science Enterprise Data Trust. Cases were defined as adults with PSA-positive cultures, while controls had Enterobacteriaceae (ENT)-positive cultures. Exclusion criteria included cystic fibrosis and polymicrobial infections. Basic descriptive statistics were performed and multivariable logistic regression was utilized to identify risk factors for PSA infections.
RESULTS: 2770 patients were evaluated (2399 ENT vs. 371 PSA). Male gender (60% vs. 40%, $p<0.0001$) and comorbidities including CKD, ESRD, COPD, immunosuppression and hematologic malignancies were significantly more prevalent in the PSA group. Patients with prior history of PSA cultures and antibiotic exposure were more likely to have PSA infections ($p<0.001$ and 54% vs. 38%, $p<0.0001$, respectively). They were also more likely to have central-lines, mechanical ventilation, and circulatory shock (12% vs 7%, $p=0.003$; 22% vs. 15%, $p=0.002$; 22% vs. 16%, $p=0.002$ respectively). Charlson Comorbidity Index (CCI) score and frequency of hospital-acquired infections were higher in PSA group (median[IQR] 4[2–8] vs. 5[3–8] $p=0.002$ and 67% vs. 58%, $p=0.0005$, respectively). Prior antibiotic exposure or PSA culture, hematological malignancy, immunosuppression, CCI >= 5, and pulmonary source were independent predictors for PSA in our population. A risk-factor score cutoff of 5.5 had the most optimal combination of sensitivity (64.2%), specificity (76%), accuracy (74.4%), negative predictive value (93.2%), and positive predictive value (29.2%).
CONCLUSION: A score cutoff of 5.5 was optimal in our population. Score distributions for ENT and PSA patients were

remarkably similar, making it difficult to distinguish between them in order to direct antibiotic therapy.

182. Challenging the challenge of beta-lactam allergies: Before-after study assessing multidisciplinary interventions to improve allergy documentation and antibiotic selection. Steven Krey, PharmD[1], Lee Skrupky, PharmD, BCPS[1], Jeff Waise, PharmD, MBA[1], Ashley Purohit, PharmD, MBA[2]; (1) Department of Inpatient Pharmacy, Aurora BayCare Medical Center, Green Bay, WI (2) Department of Inpatient Pharmacy, Aurora Health Care, Milwaukee, WI

INTRODUCTION: Beta-lactam antibiotic allergies account for some of the most commonly reported drug allergies and can adversely affect antibiotic selection and related patient outcomes.

RESEARCH QUESTION OR HYPOTHESIS: Multidisciplinary interventions focused on improving knowledge, documentation, and approach to beta-lactam allergies will lead to improved documentation and antibiotic selection.

STUDY DESIGN: Before-after study conducted at a tertiary community medical center.

METHODS: Inpatients with a reported beta-lactam allergy receiving at least one antibiotic for > 24 h were included; only first admissions were assessed. All interventions were implemented as of January 4th, 2016 and included a combination of multidisciplinary education, creation of practice guidelines, and modified practices for nurses, pharmacists, pharmacy technicians, and physicians. The before phase consisted of eligible patients admitted between September 1st and November 30th, 2015 and the after phase was between January 5th and April 30th, 2016. Primary outcomes were documentation of reaction type and percentage of patients receiving non beta-lactam therapy. Secondary outcomes included documentation of previously tolerated beta-lactams and modification of non-beta-lactam therapy.

RESULTS: A total of 179 patients were included, 91 pre- and 88 post-intervention. No significant differences were observed between the before vs. after groups in the percentage of patients with documentation of reaction type (90.1% vs. 89.8%, p=0.940) or the overall percentage of patients receiving non beta-lactams (86.8% vs. 84.1%, p=0.605). However, significantly more patients in the after phase had documentation of previously tolerated beta-lactams (8.8% vs. 28.4%, p=0.001) and among patients receiving a non beta-lactam, a greater percentage were subsequently switched to a beta-lactam (11.4% vs. 25.7%, p=0.022). One allergic reaction was documented during the study, which occurred in the before phase.

CONCLUSION: Multidisciplinary efforts to improve the approach to beta-lactam allergic patients had a positive impact on documentation of previously tolerated beta-lactams and antibiotic selection.

183. Relative contributions of multidrug resistance transporters to azole antifungal resistance in *Candida glabrata*. Sarah G. Whaley, PharmD[1], Qing Zhang, BS[1], Kelly E. Caudle, PharmD, PhD[2], P. David Rogers, PharmD, PhD[1]; (1) University of Tennessee College of Pharmacy, Memphis, TN (2) Department of Pharmaceutical Sciences, St. Jude Children's Research Hospital, Memphis, TN

INTRODUCTION: The utility of the azole antifungals for the treatment of invasive candidiasis is severely hampered by azole resistance in *Candida glabrata*. Azole resistance in *C. glabrata* is mediated almost exclusively by activating mutations in the zinc cluster transcription factor Pdr1, which controls the genes encoding the multidrug resistance transporters Cdr1, Pdh1, and Snq2. However, the specific relative contribution of these transporters is not known.

RESEARCH QUESTION OR HYPOTHESIS: Specific multidrug resistance transporters make distinct contributions to azole resistance in *C. glabrata*.

STUDY DESIGN: Genetic deletion of all relevant multidrug transporters in a highly resistant strain of *C. glabrata* in all possible combinations followed by determination of susceptibility of each deletion strain to a panel of azole antifungals.

METHODS: The *SAT1* flipper method was used to delete *CDR1*, *PDH1*, and *SNQ2* in a strain of *C. glabrata* engineered to carry an activating mutation in *PDR1*. Susceptibility testing was performed according to the CLSI guidelines with minor modifications. Spot assays were conducted by spotting serial dilutions of the generated strains on solid minimal media containing varying azole concentrations.

RESULTS: Of the single transporter deletion strains, only *CDR1* deletion resulted in decreased azole MIC. Deletion of *PDH1* in combination with *CDR1* resulted in a moderate decrease in MIC from the *CDR1* alone deletion strain. *SNQ2* deletion only decreased MIC in the triple knockout strain in the absence of both *CDR1* and *PDH1*. Deletion of all three transporters in combination did not decrease MIC to the level of the *PDR1* deletion strain for all of the azoles tested.

CONCLUSION: Cdr1 is the most important Pdr1-mediated multidrug resistance transporter for azole resistance in *C. glabrata*, while Pdh1 and to a lesser extent Snq2 impact the phenotype as well. Additional as yet unidentified Pdr1 targets also contribute to this phenotype.

184. Vancomycin pre-dialysis serum concentrations- a possible predictor of mortality in gram positive bacteremic hemodialysis patients?. Kerry Anne Rambaran, PharmD[1], Kristen Fuhrmann, PharmD, BCPS-AQ ID, AAHIVP[2], Charles F. Seifert, PharmD, FCCP, BCPS[1]; (1) School of Pharmacy, Texas Tech University Health Sciences Center, Lubbock, TX (2) Department of Pharmacy, UMC Health System, Lubbock, TX

INTRODUCTION: Vascular access infection is one of the major contributors to hemodialysis (HD) patient morbidity and mortality. Thus, antibiotic use in HD patients is not uncommon, particularly vancomycin, as it provides coverage against Gram positive organisms inclusive of *Staphylococcus* and *Streptococcus*. There is a paucity of consensus guidelines on vancomycin use in the HD population.

RESEARCH QUESTION OR HYPOTHESIS: What vancomycin levels are associated with positive outcomes in HD patients with Gram positive bacteremia?

STUDY DESIGN: A retrospective cohort study conducted at a 454 bed tertiary teaching county hospital in Lubbock, TX from January 1, 2010 to January 1, 2016.

METHODS: Patients 18–89, with chronic renal failure on hemodialysis who presented with positive blood cultures with Gram positive bacteria and received intravenous vancomycin for at least 24 h were evaluated. A multivariate analysis was performed using Analyse-it for Microsoft Excel 3.90.7 (Copyright 1997–2016, Leeds England) comparing factors related to outcomes including clinical cure, hospital length of stay, and in-hospital mortality. An alpha level of significance was defined apriori as < 0.05.

RESULTS: A total of 138 patients were analyzed, 90 of whom had documented pre-dialysis serum concentrations. A multivariate analysis showed that SAPS II score [OR 1.220 (95% CI = 1.086–1.370, p<0.0001)], initial dose/kg [OR 0.7911 (0.6302–0.9929, p=0.0239)], and pre-dialysis concentrations between 15–20 μg/mL [0.05437 (95% CI = 0.0033–0.8891, p=0.0099)] were associated with mortality (overall multivariate model, p<0.0001).

CONCLUSION: When patient acuity and initial dosing are taken into account, pre-dialysis concentrations between 15–20 μg/mL were associated with decreased mortality in Gram positive bacteremic HD patients. Further prospective studies are needed to assess whether these targeted serum vancomycin concentrations improve mortality.

185E. Increased incidence of clostridium difficile infections with proton pump inhibitor use post-kidney transplant. Michael Spinner, PharmD[1], Kajal Patel, PharmD, BCPS[1], Elizabeth Neuner,

PharmD, BCPS (AQ-ID)[1], Brian Stephany, MD[2]; (1) Department of Pharmacy, Cleveland Clinic, Cleveland, OH (2) Department of Nephrology, Cleveland Clinic, Cleveland, OH
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186. Impact of a pharmacist driven microbiological culture surveillance as part of an emergency department antimicrobial stewardship service. Eric Ocheretyaner, PharmD[1], Eris Cani, BS, PharmD[2], Stanley Moy, PharmD, BCPS[3], Roopali Sharma, PharmD, BCPS AQ-ID, AAHIVP[4]; (1) Department of Pharmacy, SUNY Downstate Medical Center, Brooklyn, NY (2) Pharmacy, SUNY Downstate Medical Center, Brooklyn, NY (3) SUNY Downstate Medical Center, Brooklyn, NY (4) Long Island University, Greenvale, NY
INTRODUCTION: In the emergency department (ED) antibiotics are frequently prescribed and a pharmacist can play an essential role in antimicrobial selection and culture follow-up in collaboration with the ED team. Baker et al have shown that pharmacist-managed ED culture follow-up resulted in a decrease in time to culture review from 3 to 2 days.
RESEARCH QUESTION OR HYPOTHESIS: Does pharmacist-managed prospective ED culture review improve time to positive culture follow-up?
STUDY DESIGN: Retrospective, single-center, cohort study
METHODS: Utilizing TheraDoc®, a clinical decision support system, positive adult cultures in the ED over 2 months were retrospectively reviewed. The first month served as a control group with no pharmacist present in the ED. An infectious diseases pharmacist was incorporated into the ED work flow in the second month of the study to aid in culture review and education of ED staff. The empiric antibiotic prescribed was assessed for appropriate selection, dose, frequency, and duration based on susceptibility results. The primary endpoint was time to review of reported positive culture.
RESULTS: A total of 62 patients were reviewed in the no pharmacist group with 45 patients reviewed in the pharmacist group. The majority of cultures reviewed were urine (80.6%). The rate of review was 32.3% (20/62) in the no pharmacist group versus 100% (45/45) in the pharmacist group. The mean time to review of positive culture was 2.6 days compared to 5.7 days, in the pharmacist versus no pharmacist group, respectively. The pharmacist was able to identify and initiate timely antibiotics in 50% of the bacterial upper respiratory tract infections.
CONCLUSION: The incorporation of an infectious diseases pharmacist into review of ED cultures resulted in decreased time to culture follow-up, as well as timely initiation of appropriate antibiotics following positive culture results.

187. Identification of risk factors associated with urinary tract infections caused by ESBL organisms in a community hospital. Tiffany Dickey, PharmD, Bradley Gann, PharmD, Victoria Seaton, PharmD; College of Pharmacy, University of Arkansas for Medical Sciences, Fayetteville, AR
INTRODUCTION: Extended spectrum Î²-lactamase (ESBL) producing Enterobacteriaceae infections have been associated with longer hospital stays, increased health care costs and increased mortality rates. Previous studies have identified exposure to antibiotics, residency in nursing homes, recent hospitalization, chronic urinary catheters and age > 65 years as risk factors for acquiring ESBL organisms.
RESEARCH QUESTION OR HYPOTHESIS: What are the risk factors for urinary tract infections (UTIs) caused by ESBL producing organisms among patients admitted to a community hospital?
STUDY DESIGN: This was a single center, retrospective case-control study conducted in a 210 bed community hospital from January 1, 2010 to December 31, 2015.
METHODS: One hundred two (102) cases of UTIs caused by ESBL producing organisms were matched to 102 cases of UTIs caused by non-ESBL producing organisms. Patient characteristics and outcomes were compared using two-sample t-tests and Pearson chi-square tests for continuous and categorical data, respectively.
RESULTS: Previous ESBL infection ($p<0.0001$), history of recurrent UTIs ($p=0.02$), exposure to a rehabilitation or nursing facility in the previous 90 days ($p=0.03$) and use of antibiotics in the previous 90 days ($p=0.0007$) were identified as independent risk factors for acquiring a UTI caused by an ESBL producing organism. Patients in the ESBL group were more likely to receive 3 or more antibiotics in the previous 90 days when compared to the control group ($p=0.002$). Patients >= 65 years and those with a chronic urinary catheter were not found to have an increased risk for ESBL UTIs.
CONCLUSION: This study further supports previously identified risk factors for the acquisition of ESBL UTIs with the exception of age > 65 years and chronic urinary catheters.

189. Revealing novel mechanisms of triazole- resistance in clinical *Aspergillus fumigatus* isolates through next- generation sequencing. Jeffrey Rybak, PharmD[1], Michael Dickens, PhD[2], Nathan Wiederhold, PharmD[3], Jarrod Fortwendel, PhD[4], P. David Rogers, PharmD, PhD[1]; (1) University of Tennessee College of Pharmacy, Memphis, TN (2) High Performance Research Computing, Texas A&M University, College Station, TX (3) Fungus Testing Laboratory, UT Health Science Center at San Antonio, San Antonio, TX (4) Department of Microbiology and Immunology, University of South Alabama College of Medicine, Mobile, AL
INTRODUCTION: Invasive aspergillosis is the most commonly encountered invasive fungal infection among immunocompromised patients, and is associated with mortality rates as high as 40%. Recently, triazole resistance has emerged among both environmental and clinical isolates of *Aspergillus fumigatus* (Af), the predominant pathogen isolated from patients with invasive aspergillosis. While mutations in the Af sterol demethylase gene *cyp51A,* one of the targets of triazole antifungals, have been identified, mechanisms of resistance in a large proportion of isolates remains unexplained.
RESEARCH QUESTION OR HYPOTHESIS: Overexpression of Af genes associated with ergosterol biosynthesis, iron regulation, and small molecule transport (SMT) are associated with triazole resistance in clinical isolates of Af.
STUDY DESIGN: *In- vitro* analysis of clinical Af isolates.
METHODS: Isavuconazole, itraconazole, and voriconazole minimum inhibitory concentrations (MIC) for nine clinical Af isolates were determined using the Clinical Laboratory Standards Institute M38-A2 methodology. RNA was extracted from each isolate and RNAseq was performed using the Ion Torrent sequencer. Expression of Af genes in six triazole resistant isolates, including 2 with *cyp51A* mutations, were individually compared to a composite of 3 voriconazole highly susceptible isolates.
RESULTS: Triazole MIC among resistant isolates varied greatly between agents. All isolates displayed high level resistance to itraconazole, and five were observed to have isavuconazole and voriconazole MIC >= 4 mg/L. RNAseq analysis revealed a multitude of genes associated with ergosterol biosynthesis, iron regulation, and SMT that were uniquely overexpressed only in triazole-resistant Af isolates. Notably, 2 isolates were observed to overexpress (>= 3 fold) *cyp51A*, 3 isolates overexpressed (>= 8 fold) the siderophore iron transporter *mirB,* and 5 isolates overexpressed (>= 2 fold) SMT genes *abcA* or *abcC*.
CONCLUSION: These data reveal genes involved in ergosterol biosynthesis, iron regulation, and SMT uniquely overexpressed among clinical isolates of triazole resistant Af. Further research is needed to investigate the direct contribution of genes identified in this study to triazole resistance.

190. Use of fidaxomicin compared to vancomycin or metronidazole for initial treatment of clostridium difficile infection in a community hospital. Bobby Jacob, PharmD[1], Angela O. Shogbon,

PharmD, BCPS[1], Samuel K. Peasah, PhD, MBA, RPh[2], Adam Bressler, MD[3], Michelle Vu, PharmD Candidate 2018[1]; (1) College of Pharmacy, Mercer University, Atlanta, GA (2) Department of Pharmacy Practice, Mercer University College of Pharmacy, Atlanta, GA (3) DeKalb Medical Center, Decatur, GA

INTRODUCTION: *Clostridium difficile* infection (CDI) is one of the most common etiologies for hospital acquired infection. Fidaxomicin was approved for treatment of CDI based on studies demonstrating non-inferiority to oral vancomycin. Relatively few studies have specifically compared clinical cure and recurrence rates associated with fidaxomicin to vancomycin or metronidazole in large community hospital settings.

RESEARCH QUESTION OR HYPOTHESIS: To evaluate the effectiveness of fidaxomicin as initial CDI therapy in a community hospital.

STUDY DESIGN: Retrospective, observational chart review.

METHODS: Investigators compared all patients diagnosed with CDI who received fidaxomicin (October 2011 to June 2015) with a one-year control group of patients diagnosed with CDI who received treatments including vancomycin or metronidazole. Endpoints included clinical cure defined as resolution of diarrhea-like symptoms or documented normal stools, re-admission by day 90, and recurrence of CDI defined as re-admission within 90 days of discharge due to a diagnosis of CDI. Chi-square and Fisher exact tests were used to analyze categorical variables and two-tailed Student t tests for continuous variables.

RESULTS: A total of 298 patients were evaluated. In the fidaxomicin group (n=102), 41 patients received fidaxomicin as initial therapy for CDI (40.2%). In the control group (n=196), 41 patients received oral vancomycin (20.9%), 82 patients received oral metronidazole (41.8%), and 31 patients received combination therapy (15.8%) as initial therapy for CDI. There were no statistically significant differences in clinical cure between fidaxomicin (29.3%) and vancomycin (9.8%), metronidazole (8.5%), or combination therapy (16.1%). Likewise, no statistically significant differences were noted in recurrence between fidaxomicin (4.9%) and vancomycin (9.8%), metronidazole (8.5%), or combination therapy (12.9%). All-cause re-admission to the hospital was significantly higher in the fidaxomicin group (51.2%) compared to vancomycin (39%), metronidazole (30.5%), and combination therapy (19.4%).

CONCLUSION: Preliminary results suggest the potential for positive clinical outcomes associated with fidaxomicin. Further studies in larger populations are warranted to elucidate appropriate strategies for fidaxomicin use.

191. Comparison of oral antibiotic failure rates in post-Roux- en-Y gastric bypass patients versus controls. David Roy, PharmD[1], Kristina Thurber, PharmD[1], Diana Langworthy, PharmD[2], Paul Lorentz, MS, RN, RD[3], Manpreet Mundi, MD[3], Ross Dierkhising, MS[4]; (1) Department of Pharmacy Services, Mayo Clinic, Rochester, MN (2) Department of Pharmaceutical Care and Health Systems, University of Minnesota College of Pharmacy, Minneapolis, MN (3) Division of Endocrinology, Diabetes, Metabolism, and Nutrition, Mayo Clinic, Rochester, MN (4) Division of Biomedical Statistics and Informatics, Mayo Clinic, Rochester, MN

INTRODUCTION: Due to the malabsorptive nature of the Roux-en-Y gastric bypass (RYGB), there is a potential for impaired absorption of oral medications. Clinical outcomes of patients who receive oral antibiotics for urinary tract infections (UTI), skin and soft tissue infections (SSTI), and community acquired pneumonia (CAP) after RYGB have not been adequately described in the literature.

RESEARCH QUESTION OR HYPOTHESIS: Patients who have a history of RYGB will be more likely to fail oral antibiotic therapy when compared with controls with no history of gastrointestinal resection.

STUDY DESIGN: Retrospective cohort study

METHODS: Patients with a history of RYGB and controls who received an eligible oral antibiotic for UTI, SSTI or CAP between April 1, 2008, and September 30, 2015 were included. Therapeutic failure rates between groups were compared and adjusted for body mass index (BMI) and infection type. Failure rates among antibiotic classes and among various time points since RYGB (0–1 year, 1–2 years, and > 2 years) were also compared.

RESULTS: A total of 58 RYGB and 128 controls met inclusion and exclusion criteria. Therapeutic failure occurred in the RYGB and control group in 14 (24.1%) and 20 (15.6%) patients, respectively (p=0.18; odds ratio, 1.8; 95% [CI, 0.8–4.4]). There were no significant differences found for secondary outcomes.

CONCLUSION: Roux-en-Y gastric bypass was not associated with a statistically significant increase in the risk of therapeutic failure of oral antibiotics in the treatment of UTI, SSTI, or CAP when compared to patients who do not have a history of gastrointestinal resection. The authors feel that there was a clinically relevant trend towards increased failure rates after RYGB which should caution prescribers to be vigilant and closely monitor post-RYGB patients for response to therapy when receiving oral antibiotics. Further research is warranted to confirm the effects of RYGB on clinical outcomes in patients taking oral antibiotics.

192. Revealing novel mechanisms of fluconazole- resistance in clinical *Candida tropicalis* isolates through next- generation sequencing and heterologous- overexpression in *Candida albicans*. Jeffrey Rybak, PharmD[1], Elizabeth Berkow, PhD[1], Qing Zhang, BS[1], Michael Dickens, PhD[2], Nathan Wiederhold, PharmD[3], Glen Palmer, PhD[1], P. David Rogers, PharmD, PhD[1]; (1) University of Tennessee College of Pharmacy, Memphis, TN (2) High Performance Research Computing, Texas A&M University, College Station, TX (3) Fungus Testing Laboratory, UT Health Science Center at San Antonio, San Antonio, TX

INTRODUCTION: *Candida tropicalis* (Ct) is one of the leading pathogens isolated from patients with invasive candidiasis. While much is known about the molecular mechanisms contributing to fluconazole resistance in *Candida albicans* (Ca), relatively little is known with regards to Ct, where rates of fluconazole resistance can be even greater.

RESEARCH QUESTION OR HYPOTHESIS: Overexpression of Ct genes encoding small molecule transporters (SMT) contributes to fluconazole resistance in clinical isolates of Ct.

STUDY DESIGN: *In- vitro* analysis of clinical Ct isolates.

METHODS: RNA was extracted from 14 clinical Ct isolates. RNAseq was performed using the Ion Torrent sequencer. Expression of Ct SMT genes in 9 fluconazole non-susceptible (FNS) isolates were compared to a composite of 5 fluconazole highly-susceptible isolates. Ct SMT genes of interest were amplified from Ct genomic DNA, then chemically transformed into a fluconazole susceptible (FS) laboratory strain of Ca under the control of a strong promoter. Fluconazole minimum inhibitory concentrations (MIC) were determined using the Clinical Laboratory Standards Institute M27-A3 methodology.

RESULTS: RNAseq analysis revealed a number of Ct genes predicted to encode SMT, including Ct homologs of Ca *CDR1, MDR1, PDR16, CDR11* and *SNQ2*, which were overexpressed in FNS Ct isolates. Constitutive overexpression of Ct *CDR1, MDR1,* and *PDR16* all produced >= 4 fold increase in fluconazole MIC relative to the isogenic control Ca. No change in fluconazole MIC was observed with Ct *CDR11* or *SNQ2*.

CONCLUSION: These data reveal that Ct *CDR1, MDR1, PDR16, CDR11* and *SNQ2* are all overexpressed in FNS clinical isolates. While increases in fluconazole MIC were observed with heterologous overexpression of *CDR1, MDR1,* and *PDR16* in a FS Ca isolate, no change was observed with *CDR11* or *SNQ2*. Further research is needed to quantify the impact of overexpression of these SMT genes in clinical isolates of Ct.

193. Impact of a computerized physician order entry set on adherence to *C. difficile* infection treatment guidelines and clinical outcomes. Jeffrey Aeschlimann, PharmD[1], Emily Polidoro, BS[2],

Erik Swanson, BS[2]; (1) Department of Pharmacy Practice, UConn School of Pharmacy, Storrs, CT (2) UConn Health/John Dempsey Hospital, Uconn School of Medicine, Farmington, CT

INTRODUCTION: *Clostridium difficile* infection (CDI) is a leading cause of gastroenteritis-associated deaths. The UConn Health/John Dempsey Hospital (UCH/JDH) Antimicrobial Stewardship Program implemented a computerized physician order entry (CPOE) set based on IDSA CDI guidelines to help caregivers make treatment decisions.

RESEARCH QUESTION OR HYPOTHESIS: The two research questions we addressed in the current study were: (1) Would the CPOE set improve adherence to treatment guidelines? (2) Would patients who received guideline-concordant CDI treatment have better clinical outcomes compared to those patients who did not?

STUDY DESIGN: This was a retrospective case-control study of hospitalized patients admitted to UCH/JDH between 2012 and 2015. Patients were identified by a query of the microbiology lab system and were considered to have CDI if they had a stool sample positive for *C. difficile* GDH and either a positive toxin A/B immunoassay or positive toxigenic PCR assay.

METHODS: Key data extracted from the electronic medical records included: patient demographics, lab values, hospital course, CDI treatment(s), use of the CPOE set for care, and recurrence of CDI. Severity of CDI was stratified based on IDSA CDI guidelines. Clinical outcomes for patients receiving guideline-concordant treatment were compared to those who received alternative treatments. Standard statistical tests were used to compare differences between groups.

RESULTS: The pre-CPOE (n=65) and post-CPOE (n=123) cohorts were similar with respect to nearly all important demographic variables. Prior to the implementation of the CDI CPOE, only 25% of CDI patients received treatment in accordance with IDSA guidelines. After CPOE set implementation, adherence to IDSA guidelines improved to 46% (p=0.01). The mean length of stay decreased from 15.8 days pre-CPOE implementation to 10.5 days post-CPOE (p<0.01).

CONCLUSION: Implementation of a CDI CPOE set significantly increased receipt of guideline-concordant therapy for patients and length of stay also significantly decreased.

194. Risk factors for *Pseudomonas aeruginosa* in diabetic foot infections. Nada Farhat, PharmD, Christopher Le, PharmD Candidate, Daniel McClung, MD, Jerod Nagel, PharmD, BCPS (AQ-ID); Department of Pharmacy Services, University of Michigan Health System, Ann Arbor, MI

INTRODUCTION: Infectious Diseases Society of America guidelines for the management of diabetic foot infections (DFIs) suggest 15 different antibiotic treatment options for moderate-to-severe infections. All treatment options provide coverage for gram-positive cocci, and some provide coverage for gram-negative pathogens, including Pseudomonas aeruginosa (PSA). However, there is minimal guidance in determining which patients require anti-PSA therapy.

RESEARCH QUESTION OR HYPOTHESIS: Can quantifiable risk factors associated with the presence of PSA in hospitalized patients with DFIs be identified?

STUDY DESIGN: This single-center retrospective case-control study included patients hospitalized between October 2013–September 2015.

METHODS: Adult patients admitted with a DFI were identified using a combination of ICD-9 codes for diabetes with complications and cellulitis. The primary outcome was identification of risk factors associated with PSA DFIs. A multivariable model using logistic regression was constructed, and a receiver operator characteristic (ROC) curve was generated to assess the sensitivity and specificity of the model.

RESULTS: 262 patients were included and 12 (4.6%) patients had cultures with PSA. Multivariable analysis yielded six risk factors for PSA DFIs (see table). ROC construction yielded an area under the curve of 0.895.

CONCLUSION: The incidence of PSA from DFIs is low. A model with excellent performance characteristics demonstrated that risk factors for PSA DFIs include age > 65, BMI ≥ 35, former or current smoker, history of lower extremity bypass procedure, cardiovascular disease, and severe infection. Future validation of these factors could help stewardship programs reduce unnecessary antibiotic utilization.

Risk factor for PSA DFI	Odds ratio (95% confidence interval)	p
Age > 65 years	5.94 (1.40–25.28)	0.016
Body mass index ≥ 35 kg/m^2	7.53 (1.73–32.81)	0.007
Former or current smoker	9.27 (1.06–81.54)	0.045
History of a lower extremity bypass procedure	9.63 (1.52–61.15)	0.016
Cardiovascular disease	5.28 (1.22–22.86)	0.026
Severe infection	4.50 (0.97–20.95)	0.055

195. Utilization of T2Candida Panel for the rapid detection of *Candida* species in a large community hospital. Hayley Kateon, PharmD[1], Adam Sawyer, PharmD, BCPS[2], Jonathan D. Edwards, PharmD, BCPS-AQ ID, CGP[2]; (1) Pharmacy, Huntsville Hospital, Huntsville, AL (2) Department of Pharmacy, Huntsville Hospital, Huntsville, AL

INTRODUCTION: The T2Candida Panel is a newly FDA approved diagnostic product conducted from whole blood that enables species-specific detection of fungal pathogens in 3 to 5 h without the need for blood cultures. Use of this panel may enable clinicians to quickly initiate appropriate antifungal therapy, thus potentially reducing adverse outcomes and patient mortality. The T2Candida panel detects the following species: *C. albicans*, *C. tropicalis*, *C. parapsilosis*, *C. krusei*, and *C. glabrata*. The purpose of this study is to implement and evaluate the utilization of T2Candida Panel in a community hospital.

RESEARCH QUESTION OR HYPOTHESIS: Implementation of the T2Candida Panel will positively impact patient care and reduce the use of antifungal agents at our institution.

STUDY DESIGN: Prospective, observational analysis

METHODS: This prospective, observational analysis included 136 inpatients at Huntsville Hospital who met our specified criteria. The T2Candida Panel was restricted to Infectious Disease (ID) and Oncology physicians' use. Endpoints included drug use, patient characteristics, risk factors, T2 results, corresponding blood cultures, time to de-escalation, and duration of therapy (DOT).

RESULTS: Of the 160 T2 tests evaluated, 8.8% were positive. Approximately 36% of the positive T2 patients had a positive corresponding blood culture. The average duration of therapy (DOT) of micafungin for negative T2 patients was 4 days. The average time to de-escalation of therapy for negative T2 patients was 42.6 h. Patients displayed multiple risk factors, most of which overlapped, including 27.2% malnutrition, 32.4% renal failure, 27.2% intra-abdominal infection/surgery, 40.4% immunocompromised, 51.4% central line. Approximately 69% of the patients were in the ICU.

CONCLUSION: The T2Candida panel has demonstrated greater sensitivity to *Candida* infections at our facility thus far and has provided a reduction in DOT of micafungin use. Despite the rapid nature of the test, time to de-escalation of therapy remained high at 2 days, demonstrating variations in level of physician confidence with T2 results.

Medication Safety

196. The impact of pharmacist-led medication reconciliation in surgical ward targeting high risk patients. Lorraine Lok Yan Li,

MPharm, MClinPharm, Howard Ho Yeung Tsoi, BPharm, MClinPharm; Department of Pharmacy, United Christian Hospital, Hong Kong, Hong Kong
INTRODUCTION: Medication errors are prevalent upon hospital admission and discharge. Clinical pharmacist involvement in medication reconciliation is effective in identifying and rectifying medication errors. However, pharmacist involvement at all stages of the reconciliation process for every patient may not be feasible at individual institutions. This study evaluated a targeted approach in selecting high-risk patients in an effort to reduce unintended medication discrepancies.
RESEARCH QUESTION OR HYPOTHESIS: Targeting high risk patients in medication reconciliation process can increase the detected percentage of incidence and the severity of unintended medication discrepancies in surgical wards.
STUDY DESIGN: Quasi-experimental pre-post intervention study
METHODS: This was a single-center study conducted at the surgical wards in the United Christian Hospital, Hong Kong. Following IRB approval, pre-intervention data (From ward A) were collected retrospectively from December 2013 to February 2014; while post-intervention data (From ward A and B) were collected prospectively from December 2014 to February 2015. The potential severity of the unintended medication discrepancies were rated by pharmacists and classified into three levels according to NCC MERP index.
RESULTS: A total of 1183 and 1033 cases in the pre-intervention and post-intervention group were screened respectively. When comparing the pre-intervention (Ward A) and post-intervention group (Ward A and B), the percentage incidence of unintended medication discrepancies increased from 5.32% to 7.35% (p-value 0.056). Statistical significance was shown when comparing ward A patients only, the percentage of incidence increased from 5.32% to 8.15% (p-value 0.021). There was no statistically significant difference in terms of the severity level of medication discrepancies between pre-intervention and post-intervention group (Ward A and B: p-value 0.295; Ward A only: p-value 0.388).
CONCLUSION: Targeting high risk patients in medication reconciliation process in surgical wards is a feasible approach given the limited time and resources for pharmacists, resulting in a higher percentage of incidence of unintended medication discrepancies being detected, although the detected severity level of the discrepancies may not be altered.

198. Effect of a rivaroxaban patient assistance kit (R-PAK) for patients discharged with rivaroxaban: A randomized controlled trial. Michelle Castelli, PharmD, Catherine Saint, PharmD, Andrew J. Crannage, PharmD, BCPS, Zachary A. Stacy, PharmD, BCPS, Jamie M. Pitlick, PharmD, BCPS; St. Louis College of Pharmacy/Mercy Hospital St. Louis, St. Louis, MO
INTRODUCTION: The combination of poor health literacy and a complex dosing regimen/transition for rivaroxaban in venous thromboembolism (VTE) treatment may increase the probability of negative clinical outcomes secondary to non-adherence.
RESEARCH QUESTION OR HYPOTHESIS: Does a rivaroxaban patient assistance kit (R-PAK) given at hospital discharge increase proper dose transition and overall patient adherence?
STUDY DESIGN: Prospective, randomized, controlled trial
METHODS: This study was conducted at a 979-bed academic medical center. Patients were randomized into two groups. In the treatment group, patients received the R-PAK with counseling at discharge, while patients in the control group received discharge counseling alone. The R-PAK contained an individualized medication box with dividers to indicate twice daily or once daily dosing, a patient's guide to rivaroxaban, and a date of transition reminder card. Additionally, patients were contacted after 21 days of therapy to assess dose transition, adherence, satisfaction, and safety. The primary outcome was percentage of patients who properly transitioned to rivaroxaban once daily on day 22. An alpha level of 0.05 was determined a-priori for statistical significance. Fisher's exact test was used for nominal data, while Mann-Whitney U and student t-tests were used for ordinal and continuous data, respectively.
RESULTS: Twenty-five patients were enrolled; 12 received an R-PAK, while 13 comprised the control group. No difference in baseline assessment of health literacy status was noted (p=0.063). Proper transition to daily administration on day 22 was no different between the groups (p<0.891). Adherence was reported in 99.8% of R-PAK patients and 97.65% of control patients (p<0.074). Side effects were rarely reported.
CONCLUSION: The use of an R-PAK for the treatment of VTE was not associated with an improvement in transition to daily administration; however, both groups had high rates of overall adherence. Pharmacist counseling/education was provided in both groups and is an important component to include in any patient discharge, especially for medications with dose transitions.

199. Accuracy of hospitalized patients height and weight documentation and impact on drug dosing. Alice Margulis, Bachelor of Science Pharmacy Studies[1], Ronald Patrick Landayan, Bachelor of Science Pharmacy Studies[1], Nicholas Quinn, Bachelor of Science Pharmacy Studies[1], Alison Lew, Bachelor of Science Pharmacy Studies[1], Michael J. Gonyeau, BS, Pharm, PharmD, BCPS, FCCP[2]; (1) School of Pharmacy, Northeastern University, Boston, MA (2) Northeastern University School of Pharmacy, Boston, MA
INTRODUCTION: Height and weight can significantly impact medication dosing. Frequently, these two measurements are inaccurate or non-existent in a patient's profile.
RESEARCH QUESTION OR HYPOTHESIS: To determine the accuracy of hospitalized patients' height and weight and impact on medication dosing and clinical outcomes.
STUDY DESIGN: Twenty-week prospective, observational study of patients admitted to general medicine service.
METHODS: Measured heights and weights completed by a pharmacist or pharmacy student using a standing scale and stadiometer. These measurements were compared to those in patients' EMR and utilized to determine errors in weight-based or renally-dosed medications. Bivariate Pearson correlations were calculated to assess outcomes. All analyses were performed with SPSS® V23 with a two-tailed Ĭ±=0.05 to assess significance. IRB approval was obtained.
RESULTS: Of 100 patients, 97 (43 overestimated, 54 underestimated) of recorded weights and 78 (66 overestimated, 12 underestimated) of recorded heights were inaccurate. Patient height was underestimated by 1 ± 0.54 inches or overestimated by 2.1 ± 1.78 inches. Patient weight was categorized according to percent error- incorrect by: < 2.5% (n=57), 2.5–5% (n=22), 5.1–10% (n=10), 10.1–15% (n=5), 15.1–20% (n=1) and > 20% (n=2). Accuracy of height was influenced by age (p=0.029), gender (p=0.069), BMI (p=0.326) and method of measurement (p=0.116). Similar results were noted with accuracy of weight with respect to age (p=0.605), gender (p=0.564), BMI (p=0.211), and original method of collection (p=0.461). Ninety-two patients had inaccurate recorded ClCr due to inaccurate height and/or weight, accounting for 171 renally dosed medications and 68 weight based medications. Eleven improperly weight-based and six improperly renally adjusted medications reached patients.
CONCLUSION: Patient heights and weights are frequently inaccurately recorded in the EMR, potentially leading to negative downstream consequences and clinical outcomes. Obtaining accurate height and weight measurements is critical toward ensuring appropriate medication dosing to improve patient safety.

200. Appropriate monitoring to improve sotalol safety. Kelly C. Rogers, PharmD[1], Nicholas Elliott, PharmD[2], Lindsey Greiner, PharmD[3], Michael Brenner, PharmD, BCPS- AQ Cardiology[3], Shannon W. Finks, PharmD[1]; (1) Department of Clinical Pharmacy, University of Tennessee College of Pharmacy,

Memphis, TN (2) Department of Pharmacy, Veterans Affairs Medical Center, Memphis, Memphis, TN (3) VA Ann Arbor Healthcare System, Ann Arbor, MI
INTRODUCTION: Sotalol is indicated for ventricular and atrial arrhythmias. Important dosing recommendations based on creatinine clearance (CrCl) exist depending upon indication, with sotalol being contraindicated in CrCl < 40 mL/min in atrial arrhythmias. Additionally, due to risk for torsades, initiation in a hospital setting with continuous electrocardiogram monitoring is recommended.
RESEARCH QUESTION OR HYPOTHESIS: Are veterans on sotalol being appropriately dosed and monitored?
STUDY DESIGN: Retrospective, dual-site analysis of computerized medical records of veterans receiving sotalol.
METHODS: Evaluation of specified baseline and follow-up monitoring from the time of initial prescription was evaluated and compared between those initiated by an outside provider (Group A) and those iniated by a VA provider (Group B).
RESULTS: There were 201 patients included; 154(77%) were receiving sotalol for atrial arrhythmias. Interestingly, there were 131 (65%) sotalol prescriptions in Group A; although follow-up monitoring occurred within the VA system. There were 70 (35%) in Group B. Ninety-eight (75%) in Group A had a baseline metabolic panel within 90 days of prescription compared to 69(99%) in Group B (p<0.0001). Of those, six in Group A had a contraindication to sotalol based on CrCl vs. none in Group B (p=0.0426). Forty-two (32%) in Group A had baseline QTc assessed within 90 days compared to 66(94%) of those in Group B (p=0.0247). There were 28 (29%) in Group A with a contraindication based on dosing interval compared to 4 (6%) in Group B (p=0.002).
CONCLUSION: Adherence to recommended sotalol dosing and monitoring occurs more frequently in patients initiated by a VA provider. Sotalol monitoring within the VA in patients initiated by outside providers can occur, but needs improvement. Based on our results, a standard order set for sotalol is being developed to prompt providers to appropriately dose and monitor the drug regardless of initiating prescriber. After implementation, we plan to re-examine adherence rates to assess improvement in medication safety with sotalol.

201. Medication discrepancies in elderly patients admitted through emergency department in Korea. So-Youn Park, PhD Candidate[1], Hyunah Kim, PharmD, BCPS[1], Haesook Kim, MS[2]; (1) College of Pharmacy, Sookmyung Women's University, Seoul, The Republic of Korea (2) Department of Pharmacy, Gang Neung Asan Hospital, Seoul, The Republic of Korea
INTRODUCTION: Unintended medication discrepancies are common at the time of hospital admission especially in the elderly patients.
RESEARCH QUESTION OR HYPOTHESIS: The objective of this study was to determine the incidence of discrepancies and characterize the unintended discrepancies using medication history obtained from drug identification service.
STUDY DESIGN: This was a single-centered, retrospective study of elderly patients admitted through emergency department (ED) between January 2013 and December 2013.
METHODS: All ED patients 65 years or older who received drug identification service by the pharmacists were evaluated for medication discrepancy at the time of admission. The medication history from drug identification service was compared to the medication ordered by the ED physician. Each home medication not ordered by ED physician was considered a discrepancy. The primary outcome evaluated was unintended discrepancies (errors) between medication orders in ED and medication history obtained through drug identification service. Unintended discrepancies were characterized by medication class based on the Anatomical Therapeutic Chemical (ATC) Classification System. Potentially high-risk discrepancies were identified by determining if the medications were included in the Institute for Safe Medication Practices (ISMP) high-alert list.
RESULTS: A total of 2753 home medications documented from drug identification service for 453 eligible patients (mean of age: 76.47 ± 6.57 years old; 41.5% male) were reviewed. Of these, 2370 omission discrepancies (86.1%; 95% confidence interval, 84.8–87.4%) were unintended medication errors with mean of 5.23 unintended discrepancies per patient. The three most common drug classes involved in errors were cardiovascular (36.0%), alimentary tract and metabolism (24.9%) and nervous system (13.1%) medications. 15.3% of unintended omission discrepancies were included in the ISMP high-alert list.
CONCLUSION: A high incidence of unintended omission discrepancies in elderly patients admitted through ED was detected from drug identification service. This was the first study to examine the potential role of pharmacists in reducing unintended medication discrepancies in Korea.

202. Effect of nursing education and electronic medical record support on the appropriateness of vancomycin trough timing. Steven Smoke, PharmD, BCPS[1], Ruben Patel, PharmD[2], Sandy Moreau, PharmD, BCPS[3], Maria Devivo, PharmD, MPA, BCPS, BCACP[1]; (1) Pharmacy Department, Jersey City Medical Center, Jersey City, NJ (2) Pharmacy Department, Clara Maass Medical Center, Belleville, NJ (3) Department of Pharmacy Practice and Administration, Ernest Mario School of Pharmacy, Rutgers, the State University of New Jersey, Piscataway, NJ
INTRODUCTION: Vancomycin therapeutic drug monitoring is recommended to minimize drug toxicity and optimize treatment outcomes. Guidelines recommend measurement of vancomycin serum trough concentrations at steady-state conditions, just prior to the fourth dose. Level collection outside of steady-state conditions can lead to incorrect interpretation of levels and inappropriate use.
RESEARCH QUESTION OR HYPOTHESIS: Does nursing education and electronic medical record (EMR) support improve the appropriateness of vancomycin trough timing?
STUDY DESIGN: This is a retrospective pre- and post-intervention cohort study conducted at a single acute-care community hospital.
METHODS: Nurses were educated regarding appropriate vancomycin trough level timing at unit huddles and in the form of a handout. Nurses were also reminded of appropriate trough level timing within the EMR. A random sample of vancomycin troughs were evaluated for appropriateness in two-month pre- and post-intervention periods. Levels were evaluated with regard to the number of previous doses (appropriate defined as 3) and time relative to next scheduled dose (appropriate defined as within 30 min). Samples that were appropriate with regards to both previous measures were considered appropriate for "Dose Number and Time." Categorical variables were compared via chi-square using Microsoft Excel 2007,,¢.
RESULTS: A total of 40 levels for the pre-intervention period and 50 levels for the post-intervention period were assessed. Levels were appropriate with regard to number of previous doses in 48% vs 64% (p=0.12), time relative to next scheduled dose in 67% vs 79% (p=0.25) and Dose Number and Time in 33% vs 45% (p=0.28) in the pre- and post- intervention periods, respectively.
CONCLUSION: Nursing education and electronic medical record support yielded non-statistically significant increases in the appropriateness of vancomycin trough timing.

204. Frequency of toxicity monitoring in ambulatory patients on amiodarone and dofetilide. Joshua Rickard, PharmD, BCPS[1], Jenna Negrelli, PharmD, BCPS[2], Jeffry Olson, PharmD, BCPS[1], Travis Dick, PharmD, MBA, BCPS[3]; (1) Intermountain Healthcare, Midvale, UT (2) Intermountain Medical Center, Murray, UT (3) University of Rochester Medical Center, Rochester, NY
INTRODUCTION: Antiarrhythmic drugs have drug-related toxicities associated with use and strict monitoring parameters.

Published studies state that adherence to regular laboratory assessments is as low as 20%. Monitoring adherence is important as other studies have shown that up to 93% of patients on amiodarone experience an adverse drug event leading to a potentially lethal event.
RESEARCH QUESTION OR HYPOTHESIS: Are patients prescribed amiodarone or dofetilide monitored for toxicities according to guidelines and package labels amongst prescribers within an integrated healthcare system?
STUDY DESIGN: This is a retrospective descriptive study of antiarrhythmic monitoring practices in patients prescribed amiodarone or dofetilide.
METHODS: Patients prescribed amiodarone or dofetilide from July 1, 2013 through June 30, 2015 were eligible for inclusion. Patients with ventricular arrhythmias, prescribed more than one antiarrhythmic, or received antiarrhythmic monitoring outside the healthcare system were excluded. Monitoring parameters were assessed according to labeled recommendations. For amiodarone vitals, eye examinations, chest x-ray, liver, thyroid and pulmonary function tests were evaluated. For dofetilide, vitals, electrocardiograms, QTc intervals, and serum creatinine were assessed. The primary objective was to determine adherence rates to baseline and follow up monitoring recommendations for patients receiving amiodarone or dofetilide. The secondary objective was to determine rates of severe adverse drug reactions or drug toxicities.
RESULTS: One hundred patients were evaluated (amiodarone n=50, dofetilide n=50). Average adherence to baseline and follow-up amiodarone monitoring parameters were 55% and 57%, respectively. Average adherence to baseline and follow-up dofetilide monitoring were 99.6% and 85%, respectively. There was a statistically significant difference in abnormally elevated TSH levels (8% to 30% p=<0.005) in patients prescribed amiodarone. Twelve percent of patients taking dofetilide had an increase in QTc by > 15%.
CONCLUSION: Adherence to amiodarone and dofetilide monitoring recommendations is low. Pharmacists are optimally positioned to make recommendations to improve adherence and minimize the risk of adverse drug reactions.

205. Implementation of pharmacist-managed medication review and reconciliation service in orthopaedic wards in Queen Elizabeth Hospital. May Chung Yuet Yu, BPharm, M Clin Pharm, Wilson Yun Shing Leung, BPharm, PhD, BCPS, Kenneth Wing Fai Chung, BPharm, M Clin Pharm, BCPS, Carmen Ka Man Kei, BPharm, M Clin Pharm; Department of Pharmacy, Queen Elizabeth Hospital, Hong Kong, Hong Kong
INTRODUCTION: Unintentional medication discrepancy during transition of care and drug-related problems (DRPs) could contribute to adverse drug events in hospitalized patients. Previous literatures demonstrated the positive impact of pharmacist-led medication reconciliation, mostly in medical or geriatric units. In 2014, pharmacist-managed prescription screening and medication reconciliation service was introduced in two orthopaedic wards.
RESEARCH QUESTION OR HYPOTHESIS: This study aimed to investigate the impact of clinical pharmacy service in orthopaedic wards.
STUDY DESIGN: Prospective study
METHODS: For 2 h every weekday morning, a pharmacist and an intern pharmacist performed medication reconciliation at points of admission, discharge and transfer in two orthopaedic wards. Patients with >= 5 chronic medications were included in admission reconciliation. New drug orders were screened for any clinical DRPs. Interventions would be proposed to the physicians or nurses. The clinical significance of interventions was rated by two clinical pharmacists not involved in the service, using the literature-based scale. DRPs were classified using the Pharmaceutical Care Network Europe Classification V6.2.
RESULTS: From 10 June to 28 November 2014, 348 and 428 patients underwent medication reconciliation at admission and discharge/ transfer respectively. Forty seven (13.5%) and 49 (11.5%) patients had at least one unintentional medication discrepancy identified. The commonest type of unintentional medication discrepancy was omission of chronic medications. Among the total 162 discrepancies identified, 69.1% were rated as clinically significant. It was estimated that only 6.8% of all discrepancies were identifiable during prescription vetting in main pharmacy. One hundred and nineteen DRPs were identified from 1266 charts screening, and 90 (75.6%) were considered clinically significant. The commonest causes of DRPs were €˜drug dose too high' and €˜inappropriate duplication of therapeutic group'. Overall, 89.4% of interventions proposed were accepted by prescriber.
CONCLUSION: The study demonstrated that pharmacist-managed medication reconciliation and review in orthopaedic wards could effectively identify and resolve clinically significant unintentional medication discrepancies and DRPs, with high physician's acceptance rate of interventions.

206. Identifying targets for quality improvement in the electronic prescribing process to reduce the burden of pharmacist phone calls to prescribers. Anzeela Schentrup, PharmD, PhD[1], Omjoy Ganesh, PhD, PharmD[2], Angela Boyd, PharmD[3], Jessica Gonzalez, PharmD[1], Marvin Dewar, MD, JD[4]; (1) Department of Pharmacotherapy and Translational Research, University of Florida, Gainesville, FL (2) Clinical Risk Management, UF Health at Shands Hospital, Gainesville, FL (3) University of Florida, Gainesville, FL (4) College of Medicine, University of Florida, Gainesville
INTRODUCTION: Electronic Prescription (ePrescribing) adoption has been widely implemented in the US. Unintended consequences of ePrescribing have included new sources of medication error, inefficiencies, and frustration. We set out to better understand sources of burden and frustration with electronic prescribing in order to reduce medication errors and improve pharmacist-prescriber communication.
RESEARCH QUESTION OR HYPOTHESIS: What are the drivers for pharmacists calling prescribers for clarification and which calls create the most frustration among prescribers and pharmacists, impeding communication and contributing to errors?
STUDY DESIGN: This study included quantitative chart review and qualitative review of structured interviews with community pharmacists and physicians.
METHODS: We reviewed 125 charts between April 1, 2014 and June 30, 2014 that contained a pharmacy clarification call for an electronically prescribed medication to determine the reasons for the calls. Also, we interviewed physicians and community pharmacists and structured interview answers were transcribed and categorized.
RESULTS: Incorrect and omitted information from prescriptions were responsible for 57 (46%) of pharmacy clarification calls. Forty-five (36%) were due to missing or incorrect information that could potentially contribute to an adverse event. Insurance-related calls totaled 28 (22%). Ten physicians and nine pharmacists were interviewed. Physicians reported that insurance-related calls were the most numerous. Pharmacists reported that confusing directions was the most common reason for calls to prescribers.
CONCLUSION: We concluded that a significant burden on both pharmacists and physicians lies in managing ePrescriptions due to unclear or missing information and insurance-related issues. Prescribers are particularly frustrated with the burden posed by insurance-related issues as compared to clarifications that could lead to clinical consequences. Providers relate that pharmacists should have some leeway to use their judgement to accommodate insurance needs when appropriate. Pharmacists are particularly frustrated by unclear or confusing directions because these issues are perceived as easily avoidable. Interventions will be designed to address both of these areas to improve the electronic prescribing process.

Nephrology

207. Telavancin pharmacokinetics in patients with chronic kidney disease receiving hemodialysis. Katherine N. Gharibian, PharmD[1], Susan J. Lewis, PharmD[2], Michael Heung, MD[3], Jonathan H. Segal, MD[3], Noha N. Salama, PhD[4], Bruce A. Mueller, PharmD[5]; (1) School of Pharmacy, Medical College of Wisconsin, Milwaukee, WI (2) College of Pharmacy, University of Findlay, Findlay, OH (3) Medical School, University of Michigan, Ann Arbor, MI (4) Department of Pharmaceutical and Administrative Sciences, St. Louis College of Pharmacy, St. Louis, MO (5) College of Pharmacy, University of Michigan, Ann Arbor, MI

INTRODUCTION: Telavancin is a lipoglycopeptide antibiotic with broad-spectrum antimicrobial activity against Gram-positive bacteria. It is primarily eliminated by the kidneys and has altered pharmacokinetics in patients with renal impairment. In patients with chronic kidney disease (CKD) receiving thrice-weekly, maintenance hemodialysis (stage 5D), limited data exist on the pharmacokinetics of telavancin to guide drug dosing.

RESEARCH QUESTION OR HYPOTHESIS: How does hemodialysis with a high-permeability hemodialyzer affect the pharmacokinetics of telavancin in patients with CKD stage 5D?

STUDY DESIGN: Phase IV, prospective, open-label, single-center, crossover pharmacokinetic study.

METHODS: Eight anuric, otherwise healthy subjects with CKD stage 5D were recruited. All subjects received a 5 mg/kg dose of telavancin as a 1-h intravenous infusion followed by a 3.5 h hemodialysis treatment with an F200 high-permeability hemodialyzer 2 h after the end of infusion. After a minimum 14-day washout period, another 5 mg/kg dose was administered immediately following hemodialysis. Blood samples were collected 0, 1, 1.5, 3, 6.5, 8, and 24 h after the start of each infusion and immediately prior to the next hemodialysis treatment (~48 h). Samples were assessed for total plasma telavancin concentration. Noncompartmental pharmacokinetic (PK) analysis was performed to determine telavancin PK parameters.

RESULTS: Following initial telavancin dosing (pre-hemodialysis), mean±SD peak plasma concentration (C_{max}), total clearance (CL_T), volume of distribution at steady-state (V_{ss}), terminal half-life ($t_{1/2}$), and 48-h area under the concentration curve ($AUC_{0–48\ h}$) were 33.1 ± 6.8 μg/mL, 11.8 ± 4.6 mL/h/kg, 201 ± 48 mL/kg, 13.4 ± 2.9 h, and 429 ± 114 μg·h/mL, respectively. Following the second dose (post-hemodialysis), C_{max}, CL_T, V_{ss}, $t_{1/2}$, and $AUC_{0–48\ h}$ were 38.1 ± 10.1 μg/mL, 6.1 ± 1.8 mL/h/kg, 172 ± 36 mL/kg, 21.4 ± 5.5 h, and 685 ± 136 μg·h/mL, respectively. Percent removed by hemodialysis and percent rebound were 33.3 ± 17.4% and 3.00 ± 12.8%, respectively. Clearance attributed to hemodialysis (CL_{HD}) was 5.7 ± 3.1 mL/h/kg.

CONCLUSION: Hemodialysis enhances the clearance of telavancin. Dosage adjustment in patients with CKD receiving hemodialysis may be warranted.

208. Influence of hemodialyzer permeability and flow rate on the dialytic clearance of regadenoson in an in vitro hemodialysis model. Katherine N. Gharibian, PharmD[1], Bruce A. Mueller, PharmD[2]; (1) School of Pharmacy, Medical College of Wisconsin, Milwaukee, WI (2) College of Pharmacy, University of Michigan, Ann Arbor, MI

INTRODUCTION: Regadenoson is a novel pharmacological stress agent whose disposition during hemodialysis is not known. Its small molecular weight (408 Daltons) and low plasma protein binding (~30%) suggest the potential for removal by hemodialysis. However, its relatively large volume of distribution (63–75 L) may offset this potential. This effect may be mediated by varying dialytic conditions, including hemodialyzer permeability and blood/dialysate flow rate.

RESEARCH QUESTION OR HYPOTHESIS: How do hemodialyzer permeability and blood/dialysate flow rate influence the transmembrane clearance (CL_D) of regadenoson?

STUDY DESIGN: Prospective, *in vitro* study.

METHODS: An *in vitro* hemodialysis model with whole human blood was used to assess regadenoson CL_D. Regadenoson was added to the blood and hemodialysis was performed in single-pass mode. Blood samples were collected pre- and post-hemodialyzer. Regadenoson CL_D was assessed for eight non-reused standard permeability (F8) and eight non-reused high permeability (F160NR) polysulfone hemodialyzers with blood/dialysate flow rates of 300/600 and 400/800 mL/min. A two-tailed, unpaired Student's t-test was used to compare regadenoson CL_D between hemodialyzer type and flow rate.

RESULTS: The mean±SD regadenoson CL_D at 300/600 mL/min for the F8 hemodialyzer was 62.5 ± 11.8 mL/min and 75.1 ± 17.0 mL/min for the F160NR hemodialyzer. At a flow rate of 400/800 mL/min, regadenoson CL_D for the F8 hemodialyzer was 76.9 ± 19.7 versus 89.1 ± 24.0 for the F160NR hemodialyzer. No significant difference in CL_D was observed between the two hemodialyzers at flow rates of 300/600 mL/min ($p=0.11$) and 400/800 mL/min ($p=0.29$). Regadenoson CL_D did not change significantly with increasing flow rates for both hemodialyzers ($p>0.05$).

CONCLUSION: Regadenoson is removed by hemodialysis at a rate of ~60–90 mL/min. Hemodialyzer permeability and blood/dialysate flow rate have no significant effect on regadenoson CL_D.

209. Evaluation of heart failure therapy in patients with end-stage renal disease. Tate Cutshall, PharmD[1], Benjamin T. Duhart Jr., MS, PharmD[2], Jagannath Saikumar, MD[3], Michael Samarin, PharmD, BCPS, BCCCP[1], Lydia Hutchison, PharmD, BCPS, CGP[1], Joanna Hudson, PharmD, BCPS, FASN, FCCP, FNKF[2]; (1) Methodist University Hospital, Memphis, TN (2) Department of Clinical Pharmacy, University of Tennessee College of Pharmacy, Memphis, TN (3) Department of Medicine (Nephrology), University of Tennessee, Memphis, TN

INTRODUCTION: Treatment of heart failure with reduced ejection fraction (HFrEF) requires guideline-directed medical therapy (GDMT) consisting of either an angiotensin-converting enzyme inhibitor (ACEI) or an angiotensin receptor blocker (ARB) in combination with an indicated beta-blocker (BB). Due to a paucity of data in patients with end-stage renal disease (ESRD), there is concern that patients are not being prescribed GDMT.

RESEARCH QUESTION OR HYPOTHESIS: Do outcomes differ for patients with HFrEF and ESRD receiving GDMT compared to those not receiving GDMT?

STUDY DESIGN: Single-center, retrospective study.

METHODS: We evaluated HF therapy in adult patients with ESRD and HFrEF admitted to a tertiary, teaching hospital from August 2013 through August 2015. Patients were categorized into GDMT or non-GDMT groups based on their home medications. The primary objective was to compare length of stay (LOS), mortality, and 30-day hospital readmissions. The incidence of adverse effects (hyperkalemia, hypotension, and bradycardia) and whether GDMT was continued (for the GDMT group) or newly initiated (for the non-GDMT group) at discharge was also evaluated.

RESULTS: 109 patients were included: 88% black, 61% male, mean age 62 ± 13 years with 25 in the GDMT group and 84 in the non-GDMT group. The LOS did not differ between the GDMT (6.5 ± 3.4 days) compared to the non-GDMT group (8.0 ± 4.9 days), $p=0.16$. Thirty-day hospital readmission and in-hospital mortality were also similar. Hypotension occurred less frequently in the GDMT group compared to non-GDMT group, 4% vs. 27% ($p=0.01$). At discharge GDMT was continued in 84% of patients and newly initiated in 10% of the non-GDMT group.

CONCLUSION: While there were no differences in the primary outcomes, the shorter LOS in the GDMT group may be clinically significant. The fact that the majority of patients with ESRD and HFrEF were not receiving GDMT is a finding that may require further evaluation.

210. Impact of clinical pharmacists' interventions on the management of anemia in chronic hemodialysis patients. Mohammad Zaitoun, BScPharm, PharmD, BCCP[1], Sara Hazem, BScPharm, DipClinPharm, BCPS[1], Khalid Al-Sheikh, MD[2], Adel Abou Ali, PharmD, ScD, MS[3]; (1) Pharmacy Department, Armed Forces Hospitals Southern Region, Khamis Mushait, Saudi Arabia (2) Nephrology Department, Armed Forces Hospitals Southern Region, Khamis Mushait, Saudi Arabia (3) Clinical Pharmacy Department, Faculty of Pharmacy, King Khalid University, Abha, Saudi Arabia
INTRODUCTION: Few studies evaluated the impact of clinical pharmacists' interventions on the management of Anemia in hemodialysis patients.
RESEARCH QUESTION OR HYPOTHESIS: To evaluate the impact of clinical pharmacists' interventions on the management of Anemia in chronic hemodialysis patients regularly attending the dialysis unit of the Armed forces hospitals southern region (AFHSR), Khamis Mushait, Saudi Arabia.
STUDY DESIGN: Quasi-experimental nonrandomized, pre-post intervention study.
METHODS: The study was conducted from February 2015 till February 2016. All chronic hemodialysis patients' monthly prescriptions were reviewed by two clinical pharmacists taking into consideration changes in patients' labs (Average number of patients reviewed per month = 296). Target Hemoglobin and serum ferritin were defined according to the latest edition of the KDIGO guidelines (transferrin saturation was not used as it is not routinely available in the hospital lab). The variables reviewed in the study included the treating physicians' acceptance of clinical pharmacists' recommendations, post-intervention changes of relevant patients' labs and cost saving due to reductions in medications dosing or unnecessary medications discontinuation. The study protocol was reviewed and approved by the research and ethics committee of the AFHSR.
RESULTS: Ninety six interventions were recommended by clinical pharmacists of which 93 were accepted by physicians (96.8%). The most common interventions categories were medication discontinuation (68.4%), dose change (9.7%) and added medication (21%). The accepted interventions were associated with post-intervention improvement in patient labs in 79.3% of the cases, 10.86% showed no clinically significant changes in their labs with reduced medication costs and the remaining cases showed out of range ferritin and/or hemoglobin. Dose reductions and medications discontinuation resulted in a total average saving cost of $8312 USD per month. For the non-accepted interventions, all cases were associated with post-intervention reduced ferritin.
CONCLUSION: The study findings suggest that clinical Pharmacists' interventions in the management of anemia in hemodialysis patients were associated with improved clinical and economic outcomes.

211. Are statins associated with muscular complaints in dialysis patients? Results from a double blind cross-sectional study. Sarah Hassinger, PharmD Candidate, Letitia Warunek, PharmD Candidate, Edward Foote, PharmD; Nesbitt School of Pharmacy, Wilkes University, Wilkes-Barre, PA
INTRODUCTION: Statins are commonly used in dialysis patients and anecdotally it appeared that our patients on statins have a higher incidence of muscular complaints. There is no research on the relationship between statins and muscular complaints in dialysis patients.
RESEARCH QUESTION OR HYPOTHESIS: Do hemodialysis patients on moderate or high intensity statins have a higher incidence of muscular complaints compared to dialysis patients not on statins?
STUDY DESIGN: Double blind cross-sectional study.
METHODS: A questionnaire inquiring about muscle complaints (pain, discomfort, cramping, weakness) was developed and administered orally to patients at three dialysis units. Study investigators were blinded to the use of statins during the interviews. Patients were blinded in that they were unaware of the purpose of this study. After all questionnaires were completed, home medication lists were generated. The primary outcome of the study was the incidence of muscular complaints in statin versus non-statin patients compared using chi-square analysis.
RESULTS: Questionnaires were administered in April of 2016. Of the 202 patients eligible for participation, 10 patients were not approached for various reasons, and 17 declined participation, leaving 175 patients in the study. Ten patients were subsequently excluded from analysis because they were on a low intensity statin (9) or had no active medication list (1). 72% of patients on statins reported muscular symptoms within the past four weeks compared to 71% not on statins. An equal proportion described the complaints as bilateral (59% vs. 62%). However, 52% of the patients on statins reported having other potential causes of pain compared to 81% of the non-statin group ($p<0.05$), putting into question the overall lack of contribution of muscular complaints by statins.
CONCLUSION: Moderate and high intensity statin therapy does not appear to be associated with an increased incidence of muscular complaints in hemodialysis patients, but more research is needed.

Neurology

212E. The safety of augmented visual stimulation: does repeated, extensive visual stimulation within a time-frame of one hour increase sensitivity in photosensitive patients?. Ronald Reed, BS Pharm, PharmD[1], Dorothee Kasteleijn-Nolst Trenite, MD, PhD, 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 12th European Congress on Epileptology, Prague, Czech Republic, 11th-16th September, 2016.

Nutrition

213E. Severe vitamin D deficiency in critically ill patients with traumatic injuries. Roland Dickerson, PharmD[1], Jonathan Van Cleve, PharmD[2], George Maish III, MD[3], Joseph Swanson, PharmD[4], Gayle Minard, MD[3], Rex Brown, PharmD[5]; (1) Department of Clinical Pharmacy, University of Tennessee Health Science Center, Memphis, TN (2) Clinical Pharmacy, University of Tennessee College of Pharmacy (3) Department of Surgery, University of Tennessee Health Science Center, Memphis, TN (4) University of Tennessee (5) University of Tennessee Health Science Center, Memphis, TN
Published in JPEN Journal of Parenteral and Enteral Nutrition.2016;2:96–99 (Online Suppl).

214E. Sliding scale regular human insulin for critically ill patients receiving nutrition support. Sarah Cogle, PharmD[1], Susan Dickey, PharmD[2], George Maish III, MD[3], Gayle Minard, MD[3], Martin Croce, MD[3], Roland Dickerson, PharmD[2]; (1) Department of Pharmacy Practice, Auburn University Harrison School of Pharmacy, Auburn, AL (2) Department of Clinical Pharmacy, University of Tennessee Health Science Center, Memphis, TN (3) Department of Surgery, University of Tennessee Health Science Center, Memphis, TN
Published in JPEN Journal of Parenteral and Enteral Nutrition. 2016;2:70–73 (Online Suppl).

Oncology

215E. Retrospective analysis of probiotic effectiveness in acute myeloid leukemia and transplant patients receiving chemotherapy. Daniel Przybylski, PharmD Student, David Reeves, PharmD;

College of Pharmacy and Health Sciences, Butler University, Indianapolis, IN
Presented at the ACCP Virtual Poster Symposium, May 2016, Best Student Poster Award, First Runner-Up.

Other

216. Lifitegrast 5.0% versus placebo for dry eye disease: pooled analysis of symptom outcomes from the OPUS-2 and OPUS-3 phase 3 studies. Monica Roy, OD, MPH, FAAO[1], Paul Karpecki, OD, FAAO[2], Cynthia Matossian, MD, FACS[3], Kenneth Sall, MD[4], Aparna Raychaudhuri, PhD[1], Amir Shojaei, PharmD, PhD[1]; (1) Shire, Lexington, MA (2) Kentucky Eye Institute, Lexington, KY (3) Matossian Eye Associates, Doylestown, PA (4) Sall Research Medical Center, Artesia, CA
INTRODUCTION: Lifitegrast (LIF) is a small molecule integrin antagonist designed to reduce inflammation in dry eye disease (DED) by blocking binding of ICAM-1 to LFA-1.
RESEARCH QUESTION OR HYPOTHESIS: To characterize the effect of LIF on DED symptoms using pooled data from two Phase 3 trials of similar design.
STUDY DESIGN: Pooled analysis from phase 3, multicenter, randomized controlled trials (OPUS-2 [NCT01743729] and OPUS-3 [NCT02284516]).
METHODS: Key inclusion criteria were Schirmer Tear Test ≥ 1 and ≤ 10 mm, eye dryness score [EDS, visual analogue scale 0–100; 0 = no discomfort, 100 = maximal discomfort] ≥ 40, corneal staining score ≥ 2.0, and a recent history of artificial tear use. Subjects were randomized 1:1 (LIF:placebo [PBO]) to receive ophthalmic drops twice daily for 84 days. Change from baseline to days 84 (primary endpoint of each trial), 42, and 14 in EDS were analyzed. Treatment-emergent adverse events (TEAEs) were also evaluated.
RESULTS: Overall, 1429 subjects were randomized in the trials (LIF, n=713; PBO, n=716). The mean change from baseline to day 84 in EDS was significantly greater in LIF-treated subjects versus those receiving PBO (treatment effect [TE], 9.92; 95% CI, 7.01–12.83; $p<0.0001$). Mean changes from baseline in EDS also favored LIF over PBO on day 42 (TE, 9.75; 95% CI, 6.99–12.50; $p<0.0001$) and day 14 (TE, 7.23; 95% CI, 4.71–9.76; $p<0.0001$). Most TEAEs were mild to moderate in severity, and there were no serious ocular adverse events. The most common TEAEs, occurring in > 5% of subjects in either group, were instillation site irritation (LIF 13.0%, PBO 2.2%), instillation site reaction (LIF 9.8%, PBO 3.2%) and dysgeusia (change in taste; LIF 14.5%, PBO 0.3%).
CONCLUSION: In this pooled population of DED subjects, LIF significantly improved patient-reported symptoms versus PBO, as measured by EDS. Improvement in eye dryness was observed as early as two weeks. LIF appeared well tolerated.

217. Exploring employer job requirements: a multi-state analysis of pharmacist job advertisements. Nancy Borja-Hart, PharmD[1], James Wheeler, PharmD[1], Tien Ngo, PharmD candidate[2], Jasmine Cecil, PharmD candidate[2]; (1) Department of Clinical Pharmacy, College of Pharmacy, University of Tennessee Health Science Center, Nashville, TN (2) College of Pharmacy, University of Tennessee Health Science Center, Nashville, TN
INTRODUCTION: Post-graduate training, dual degrees, and board certifications are all viewed as positive assets for pharmacist jobs seekers; however, a key question merits further investigation - do these views match employer expectations? The primary objective of this study was to identify the qualifications employers require as stated in job advertisements.
RESEARCH QUESTION OR HYPOTHESIS: What qualifications do employers expect in the current job market?
STUDY DESIGN: Descriptive, retrospective evaluation.
METHODS: Pharmacist job postings from the aggregate jobs website indeed.com were evaluated for the 20 largest metropolitan areas in the U.S. Search criteria included: pharmacist, full-time, and within a 50-mile radius of the metropolitan area. Positions were excluded if they were not pharmacist specific, part-time, or temporary. Required and preferred qualifications were collected in the following categories: practice type, experience needed, training, certification, and desired skills.
RESULTS: Six hundred and eleven of 1356 postings met inclusion criteria. Positions were classified as community (110), health-system (250), industry (164), academia (9), or other (78). Four hundred and six (66.4%) required a minimum of a Bachelor's of Pharmacy degree, while 174 (28.4%) required a Doctor of Pharmacy degree. Experience was required for 438 positions (range of 6 months to 14 years). Post-graduate training was required for 56 positions (49 residency/7 fellowship). One job required a Master's degree, type unspecified. BPS certifications were required 7 positions (1.1%) and preferred for 22 (3.6%). Certifications and skills most required by employers were verbal and written skills (252), interpersonal skills (148), MS office proficiency (94), BLS/CPR certifications (37), and immunization certifications (51).
CONCLUSION: The qualifications employers required most were experience and skills. Beyond the pharmacy degree, few employers required post-graduate training, additional degrees, or board certifications. Postgraduate training is a means to achieve employer's largest requirement: experience.

218. Tranexamic acid use in the total hip and total knee arthroplasty population at an academic medical center: a retrospective review of postoperative outcomes. Brianne Kaufman, PharmD[1], Julie Murphy, PharmD, FASHP, FCCP, BCPS[2], Natalie Tuttle, PharmD, BCPS[1], Daniel Gehling, MD[3]; (1) University of Toledo Medical Center, Toledo, OH (2) University of Toledo College of Pharmacy and Pharmaceutical Sciences, Toledo, OH (3) Department of Orthopedic Surgery, University of Toledo Medical Center, Toledo, OH
INTRODUCTION: Excessive blood loss and subsequent blood transfusions for orthopedic procedures have been associated with considerable morbidity and mortality. Tranexamic acid (TXA), a synthetic amino acid analog, acts as an antifibrinolytic agent by competitively inhibiting plasminogen activation.
RESEARCH QUESTION OR HYPOTHESIS: What is the incidence of perioperative blood transfusion after hip or knee arthroplasty with the use of TXA versus standard procedure? What is the difference in perioperative thromboembolic complication rates, hospital length of stay, and 30-day readmission rates for the two groups?
STUDY DESIGN: Quasi-experimental, retrospective, cohort study.
METHODS: Any adult patient who underwent a total hip or knee arthroplasty between October 1, 2012 and September 30, 2015 at our institution was eligible for inclusion. The following information was collected: baseline characteristics, surgery details including the need for blood transfusion, occurrence of perioperative thromboembolism, length of stay, and 30-day readmission rates. Categorical data was analyzed using Chi-square or Fisher's exact test and continuous data was analyzed using t-test or Mann-Whitney U test. To show statistical significance, 150 patients were needed per treatment arm.
RESULTS: Two hundred ninety-eight patients were eligible for inclusion, 148 in the TXA group, and 150 in the standard procedure group. In the TXA group, 30 patients (20%) required a blood transfusion versus 48 patients (32%) in the standard procedure group ($p=0.021$), without any increase in thromboembolic complications [(2% vs. 3%, respectively, ($p=1.0$)]. The median length of stay was 3 days (Interquartile Range (IQR) 3–5 days) for the TXA group, versus 4 days (IQR 3–6 days) in the standard procedure group ($p\leq0.001$). In the TXA group, 4.1% were readmitted within 30 days, versus 8.7% in the standard procedure group ($p=0.103$).
CONCLUSION: TXA significantly reduced the need for blood transfusion along with the median hospital length of stay without any increase in thromboembolic complication rates or difference in 30-day readmission rates versus standard procedure.

Pain Management/Analgesia

219. Opioid and benzodiazepine use in breast cancer patients before, during, and after curative chemotherapy. Warren Yau, BS[1], Eric Roeland, MD[2], Carolyn Revta, MPH[2], Amine Ale-Ali, PharmD[2], Joseph Ma, PharmD[3]; (1) UC San Diego, Skaggs School of Pharmacy & Pharmaceutical Sciences, La Jolla, CA (2) UC San Diego Moores Cancer Center, La Jolla, CA (3) UC San Diego, Skaggs School of Pharmacy & Pharmaceutical Sciences, La Jolla , CA

INTRODUCTION: Opioids and benzodiazepines (BDZs) are used to treat symptoms in patients with curative cancer. However, patterns of opioid and BDZ use by breast cancer patients are unknown.

RESEARCH QUESTION OR HYPOTHESIS: To determine opioid and BDZ use by breast cancer patients before, during, and after receiving curative chemotherapy.

STUDY DESIGN: Retrospective chart review.

METHODS: We evaluated stage I–III breast cancer patients receiving curative chemotherapy at a single academic cancer center. Patient demographics, chemotherapy regimens and histories were collected from an electronic medical record (EMR). Opioid and BDZ use was confirmed by a prescription drug monitoring program and/or an EMR medication list. Opioid and BDZ frequencies before, during, and after chemotherapy were analyzed by McNemar's test.

RESULTS: 148 patient charts from April 2013 to April 2015 were analyzed. The majority of patients were women (n=147), mean age 53.7 $\pm$ 11.2 years, had stage II cancer (n=85), and received docetaxel and cyclophosphamide (n=37). Short acting (SA) opioid use ranged from 31 to 44% before, during, and after chemotherapy. Less than 3% had documented use of a long acting (LA) opioid. BDZ use was most commonly indicated for anxiety, and lorazepam was the most common BDZ used. Compared to 30 days prior to chemotherapy initiation, an increase in BDZ use was observed at the first cycle (n=81, 54.7%; $p<0.001$), the third cycle (n=89, 60.1%; $p<0.001$), at end of therapy (n=87, 58.8%; $p<0.001$), and 90 days post-therapy (n=48, 33.6%; $p<0.001$).

CONCLUSION: SA opioid use was stable, while BDZ use increased throughout the course of curative chemotherapy. LA opioid use was low, which suggests that SA opioid use alone was sufficient for the management of pain for most patients in this population. Patient education should continue to highlight an expectation of BDZ cessation and SA opioid use after completion of chemotherapy in breast cancer patients on curative chemotherapy.

220. Clinical and demographic characteristics of patients receiving opioid therapy during pregnancy. Caitlin K. Frail, PharmD, MS, BCACP[1], Pamala A. Pawloski, PharmD[2], Rebecca C. Rossom, MD, MSCR[2], Avis J. Thomas, MS[2], Ann M. Werner, BS[2], Thomas E. Elliott, MD[2]; (1) Pharmaceutical Care and Health Systems, University of Minnesota College of Pharmacy, Minneapolis, MN (2) HealthPartners Institute, Bloomington, MN

INTRODUCTION: Opioid use has increased significantly in recent years, including during pregnancy. Evidence suggests as many as one in four women receive opioid therapy to some extent during pregnancy. Concerns have emerged regarding potential increased fetal risks, including central nervous system effects.

RESEARCH QUESTION OR HYPOTHESIS: The purpose of this work is to describe clinical and demographic characteristics of patients receiving opioid therapy during pregnancy.

STUDY DESIGN: Retrospective observational study.

METHODS: Pregnant members of a Midwestern integrated health care system who delivered a live birth between 2006 and 2014 and had continuous pharmacy benefits beginning three months prior to their estimated pregnancy start through three months after their known delivery date were included. As part of a larger study aimed at understanding opioid prescribing patterns during pregnancy, demographic, clinical, and healthcare utilization variables of interest were identified and described. Opioid use during pregnancy was defined as more than five days in any three month-period, excluding the two-week period following delivery.

RESULTS: Of 11,565 deliveries during the study period, 862 (7.4%) representing 816 unique patients were associated with opioid use during pregnancy. Fifteen percent of Medicaid beneficiaries received opioids during pregnancy versus 5% of commercially insured patients. Adjusting for Medicaid coverage, patient characteristics associated with an increased likelihood of receiving opioid therapy include: single marital status (OR = 1.19), current smoking status (OR = 2.42), a history of substance abuse (OR = 3.87), and mental health diagnoses (anxiety OR = 2.66, bipolar OR = 2.38, depression OR = 2.42). In addition, the use of non-opioid analgesics and mood-altering agents (e.g., benzodiazepines, antidepressants) were associated with increased opioid use.

CONCLUSION: Opioid use was more common among single women who smoke, or have a mental health diagnosis or history of substance abuse. Women with these risk factors may benefit most from targeted outreach to decrease opioid use during pregnancy.

221. Comparison of multimodal, sliding scale acute pain protocols with traditional prescribing. Jayne Pawasauskas, PharmD[1], Christian Gill, PharmD intern[1], Michael Facente, PharmD[1], Michelle Kelley, PharmD[2]; (1) University of Rhode Island, Kingston, RI (2) Kent Hospital, Warwick, RI

INTRODUCTION: Multimodal, sliding scale protocols for managing pain in inpatients were developed to better meet the analgesic needs of patients with acutely painful episodes. The protocols take into account patient-specific factors such as opioid tolerance and enteral status (PO vs. NPO).

RESEARCH QUESTION OR HYPOTHESIS: How does the use of multimodal, sliding scale acute pain protocols compare to traditional prescribing with respect to pain management efficacy and safety outcomes.

STUDY DESIGN: Retrospective Chart Review.

METHODS: Patients who were admitted to the hospital and prescribed one of the 6 protocols between 4/30/15 and 7/30/15, admitted to a hospitalist service, and had received at least 2 doses of PRN analgesic medication within a 24-h period were eligible for inclusion. We collected baseline demographics, efficacy measures (verbal pain rating scores to determine time to achieve analgesia [definition $\geq$ 2/10 improvement], total opioid use in oral morphine equivalent doses [MEDs]), and safety measures (naloxone use, gastrointestinal symptoms). A sample of patients admitted during the same time frame, meeting inclusion/exclusion criteria, but who received traditional analgesic prescribing served as controls.

RESULTS: Forty-six patients were included in the analysis (protocol group), and 46 as controls. The average baseline pain scores were similar between groups (7.26 in protocol, 7.43 in control, $p=0.684$). Protocol patients required significantly less time to achieve meaningful analgesia (average 507.52 min), compared the control group (894.33 min, $p=0.045$). Patients using an opioid protocol used an average of 35.81 MEDs per day compared to 65.77 MEDs in control patients ($p=0.019$). Patients in the protocol group used significantly fewer PRN analgesic doses (12.70 vs. 24.02, $p<0.0001$).

CONCLUSION: Analysis of the implementation of acute pain management protocols indicate that using standardized pain management protocols of opioids, non-opioids, and medications to prevent opioid-related adverse events is more effective than traditional analgesic prescribing.

222. Perioperative use of single dose intravenous versus oral acetaminophen in patients undergoing orthopedic surgery. Krista Foley, PharmD[1], Lee Skrupky, PharmD, BCPS[1], Jeff Waise, PharmD, MBA[1], Todd Bruss, PA-C, ATC, CSCS[2], Robert Limoni,

MD[2], Paul Luikart, MD[3], Barry McClain, PharmD, MS[4], Robert Mate, BA, MA[4]; (1) Department of Inpatient Pharmacy, Aurora BayCare Medical Center, Green Bay, WI (2) Aurora BayCare Orthopedic & Sports Medicine Center, Green Bay, WI (3) Department of Anesthesiology, Aurora BayCare Medical Center, Green Bay, WI (4) Aurora Health Care, Milwaukee, WI

INTRODUCTION: Evidence is conflicting supporting the use of intravenous (IV) acetaminophen compared to placebo in orthopedic surgery and comparisons to oral acetaminophen are extremely limited.

RESEARCH QUESTION OR HYPOTHESIS: Perioperative use of oral versus IV acetaminophen in patients undergoing total hip or knee replacement surgery will not significantly impact early postoperative opioid consumption.

STUDY DESIGN: Before-after study conducted at a community medical center.

METHODS: On October 1st, 2015, a practice change was implemented in patients undergoing hip or knee replacement surgery; a one-time perioperative dose of 1 g of IV acetaminophen (before phase) was changed to 1 g oral acetaminophen 30–60 min preoperatively (after phase), keeping all other standards of care the same. Patients were excluded if they received IV acetaminohpen postoperatively. The primary outcome was opioid consumption (measured in oral morphine equivalents) from 0 to 6 h postoperatively. Secondary outcomes included the immediate postoperative pain score, time to first rescue analgesic, opioid consumption from 6 to 24 h, and PACU length of stay.

RESULTS: A total of 149 patients were included in the analysis, 78 received IV and 71 received oral acetaminophen. Baseline characteristics were well balanced between groups. Median opioid consumption was significantly greater in the IV versus oral acetaminophen group from 0 to 6 h (65 mg vs. 45 mg, p=0.010), while no difference existed from 6 to 24 h (45 mg vs. 40 mg, p=0.531). Median pain score immediately post-op (4.5 vs. 5, p=0.801), time to first rescue medication (19 vs. 15 min, p=0.478) and PACU length of stay (1.53 vs. 1.63 h, p=0.122) were similar between groups. No adverse effects were identified in either group.

CONCLUSION: Use of perioperative oral acetaminophen as compared to IV acetaminophen in patients undergoing hip or knee replacement surgery did not adversely affect outcomes, and was associated with reduced early postoperative opioid consumption. Further prospecitve studies may be warranted.

223. Comparison of venlafaxine and duloxetine: measuring clinical impact of time to therapeutic dose among patients achieving therapeutic dosing for pain. Jennifer W. Baker, PharmD, BCACP, BCPS, Tim Atkinson, PharmD, BCPS, Keslie Flynn, PharmD; Veterans Affairs Tennessee Valley Healthcare System, Murfreesboro, TN

INTRODUCTION: Chronic opioid therapy remains controversial, however, there is consensus among treatment guidelines that adjunct medications should be utilized first. A meta-analysis revealed serotonin-norepinephrine reuptake inhibitors (SNRIs) venlafaxine and duloxetine to be equally efficacious in the treatment of neuropathic pain and recommend them as first-line therapy. There are no head-to-head studies, therefore the clinical impact of drug selection in terms of percentage of patients achieving therapeutic dose, time to therapeutic dose (TTD), and adverse effect profiles need to be evaluated.

RESEARCH QUESTION OR HYPOTHESIS: What is the clinical impact of drug selection as measured by percentage of patients achieving therapeutic dose and TTD for neuropathic pain with either venlafaxine or duloxetine?

STUDY DESIGN: This was a single center, retrospective, observational analysis.

METHODS: New start prescriptions for either venlafaxine or duloxetine between January 1, 2011 and January 1, 2014 were identified. Through data warehouse extraction the following was collected: age, gender, weight, height, race, comorbidities, prescriber, and concomitant antidepressants and anticonvulsants on date of initiation. Manual data collection through the Computerized Patient Record System (CPRS) was then utilized to determine veteran eligibility as well as if therapeutic dose was achieved, TTD, along with discontinuation rates and cause.

RESULTS: 682 charts were reviewed to identify 302 patients, 151 in each group. The duloxetine group had 120 (79%) patients achieve therapeutic dose compared to 82 (54%) in the venlafaxine group (p<0.0001). Median TTD for duloxetine was 7 days (0–44, IQR) compared to venlafaxine 31.5 days (10–115, IQR). Side effects were reported in 37% of patients in venlafaxine group compared to 22% of duloxetine group (p=0.0053). Of note, 117 (77%) of the duloxetine patients had a previous trial of venlafaxine therapy.

CONCLUSION: Patients taking duloxetine are significantly more likely to achieve therapeutic dose and experience fewer adverse effects even if they have previously failed venlafaxine therapy.

224. Impact of educating the college population about intranasal naloxone. Nicolette Diehl, Student[1], Jennifer Pruskowski, PharmD, BCPS, CGP, CPE[2]; (1) School of Pharmacy, University of Pittsburgh, Pittsburgh, PA (2) Palliative and Supportive Institute (PSI), University of Pittsburgh Medical Center, Pittsburgh, PA

INTRODUCTION: According to many national institutes, we are currently experiencing an opioid epidemic, which is no different within Allegheny County, Pennsylvania. The passing of the Pennsylvania intranasal naloxone act, Act 139, and naloxone standing order in late 2014 and early 2015 respectively, has made naloxone widely available across the county. A major age group affected is 20–30 year olds and it is hypothesized that educating college students may reduce the number of future overdoses.

RESEARCH QUESTION OR HYPOTHESIS: The study objective was to explore the impact of a 30-min presentation in the desired population.

STUDY DESIGN: This was a pre-post cohort study of undergraduate students at the University of Pittsburgh who participated in the Drugs and Behaviors class, regarding intranasal naloxone and Act 139.

METHODS: Surveys were distributed prior to and after the lecture, assessing their knowledge, beliefs, and attitudes regarding the subject. Description statistics were utilized to describe participant demographics, and a Wilcoxon signed-rank test was used to assess ordinal data.

RESULTS: One hundred seventy-six students completed the survey; 36.9% were male and the mean age was 19.8. The pre-survey revealed that only 14.7% had heard of Act 139 and 39.2% thought that intranasal or injectable naloxone should be widely available across the state. Following the presentation, the statistically significant data showed that 89.2% of students felt that intranasal or injectable naloxone should be available. On a scale of 1–5 with 1 being not confident and 5 being very confident, 69.9% of students recorded at least a 4, stating that they were confident administering intranasal or injectable naloxone.

CONCLUSION: This small cohort study shows that a 30-min presentation, led by a Student Pharmacist, can statistically and clinically impact knowledge, beliefs, and attitudes of college students. Therefore, this project shows the value in educating the community and the opportunity to change public opinion regarding intranasal naloxone.

225. A retrospective review of the effectiveness of first dose therapeutic drug monitoring of gentamicin in the pediatric population. Wen Bing Brandon Chua, BSc Pharm(Hons) , Wan Xuan Selina Lim, BSc Pharm(Hons), Bao Hui Poh, BSc Pharm (Hons); Department of Pharmacy, KK Women's and Children's Hospital, Singapore

INTRODUCTION: Timely optimisation of drug concentration is essential to achieve rapid therapeutic response. However, information regarding dose optimisation with therapeutic drug monitoring (TDM) after the first dose of antibiotic is lacking.

RESEARCH QUESTION OR HYPOTHESIS: First dose TDM (FD) results in fewer days to optimise serum gentamicin concentrations compared to steady state concentration TDM (SS).
STUDY DESIGN: A retrospective cohort study based in KK Women's and Children's Hospital, Singapore.
METHODS: Patients aged one month to 18 years old who received gentamicin between October 2012 to October 2014 were included in the study. Patients with unstable renal function and those without both peak and trough serum gentamicin concentrations were excluded. Gentamicin therapy was considered optimised when peak and trough concentrations were 8–10 mg/L and < 2 mg/L respectively. The primary outcome includes the time taken to optimise serum gentamicin concentration since antibiotic initiation. Secondary outcomes include time to microbial clearance, fever resolution, and normalisation of white blood cells. The total number of serum gentamicin assays, gentamicin doses given and dose adjustments required to optimise therapy were analysed for cost implications.
RESULTS: 116 patients were included in the study – 19 in FD and 97 in SS. Baseline characteristics were comparable between FD and SS. Time to optimized therapy was shorter in FD [FD: 1.34 days, IQR: 1.12–1.67 days vs. SS: 4.12 days, IQR: 1.95–5.11, p<0.001]. The longest time taken was 6 and 11 days for FD and SS respectively. Secondary outcomes were not statistically significant between the two groups. Among patients with optimised therapy, lesser doses were required by FD to achieve optimised concentration [FD: 4.50, IQR: 4.00–5.75 vs. SS: 6.00, IQR: 5.00–9.75, p=0.037]. However, other parameters contributing to cost implications were comparable between FD and SS.
CONCLUSION: FD results in shorter time to optimise gentamicin therapy. This may be a useful strategy to attain individualized dosage regimen more quickly for improved patient outcomes.

226. Impact of adherence to an oral morphine dosing protocol for treatment of neonatal abstinence syndrome on length of stay. Sapna Bhambhani, PharmD; Pharmacy, Saint Peters University Hospital, New Brunswick, NJ
INTRODUCTION: Up to 75% of neonates exposed to opioids in utero develop neonatal abstinence syndrome (NAS) and may require opioid therapy to alleviate symptoms of withdrawal. There are no specific guidelines for weaning opioid therapy in neonates with NAS. We sought to assess the impact of adherence to an oral morphine dosing protocol for NAS on the duration of morphine therapy and hospital length of stay (LOS).
RESEARCH DESIGN OR HYPOTHESIS: Protocol-driven dosing for NAS will reduce the duration of morphine therapy and LOS.
STUDY DESIGN: Retrospective chart review.
METHODS: This IRB-approved study was conducted from March 2014 and February 2016 in consecutive neonates at least 34 weeks gestational age with NAS who received oral morphine for treatment of withdrawal symptoms. Patients who were not weaned off morphine prior to discharge or who were switched to methadone were excluded from the analysis. Patients were divided into two groups- those adherent to the protocol (ADH) versus those non-adherent to the protocol (non-ADH). Data is presented as median [IQR] where appropriate. Wilcoxon rank sum test for two-independent samples was used to compare continuous data. A p<0.05 was considered significant.
RESULTS: There were 23 patients included in the analysis, 5 in the ADH group and 18 in the non-ADH group. Adherence to the protocol resulted in median of 230 (212–666) hours of morphine therapy (ADH group) compared to 456 (271–736) hours in the non-ADH group (p=0.48). Adherence also resulted in a median LOS of 16 days compared to 23 days with non-adherence (p=0.29). Nine neonates were breastfed, seven of those by mothers taking methadone. Consistent with the literature, duration of morphine therapy in breastfed neonates was decreased, 203 (157–230) hours compared to 456 (256–544) hours in those who were not breastfed (p=0.02).
CONCLUSION: Implementation of a morphine dosing protocol for NAS has potential to improve outcomes.

228. Excretion of hydroxychloroquine in milk of lactating patients. Rongji Liu, MS[1], Lejia Zhang, MS[2], Dan Mei, BSPharm[1], Xiaoli Du, MS[1]; (1) Department of Pharmaceutical Services, Peking Union Medical College Hospital, Beijing, China (2) Department of Pediatrics, Peking Union Medical College Hospital, Beijing, China
INTRODUCTION: Female patients with specific immune diseases need to continue taking hydroxychloroquine, a potentially toxic drug for infants, after delivery. Mothers on hydroxychloroquine and their physicians are concerned with the medication safety to the breast-fed infants. Although the American Academy of Pediatrics and some expert consensus suggest that maternal use of hydroxychloroquine is usually compatible with breastfeeding, unfortunately, there is very little solid data on its excretion in human milk to dismiss the patients' doubts.
RESEARCH QUESTION OR HYPOTHESIS: Is the amount of hydroxychloroquine excreted in human milk safe to the breast-fed infants?
STUDY DESIGN: A prospective, open pharmacokinetic study was conducted.
METHODS: Breastfeeding women on long-term treatment with hydroxychloroquine were enrolled into the study. Breast milk samples were collected before and at 2, 4, 6, 8, 12 and 18 h after hydroxychloroquine administration. The drug concentration was measured by HPLC. The daily dose of hydroxychloroquine taken by the infants were estimated by multiplying the average daily milk hydroxychloroquine concentration with assumed daily milk consumption.
RESULTS: A total of 13 qualified breastfeeding women took part in the research. The average milk concentrations of hydroxychloroquine for different dosage regimens were 2152.23 (1335.92–3268.52, 0.2 g bid, n=5), 811.19 (671.74–979.66, 0.2 g qd, n=4), 495.46 (358.08–746.08, 0.1 g bid, n=3), and 415.84 ng/mL (0.1 g qd, n=1), respectively. Assuming a daily milk consumption of 1L for an infant, the daily dose of hydroxycholoroquine received by the infant *via* breastfeeding would be about 2.15, 0.81, 0.50 and 0.42 mgï¼Œcorresponding to 0.54%, 0.41%, 0.25% and 0.42% of the daily maternal doses, respectively.
CONCLUSION: The concentration of hydroxycholoroquine in breast milk is positively correlated to the maternal dose. The daily dose of hydroxycholoroquine received by the infants *via* breastfeeding is less than 1% of the maternal dose, which is considered posing low risk to the infants.

229. Methadone-induced QTc prolongation in hospitalized pediatric patients. Amy Schwinghammer, PharmD[1], Brent Hall, PharmD, BCPPS[1], Machelle Wilson, PhD[2]; (1) Department of Pharmacy, University of California Davis Children's Hospital, Sacramento, CA (2) Department of Public Health Sciences, Clinical and Translational Science Center, UC Davis, Sacramento, CA
INTRODUCTION: Clinical pharmacists contribute to the safe use of methadone through education and monitoring. However, the incidence of QTc prolongation, torsades de pointes (TdP), and contributing risk factors are not well-defined in hospitalized pediatric patients.
RESEARCH QUESTION OR HYPOTHESIS: What is the incidence of QTc prolongation and TdP in hospitalized pediatric patients receiving methadone? Are adult risk factors applicable to children?
STUDY DESIGN: Retrospective, observational cohort study.
METHODS: Pediatric (birth to 18 years) patients who received at least one dose of methadone were included. Exclusion criteria included baseline prolonged QTc, missing electrocardiography (ECG), concomitant antiarrhythmic, or malignancy. The primary endpoint, QTc prolongation, was defined as > 450 msec. Chart review was used to identify TdP. Sixty-six patients were needed to

power the primary endpoint. SAS software version 9.4 (SAS Institute, Cary, NC) was utilized to perform Chi square for categorical variables and univariate logistic regression for continuous variables. Statistically significant covariates were included in multivariate logistic regression with significance at $p<0.05$.
RESULTS: Eighty-nine patients, median age 13 months (IQR 5–59 months), were included. During the 3656 patient-days of methadone therapy, QTc prolongation occurred in 45 patients (50.6%). No episodes of TdP were identified. Patients with prolongation received higher maximum methadone doses (0.98 vs. 0.59 mg/kg/day, OR 2.56, 95% CI 1.15–5.76). Prolongation occurred more frequently in patients with cardiac disease (63% vs. 41%, p=0.15 in multivariate analysis). Prolongation occurred less frequently in patients with hepatic dysfunction (29% vs. 64%, p=0.12) and less frequently in patients with renal dysfunction (18% vs. 56%, p=0.04). Patients with other potential risk factors had a non-significantly lower incidence of QTc prolongation.
CONCLUSION: In hospitalized pediatric patients receiving methadone, QTc prolongation was common and no cases of TdP occurred. Larger maximum dose was independently associated with QTc prolongation. Many risk factors in adults were not associated with prolongation in our study population.

Pharmacoeconomics/Outcomes

231. Updated cost-savings of metformin for diabetes prevention. Nicholas Carris, PharmD[1], Branko Miladinovic, PhD[2], William Kelly, PharmD[3]; (1) Pharmacotherapeutics & Clinical Reserach, Family Medicine, University of South Florida, Tampa, FL (2) Division of Evidence-based Medicine, Department of Internal Medicine, University of South Florida, Tampa, FL (3) Pharmacotherapeutics & Clinical Research, University of South Florida, Tampa, FL
INTRODUCTION: Eighty-six million Americans have prediabetes and lifestyle-intervention, being poorly implemented, has minimally impacted the incidence of type 2 diabetes. Concurrently, metformin's use has remained low, partly due to the Diabetes Prevention Program's (DPP) findings. The DPP prospectively compared lifestyle-intervention, metformin, and placebo. Metformin and lifestyle-intervention were found to prevent diabetes, though lifestyle-intervention to a greater extent. However, metformin was cost-saving, and its acquisition-cost has further dropped (without insurance, $0–10 for three months). Additionally, the DPP's analysis included trial-only costs, one of which was only attributed to the metformin group.
RESEARCH QUESTION OR HYPOTHESIS: What is the per capita cost-savings associated with metformin for diabetes prevention from a U.S. health-system perspective over five years?
STUDY DESIGN: Retrospective cost-effectiveness analysis.
METHODS: Data from the DPP 10-year health-system perspective cost-effectiveness analysis were used with targeted cost updates. Excluded costs: oral glucose-tolerance tests (not standard-of-care; balanced between groups); baseline physician visit (perspective of treatment decision regarding patient diagnosed with prediabetes). Adjusted cost scenarios: 1) metformin cost set at $0 for prediabetes treatment; 2) metformin cost set at $40 per patient per prediabetes treated-year.
RESULTS: The 10-year unadjusted per capita cost-savings of metformin in the DPP was $93 versus placebo. Using updates and $0 cost for metformin: per capita cost-savings was $309 at five years and $749 at 10 years. Placebo treatment with greater total-cost and lower quality-of-life cost $14,690 per quality-adjusted life-year lost. Using updates and $40 cost for metformin: per capita cost-savings was $183 at five years and $555 at 10 years.
CONCLUSION: Considering these findings, a 10% increase in untreated-patients with prediabetes being treated with metformin could save the U.S. healthcare-system approximately $1.57-$2.65 billion over five years. As metformin reduces cost and morbidity while improving quality-of-life, its underuse is a public health concern. Future studies are needed to validate these results and identify methods to broadly implement metformin for diabetes prevention.

232E. Satisfaction and adherence with current treatment options for dry eye disease: analysis of data from the United States National Health and Wellness Survey. Debra A. Schaumberg, ScD, OD, MPH[1], Ipek Özer Stillman, MS[2], Kimberley F. Farrand, MPH[3], Moshe Fridman, PhD[4]; (1) Ophthalmics, Shire, Lexington, MA (2) Global HEOR & Epidemiology, Shire, Lexington, MA (3) Global HEOR & Epidemiology, Shire, Wayne, PA (4) AMF Consulting, Inc., Los Angeles, CA
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233. Cost-effectiveness of a collaborative care model with pharmacist-provided medication review for hemodialysis patients. Paik Shia Lim, PharmD, BCPS[1], Giat Yeng Khee, PharmD, BCPS[1], Wan Chee Ong, PharmD, CGP, BCPS[1], Mee Yin Melissa Chow, Bachelor of Pharmacy, BCPS[1], Hui Lin Lina Choong, MBBS, M Med Int Med, FAMS[2], Hua Heng McVin Cheen, BSc PharmHons, CGP, BCACP[1]; (1) Department of Pharmacy, Singapore General Hospital, Singapore, Singapore (2) Department of Renal Medicine, Singapore General Hospital, Singapore, Singapore
INTRODUCTION: Hemodialysis patients often take multiple medications and are at high risk for drug-related problems. A multidisciplinary collaborative care (CC) model with pharmacist-provided medication review can reduce hospitalization and mortality in these patients by improving medication management. However, little is known about its cost-effectiveness.
RESEARCH QUESTION OR HYPOTHESIS: The CC model is a cost-effective strategy to manage hemodialysis patients compared with usual care (UC), at a willingness-to-pay threshold of US$50,000/quality-adjusted life year (QALY).
STUDY DESIGN: Modeled cost-effectiveness analysis.
METHODS: A Markov model with three-month cycle length and ten-year time horizon was developed. The target population was a hypothetical cohort of 60-year-old hemodialysis patients. Costs and QALYs were compared between CC and UC from the patient and provider perspectives, reported as incremental cost-effectiveness ratio (ICER). The model was populated using clinical data from published studies, costs from Singapore's government and hospital databases and utilities from a study that surveyed Singaporean hemodialysis patients. Sensitivity analyses were performed to account for uncertainties. Costs and QALYs were discounted at 3% per annum.
RESULTS: In base case analyses, CC and UC resulted in a gain of 2.16 and 2.02 QALYs respectively. From the patient and provider perspectives, CC increased costs by US$3,280 and US$6,760 respectively. The corresponding ICERs were US$23,630/QALY and US$48,710/QALY. One-way sensitivity analysis showed that CC was not cost-effective compared with UC from the provider perspective if (i) utility increased by less than 0.013; (ii) prescription cost reduced by less than 8.3%; (iii) risks of cardiovascular disease, stroke and mortality reduced by less than 0.7%, 1.0% and 7.4% respectively. Probabilistic sensitivity analyses demonstrated that CC was 99% and 56% cost-effective from the patient and provider perspectives respectively.
CONCLUSION: The findings suggest that the CC model is cost-effective in the management of hemodialysis patients. Utility benefits, reductions in prescription cost, risk of stroke, cardiovascular disease and mortality are the key drivers influencing cost-effectiveness.

234E. Evaluation of health care costs and utilization patterns for patients with gout in Taiwan. Yi-yun Lee, PharmD[1], Yu Ko, PhD[2]; (1) Department of Pharmacy, Wan Fang Hospital, Taipei Medical

University, Taipei, Taiwan (2) School of Pharmacy, College of Pharmacy, Taipei Medical University Presented at ISPOR 7th Asia-Pacific Conference, Singapore, September 3–6, 2016.

235. Personalized antiplatelet therapy by CYP2C19 loss-of-function and gain-of-function alleles – a decision analysis. Minghuan Jiang, BSc, MPhil, Joyce You, PharmD, BCPS; School of Pharmacy, The Chinese University of Hong Kong, Hong Kong

INTRODUCTION: Clopidogrel is an antiplatelet agent ($P2Y_{12}$ inhibitor) activated by P450 enzyme system (CYP). Carriers of *CYP2C19* loss-of-function (LOF) alleles are associated with high risk of major adverse cardiovascular events, whereas *CYP2C19* gain-of-function (GOF) allele is an independent factor of bleeding.

RESEARCH QUESTION OR HYPOTHESIS: We aimed to evaluate potential cost-effectiveness of genotype-directed therapy using both *CYP2C19* LOF and GOF alleles to guide antiplatelet agent selection for patients with acute coronary syndrome (ACS) after percutaneous coronary intervention (PCI).

STUDY DESIGN: Life-long decision-analytic modelling from perspective of public healthcare providers.

METHODS: A life-long Markov model was used to simulate outcomes of two antiplatelet strategies in a hypothetical cohort of ACS patients aged 60 years undergoing PCI: Universal alternative $P2Y_{12}$ inhibitor (prasugrel 10 mg daily or ticagrelor 90 mg twice daily), and LOF/GOF-guided therapy. In LOF/GOF-guided arm, LOF allele carriers received alternative $P2Y_{12}$inhibitor, non-carriers of LOF allele received clopidogrel 75 mg daily, and GOF allele carriers received clopidogrel with famotidine 20 mg twice daily. Model inputs were derived from the literature. Outcome measurements were direct medical costs and quality-adjusted life-years (QALYs), both discounted to 2016 at annual rate of 3%. Robustness of model was examined by sensitivity analysis.

RESULTS: In base-case analysis, LOF/GOF-guided arm had lower life-long cost (USD75,159) and higher QALYs (7.5594 QALYs) than universal new antiplatelet agent (USD78,296 and 7.4868 QALYs). Base-case results were robust to variation of all model inputs. In 10,000 Monte Carlo simulations, LOF/GOF-guided therapy was less costly by a mean cost-saving of USD2,943 (95%CI: USD2,906–2,980; $p<0.001$) with higher QALYs gained by 0.062 QALYs (95%CI: 0.061–0.0623; $p<0.001$). Using 50,000 USD/QALY as the threshold of willingness-to-pay, LOF/GOF-guided therapy was the preferred option in 98.11% of 10,000 simulations.

CONCLUSION: Using *CYP2C19* GOF and LOF alleles to guide antiplatelet therapy appears to be cost-effective when compared to universal use of alternative $P2Y_{12}$ inhibitors for ACS patients undergoing PCI.

236. Cost-effectiveness of point-of-care testing for influenza at community pharmacy setting in Hong Kong. Lok-pui Tam, BPharm, Joyce You, PharmD, BCPS; School of Pharmacy, The Chinese University of Hong Kong, Hong Kong

INTRODUCTION: Every year public healthcare provider of Hong Kong is burdened by the surge of influenza-like illness (ILI) cases during peak influenza season. Complications of influenza are highly associated with hospitalization and mortality. Early antiviral therapy with neuraminidase inhibitors (within 48 h of symptom onset) is associated with improved clinical outcomes. Detection of influenza at community setting could potentially enhance early prescription of antiviral therapy.

RESEARCH QUESTION OR HYPOTHESIS: To evaluate potential cost-effectiveness of point-of-care (POC) testing for influenza at community pharmacy setting in Hong Kong.

STUDY DESIGN: Decision-analytic modelling from perspective of public healthcare providers.

METHODS: A decision-analytic model was designed to simulate the outcomes of POC testing for influenza versus no testing (control group) in patients with ILI presented to community pharmacy. Influenza-associated outcomes included in the model were direct medical cost, mortality rate and quality-adjusted life years (QALY) loss. Model inputs were derived from the literature. Sensitivity analyses were conducted to evaluate the robustness of base-case results.

RESULTS: In base-case analysis, the POC testing group showed lower mortality rate per 1,000 individuals presented (0.01 vs. 0.02), less QALY loss (0.340 vs. 0.447) and higher direct cost (USD150.1 vs. USD80.9) (USD1 = HKD7.8) per individual presented when comparing to control group. Incremental cost per QALY saved by POC testing was 647 USD/QALY. One-way sensitivity analysis found base-case results to be robust throughout variation of model inputs. Using Hong Kong gross domestic product per capita (USD40,594 in 2015) as threshold of willingness-to-pay per QALY, POC testing was the preferred option versus control group in 100% of 10,000 Monte Carlo simulations in probabilistic sensitivity analysis.

CONCLUSION: Detection of influenza using POC testing appears to be cost-effective in reducing mortality and saving QALYs at community pharmacy setting of Hong Kong.

237. Cost-effectiveness of active surveillance with decolonization of carbapenem-resistant Enterobacteriaceae in intensive care unit setting of Hong Kong. Hong-kiu Li, BPharm, Joyce You, PharmD, BCPS; School of Pharmacy, The Chinese University of Hong Kong, Hong Kong

INTRODUCTION: In Hong Kong, despite the disease burden of carbapenem-resistant Enterobacteriaceae (CRE) infection remains low, the prevalence of CRE has been increasing from 0.05% in 2009 to 0.6% in 2011. Therapeutic options for CRE infections are limited with low success rate and high mortality rate. Clinical studies have shown that eradication of CRE from carriers by oral non-absorbable antibiotics was associated with reduced risk of interpatient transmission and CRE infection.

RESEARCH QUESTION OR HYPOTHESIS: We aimed to evaluate potential cost-effectiveness of active surveillance of CRE with decolonization in adult intensive care unit (ICU) in Hong Kong.

STUDY DESIGN: Decision-analytic modelling from perspective of public healthcare providers.

METHODS: A Markov model was designed to simulate the outcomes of active surveillance with decolonization versus no surveillance (control group) in patients admitted to adult ICU. Model outcomes included CRE-associated direct medical costs and quality-adjusted life year (QALY) loss. Model inputs were derived from the literature. Sensitivity analyses were conducted to evaluate the robustness of base-case results. Scenario analysis was conducted on three options of CRE decolonization (gentamicin alone, colistin alone, and gentamicin plus colistin).

RESULTS: In base-case analysis, decolonization with gentamicin alone saved QALYs and cost when compared with the control group. Decolonization using colistin alone and in combination with gentamicin saved QALYs at incremental costs per QALY saved of USD445 and USD452, respectively (USD1 = HKD7.8). Using the Hong Kong gross domestic product per capita (USD40,594 in 2015) as threshold of willingness-to-pay per QALY, all the active surveillance with decolonization scenarios were preferred options. One-way sensitivity analyses found base-case results to be robust throughout variation of model inputs. In probabilistic sensitivity analysis, the decolonization regimens were the preferred options versus control group in over 99% of 10,000 Monte Carlo simulations.

CONCLUSION: Active surveillance plus decolonization of CRE upon admission to adult ICU appears to be a cost-effective infection control strategy in Hong Kong.

239. The association of benzodiazepine use with smoking cessation among hospitalized smokers in a clinical trial. Austin Wilson, MS, BSPS, PharmD Candidate 2017, Edward Ellerbeck, MD, MPH,

Niaman Nazir, MD, MPH, Babalola Faseru, MD, MPH, Taneisha Scheuermann, PhD, Kimber Richter, PhD, MPH; The University of Kansas Medical Center, Kansas City, KS

INTRODUCTION: Benzodiazepines are an increasingly prescribed class of addictive anxiolytic medications that target GABA-A receptors in the brain. Tobacco smoking, the leading cause of preventable death in the United States, also has indirect effects on GABA receptors. Benzodiazepines could help or hinder smokers' ability to quit. There is a paucity of data examining the association of benzodiazepine use on smoking cessation rates.

RESEARCH QUESTION OR HYPOTHESIS: What association does benzodiazepine use have with 6-month biochemically verified smoking cessation rates among participants in a hospital-based cessation trial?

STUDY DESIGN: The Enhancing Quitline Utilization among In-Patients (EQUIP) study is a two-arm randomized clinical trial designed to examine the impact of warm handoff on enrollment in quitline services and biochemically verified cessation at 6-months. A secondary data analysis of the study was conducted to examine the association of benzodiazepine prescription presence at hospital discharge with biochemically verified cessation at 6-months.

METHODS: Participant data was abstracted through a baseline survey and electronic medical records. The primary endpoint was 6-month biochemically verified cessation rates among participants. Variables identified as a priori predictors of cessation, baseline differences between groups, or within-sample predictors of cessation were used as controls.

RESULTS: A logistic regression modeling the odds of a participant quitting showed no statistical association with benzodiazepine prescription presence (Odds Ratio, OR, 0.93, 95% confidence interval 0.68, 1.28). Controlling for potential covariates maintained a negatively associated, non-significant OR of 0.88 (95% confidence interval 0.63, 1.22).

CONCLUSION: In this sample of patients, the presence of a benzodiazepine prescription at discharge did not have a significant association with 6-month biochemically verified quit rates. The odds of being quit based on the presence of a benzodiazepine prescription at discharge trended negatively across all unadjusted and adjusted analyses.

240. Adherence and persistence with cyclosporine ophthalmic emulsion for treatment of dry eye disease in a large US healthcare system. Debra A. Schaumberg, ScD, OD, MPH[1], John Bradley, OD, PhD[2], Annie Guérin, MS[3], Irina Pivneva, PhD[3], Amber Evans, MPH[4], Ipek Özer Stillman, MS[5], Reza Dana, MD, MPH, MSc[6]; (1) Ophthalmics, Shire, Lexington, MA (2) Naval Medical Research Unit Dayton, OH (3) Analysis Group, Inc., Montreal, QC, Canada (4) Health ResearchTx LLC, Trevose, PA (5) Global HEOR & Epidemiology, Shire, Lexington, MA (6) Massachusetts Eye and Ear, Boston, MA

INTRODUCTION: Dry eye disease (DED) is a common, usually chronic, ocular surface disease characterized by symptoms of discomfort, irritation and visual disturbance. Cyclosporine ophthalmic emulsion (Restasis) is a prescription treatment to increase tear production in patients with DED.

RESEARCH QUESTION OR HYPOTHESIS: What are real-world adherence and persistence rates for cyclosporine ophthalmic emulsion?

STUDY DESIGN: This study analyzed prescription fill data from the Department of Defense (DOD) cradle-to-grave healthcare database, which covers 9.7 million individuals.

METHODS: Adherence was based on proportion of days covered (PDC), calculated as the number of filled days supplied divided by the number of days during the study period (i.e., 365 days). The observation period was censored at the end of continuous enrollment. Patients were considered adherent if PDC $\geq$ 0.8. Persistence was plotted on a Kaplan-Meier curve from initiation to first discontinuation, which was defined as a gap of $\geq$ 90 consecutive days after the last day of supply.

RESULTS: Overall, 127,722 individuals had prescriptions for cyclosporine ophthalmic emulsion and met all other inclusion criteria. Among these individuals, mean (SD) adherence level was low (PDC= 0.4 $\pm$ 0.2 [median 0.3]). Just 8.8% of individuals were adherent (PDC $\geq$ 0.8) over 1 year. At 1 month, 77.3% (95% CI, 77.0–77.5%) of patients persisted with cyclosporine. At 3 months and 6 months, 56.6% (56.3–56.9%) and 37.1% (36.9–37.4%) persisted, respectively. At 12 and 18 months, 19.0% (18.8–19.3%) and 11.7% (11.5–11.9%) of patients, respectively, persisted with cyclosporine. Median time on treatment was 116 days (< 4 months).

CONCLUSION: These real world data suggest that use of cyclosporine ophthalmic emulsion is subject to substantial patient discontinuation as early as 1 month after initiation, that nearly two-thirds discontinue within 6 months, and nearly 90% by 18 months.

241. Cost avoidance based on pharmacist interventions documented in a medical Intensive Care Unit over a three month period. Heather Flowers, BS[1], Jacob Painter, PharmD, PhD, MBA[2], Drayton Hammond, PharmD, MBA, BCPS, BCCCP[3]; (1) University of Arkansas for Medical Sciences College of Pharmacy, Little Rock, AR (2) Division of Pharmaceutical Evaluation and Policy, University of Arkansas for Medical Sciences, Little Rock, AR (3) Department of Pharmacy Practice, University of Arkansas for Medical Sciences, Little Rock, AR

INTRODUCTION: The mismatch between increasing demands for and decreasing resources to provide quality healthcare necessitates healthcare professionals provide cost-effective care. Clinical pharmacist-generated cost avoidance, which has been described in the emergency department but not the medical intensive care unit (MICU), could help resolve this mismatch.

RESEARCH QUESTION OR HYPOTHESIS: What is the clinical pharmacist-generated cost avoidance in the MICU?

STUDY DESIGN: A single-center, IRB-approved, retrospective, observational cohort study was conducted.

METHODS: During a three-month period, all accepted recommendations from a clinical pharmacist who rounds in the MICU were sorted into one of fifteen specific categories and further classified into one of four general categories associated with cost avoidance. The primary end points were total and average rate of cost avoidance. Total and average rate of cost avoidance were calculated using previously published average cost avoidance per intervention and average probability of harm prevented. Average interventions and cost avoidance per hour were calculated for weekday and post-call status, and differences were evaluated using chi-square goodness of fit test linear regression, respectively. Analyses were performed using STATA 14.0. An alpha < 0.05 was significant.

RESULTS: Over three months, 2,780 clinical pharmacist-recommended interventions were implemented, averaging 45.6 interventions per day and 11.4 interventions per hour, respectively. The most frequent specific interventions were dosage adjustment (n=972), order clarification (n=476), and discontinue medication therapy (n=409). These interventions resulted in a total cost avoidance of $1,621,946, averaging $16,589.29 per day and $6,647 per hour, respectively. On Mondays, a significantly greater average number of interventions per hour (14.0, p=0.001) and average cost avoidance per hour ($8,222, p<0.001) occurred. On post-call days, a significantly greater average number of interventions per hour (14.4 vs. 8.7, p<0.001) and average cost avoidance per hour ($8,467.01 vs. $4,998, p<0.001) occurred.

CONCLUSION: The clinical pharmacist-generated cost avoidance in the MICU over three months is $1,621,946. Employing a clinical pharmacist that provides recommendations as part of an interdisciplinary MICU team reduces healthcare costs through cost avoidance.

Pharmacoepidemiology

242. Effect of medication adherence on health outcomes in patients with heart failure in a health information exchange. Michael Murray, PharmD, MPH[1], Gwen Seamon, BA[2], George Eckert,

MA[3], Katie Lane, MS[3], Wanzhu Tu, PhD[4]; (1) Purdue University College of Pharmacy, Purdue University and Regenstrief Institute, Indianapolis, IN (2) College of Pharmacy, Purdue University, West Lafayette, IN (3) Department of Biostatistics, Indiana University, Indianapolis, IN (4) Department of Biostatistics, Indiana University and Regenstrief Institute, Indianapolis, IN

INTRODUCTION: Treatment adherence is an important factor in the management of patients with heart failure (HF). Previous studies have established the beneficial effects of optimal medication adherence but often have issues of generalizability or lack of relevant clinical variables.

RESEARCH QUESTION OR HYPOTHESIS: What is the effect of medication adherence on outcomes and utilization for adult patients (≥ 18 years) with HF using an integrated health information exchange?

STUDY DESIGN: We conducted an observational study of patients with HF using the Indiana Network for Patient Care.

METHODS: We determined the effect on relevant outcomes of a 10% change in the proportion days covered (PDC) for cardiovascular medications prescribed to patients with HF. Outcomes included left ventricular ejection fraction (LVEF) < 35%, brain natriuretic peptide (BNP) > 500 pg/mL, emergency department (ED) visits, hospitalizations and total inpatient days, and death. We used mixed effect log-linear regression models to analyze repeatedly measured event counts. We adjusted for the effects of age, race, sex, number of medications, and comorbidities.

RESULTS: The 58,633 patients were 67.8 ± 16 (SD) years, 50% female, and 62% white. New York Heart Association class distribution was I: 25%, II: 36%, III: 30%, and IV: 8%. Patients had a mean of 3.8 ED visits, 7.8 hospitalizations with a mean stay of 5 days. Each 10% increase in PDC resulted in an adjusted odds ratio for ED, hospitalization, and days stay of 0.89, 0.94, and 0.98, respectively. The adjusted odds of death was 0.95 indicating that there was a 5% reduction in death for every 10% increase in PDC. Better medication adherence was associated with a reduced risk of low LVEF and high BNP concentrations ($p<0.001$).

CONCLUSION: Adherence to cardiovascular medications resulted in more favorable health outcomes, reduced health care utilization, and a lower risk of death for HF patients within Indiana health systems.

Pharmacogenomics/Pharmacogenetics

243. HLA-KIR interactions in heparin-induced thrombocytopenia. Jason Karnes, PharmD, PhD[1], Elizabeth Phillips, MD[2], Christian Shaffer, BS[2], Joshua Denny, MD[2], Jonathan Mosley, MD, PhD[2], Dan Roden, MD[2]; (1) Department of Pharmacy Practice and Science, University of Arizona, Tucson, AZ (2) Department of Medicine, Vanderbilt University, Nashville, TN

INTRODUCTION: Combinations of human leukocyte antigen (HLA) and killer cell immunoglobulin-like receptors (KIR) have been associated multiple autoimmune diseases and infections. Heparin-induced thrombocytopenia (HIT) is an unpredictable, life-threatening, immune-mediated reaction to heparin treatment. Despite the potential role of KIR-HLA interactions in the pathogenesis of HIT, the association of KIR ligands with HIT has not been evaluated.

RESEARCH QUESTION OR HYPOTHESIS: We set out to determine the association of HLA alleles, KIR ligands, and their interaction with HIT.

STUDY DESIGN: We identified HIT cases and heparin-exposed controls in BioVU, an electronic medical record coupled to a DNA biobank. Cases were defined based on HIT antibody results, HIT risk scoring (4Ts score), and serotonin release assay results. Controls were matched to cases based on age, gender, and type of heparin exposure (unfractionated vs. low molecular weight heparin).

METHODS: We performed high resolution HLA sequencing and imputed KIR types from Illumina OMNI-Quad data. We determined C1/C2 and Bw4/Bw6 groupings based on *HLA-B* and *HLA-C* alleles, respectively. We tested association of HLA alleles, KIR types, and HLA-KIR interactions using conditional logistic regressions. Analysis was restricted to variation with frequency above 0.01.

RESULTS: We identified 77 HIT cases and 345 matched controls. No statistical differences were observed between cases and controls for baseline characteristics. The *HLA-DRB3*01:01* allele was significantly associated with HIT (odds ratio 3.55, $p=1.09 \times 10^{-4}$). The KIR ligand group C1 was associated with HIT (odds ratio 1.71, p=0.02). We also observed a significant interaction between the KIR ligand group C1 and KIR2DS3 (p=0.02). No KIR ligand groups nor KIR types showed a significant association with HIT.

CONCLUSION: We implicate the *HLA-DRB3*01:01* allele, the KIR ligand group C1 and its interaction with KIR2DS3 as risk factors for HIT. Validation and further study of these associations are warranted to determine their role in HIT pathogenesis and preventive genotyping to reduce the risk of HIT.

244. Identifying novel genetic predictors associated with heart rate response to beta-blockers. Mohamed Shahin, PhD[1], Daniela Conrado, PhD[2], Daniel Gonzalez, PharmD, PhD[3], Yan Gong, PhD[1], Maximilian Lobmeyer, PhD[1], Amber Beitelshees, PharmD, MPH[4], Rhonda Cooper-DeHoff, PharmD, MS[1], Eric Boerwinkle, PhD[5], Stephen Turner, MD[6], Arlene Chapman, MD[7], John Gums, PharmD[1], Julie Johnson, PharmD, BCPS, FCCP, FAHA[1]; (1) Department of Pharmacotherapy and Translational Research and Center for Pharmacogenomics, College of Pharmacy, University of Florida, Gainesville, FL (2) Department of Pharmaceutics, College of Pharmacy, University of Florida, Gainesville, FL (3) Division of Pharmacotherapy and Experimental Therapeutics, UNC Eshelman School of Pharmacy, University of North Carolina, Chapel Hill, NC (4) Department of Medicine, University of Maryland, Baltimore, MD (5) Human Genetics Center and Institute of Molecular Medicine, University of Texas Health Science Center, Houston, TX (6) College of Medicine, Mayo Clinic, Rochester, MN (7) Department of Medicine, The University of Chicago, Chicago, IL

INTRODUCTION: Beta-blockers are a mainstay treatment for cardiovascular disease and among the most widely prescribed drug classes worldwide. For many indications, the negative chronotropic effect is important to their efficacy.

RESEARCH QUESTION OR HYPOTHESIS: We sought to conduct a genome-wide association study (GWAS) to identify novel single nucleotide polymorphisms (SNPs) associated with heart rate (HR) response to beta-blockers.

STUDY DESIGN: This study included 1,061 participants enrolled in the Pharmacogenomic Evaluation of Antihypertensive Responses studies (PEAR and PEAR-2).

METHODS: We performed a GWAS of HR response to atenolol in Caucasians (n=428) and African Americans (n=265) enrolled in the PEAR study. All analyses were adjusted for age, gender, baseline HR and population substructure. SNPs associated with HR response at a $p<1 \times 10^{-5}$were tested for replication of the association in independent Caucasians (n=200) and African Americans (n=168) treated with metoprolol in the PEAR-2 study. A meta-analysis of the replicated signals was performed using METAL, assuming fixed effects and inverse variance weighting.

RESULTS: In Caucasians, the GWAS revealed eight independent SNPs that were associated with changes in HR at a $p<1 \times 10^{-5}$, however, none reached significance in the replication analysis. In African Americans, the GWAS identified twenty independent SNPs associated with changes in HR response at $p<1 \times 10^{-5}$. We found the SNP rs2364349 in Sorting Nexin 9 (*SNX9*) gene to be significantly associated with HR changes in African Americans, where A/A individuals had a poor HR response to beta-blockers (ˆ†HR = −0.6 beats per minute (bpm)) compared to A/G (ˆ†HR=-10 bpm) and G/G (ˆ†HR=-12.6 bpm) individuals ($p=9 \times 10^{-6}$). Furthermore, this SNP was replicated in independent African Americans treated with metoprolol ($p=4 \times 10^{-4}$). The combined two study meta-analysis p-value for this SNP reached genome-wide significance ($p=1 \times 10^{-8}$).

CONCLUSION: This study uncovers a novel genetic signal, rs2364349 in *SNX9*, associated with HR changes in African Americans treated with beta-blockers. These results suggest that *SNX9* might be an important determinant of HR response to beta-blockers.

245. ABCB1 gene variation effects on the early-phase oral absorption of losartan. Choong-Min Lee, BS, Ji-Yeong Byeon, PhDCandidate, Young-Hoon Kim, PhD Candidate, Se-Hyung Kim, PhD Candidate, Seok-Yong Lee, PhD; School of Pharmacy, Sungkyunkwan University, Suwon, Korea
INTRODUCTION: Losartan is an angiotensin receptor blocker for the treatment of high blood pressure. It is known to be a substrate for the drug-efflux transporter MDR1 also called P-glcoprotein (P-gp). MDR1 is encoded by *ABCB1* gene and at least 29 single nucleotide polymorphisms (SNPs) have been found in the *ABCB1* gene. The polymorphisms *ABCB1 c.2677G > T* and *c.3435C > T*have been extensively studied since they are associated with reduced expression or function of MDR1.
RESEARCH QUESTION OR HYPOTHESIS: The aim of this study was to investigate whether *ABCB1*haplotypes affects the pharmacokinetics of losartan.
STUDY DESIGN: 38 healthy Korean volunteers with different *ABCB1* haplotypes (*c.2677G > T* and *c.3435C > T*; 13, 12, and 13 carriers of GG/CC, GT/CT and TT/TT haplotypes) received a single oral dose of losartan potassium and the samples of plasma and urine were collected up to 10 respectively 8 h after drug intake.
METHODS: The concentrations of losartan and its active metabolite E-3174 were determined by using high performance liquid chromatography (HPLC)-fluorescence detection.
RESULTS: Among the three haplotype groups, there were significant differences in C_{max} of losartan and losartan plus E-3174 (Lo+E) (both $p<0.01$) and also t_{max} of losartan and its metabolite were signicifantly different (both $p<0.01$). Urinary excretion of Lo+E until 8 h after losartan administration in TT/TT group was significantly higher than in GG/CC group ($p<0.01$). These results imply that *ABCB1* gene variants may affect the early-phase absorption of losartan, but not the total absorption of losartan.
CONCLUSION: The disposition of losartan and E-3174 appear to be dependent on the *ABCB1* genetic variants, which is consistent with the *in vitro* data. This is the first report on the functional significance of the *ABCB1* haplotype in pharmacokinetics of losartan *in vivo*.

246. Assessment of patient perceptions of genomic testing to inform pharmacogenomic implementation. Yee Ming Lee, PharmD[1], Ryan McKillip, BS[2], Catherine Klammer, BS[1], Brittany Borden, MA[1], Mark Ratain, MD[3], Peter O'Donnell, MD[3]; (1) Center for Personalized Therapeutics, The University of Chicago, Chicago, IL (2) The University of Chicago Pritzker School of Medicine, Chicago, IL (3) Department of Medicine, Center for Personalized Therapeutics, Commitee on Clinical Pharmacology and Pharmacogenomics, The University of Chicago Medicine, Chicago, IL
INTRODUCTION: Pharmacogenomics (PGx) seeks to inform prescribing through improved drug efficacy and reduced adverse responses. Previous studies described views toward PGx using hypothetical scenarios, but views of patients participating in PGx testing programs are largely unknown. This study sought to explore the attitudes and perceptions of patients being cared for in an institutional PGx implementation project, in order to understand patient viewpoints as stakeholders in PGx implementation.
RESEARCH QUESTION OR HYPOTHESIS: We hypothesized that patients' attitudes and perceptions of PGx will differ based on whether they had been offered PGx testing.
STUDY DESIGN: Two focus group sessions.
METHODS: Participants were recruited from an outpatient institutional PGx implementation project cohort; half had undergone previous PGx genotyping (PGx-group), while the other half had not been offered genotyping (traditional-care group). Groups convened separately for 120-min sessions with views elicited using a semi-structured interview. Sessions were audio-recorded, transcribed and analyzed for themes by two independent investigators.
RESULTS: Nine PGx-group and 13 traditional-care patients were included with no significant demographic differences between groups (50% male, 55% Caucasian, mean = 59.5 years). Both groups agreed PGx could potentially inform clinical decisions, with traditional-care patients asking why PGx testing was not routinely done. In contrast to PGx-group, traditional-care patients confused PGx with disease-risk testing. Both groups expressed concerns if PGx information would result in loss of privacy, insurance, or employment. While both groups agreed that PGx results should be securely stored, they differed in opinions on who could access them. The strongest difference observed between the PGx and traditional-care groups was a significantly higher degree of skepticism on the part of the traditional-care patients about how their PGx information might be used.
CONCLUSION: Patients who had experienced PGx testing and PGx-guided care were more receptive to adopt PGx. As important stakeholders in PGx implementation, addressing patient concerns could facilitate the successful dissemination of PGx in clinical practice.

247. Identification of clinically actionable drug-drug-gene interactions that impact pharmacogenomic prescribing. Yee Ming Lee, PharmD[1], Emanuele Agolini, PhD[2], Keith Danahey, MS[3], Patrick Yukman, BA[3], Brittany Borden, MA[1], Edward Leung, PhD[4], Kiang-Teck Yeo, PhD[4], Peter O'Donnell, MD[5], Mark Ratain, MD[5]; (1) Center for Personalized Therapeutics, The University of Chicago, Chicago, IL (2) Department of Pathology, Center for Personalized Therapeutics, The University of Chicago, Chicago, IL (3) Center for Personalized Therapeutics, Center for Research Informatics, The University of Chicago, Chicago, IL (4) Department of Pathology, The University of Chicago Medicine, Chicago, IL (5) Department of Medicine, Center for Personalized Therapeutics, Commitee on Clinical Pharmacology and Pharmacogenomics, The University of Chicago Medicine, Chicago, IL
INTRODUCTION: Drug-drug interactions are a major contributor of adverse drug reactions (ADRs). Pharmacogenomics (PGx) provide drug-gene information to identify patients carrying variant phenotypes who are at risk of ADRs. Certain co-medications cause drug-drug-gene-interactions (DDGI) that convert patients of normal metabolic phenotypes to variant phenotypes, thereby increasing the cohort at risk of unfavorable drug response. As cytochrome P450 (CYP) 2D6 is responsible for metabolizing 25% of the commonly prescribed medications, certain *CYP2D6* DDGI may lead to clinically significant ADRs.
RESEARCH QUESTION OR HYPOTHESIS: We hypothesize that adding DDGI information to PGx clinical decision supports may impact *CYP2D6* PGx results delivered to prescribers.
STUDY DESIGN: Retrospective analysis of *CYP2D6* genotyped patients enrolled in our institutional PGx implementation study.
METHODS: Clinical Pharmacogenetics Implementation Consortium (CPIC) and Dutch Pharmacogenetics Working Group (DPWG) guidelines were reviewed to identify actionable *CYP2D6* PGx drugs with dose recommendations. Three strong *CYP2D6* inhibitors (bupropion, fluoxetine and paroxetine) were selected and applied to our genotyped cohort to determine the prevalence of *CYP2D6* DDGI.
RESULTS: A total of 855 patients were analyzed (mean 61.6 years, 44% male, 61.4% Caucasian) with an average of 6.2 new medications prescribed between 2012 and 2015. The baseline *CYP2D6* phenotype distribution was 84.8% extensive-metabolizers (EM), 7.1% intermediate-metabolizers (IM), 3.3% poor-metabolizers (PM) and 4.8% ultra-rapid-metabolizers (UM). Out of 4834 new prescriptions given, 4.2% had clinically actionable PGx *CYP2D6* drugs with the most prominent being metoprolol, tramadol and codeine. Among 48 patients prescribed with strong *CYP2D6* inhibitors, 81.3% were *CYP2D6*-EM phenotypes who

would convert to variant phenotypes with this DDGI. This would lead to discordance in these patients' *CYP2D6* phenotype results delivered to prescribers if only drug-gene information were considered.
CONCLUSION: DDGI from prescribing strong *CYP2D6* inhibitors impacted 81.3% of *CYP2D6*-EM patients. We plan to incorporate DDGI information and prospectively examine its impact on drug prescribing and safety in our institutional PGx study.

249. R-warfarin clearance and its effect on warfarin dose requirements in African Americans. Issam Hamadeh, PharmD[1], Harumi Takahashi, PhD[2], Larisa H. Cavallari, PharmD, BCPS, FCCP[1]; (1) Department of Pharmacotherapy and Translational Research, Center for Pharmacogenomics, College of Pharmacy, University of Florida, Gainesville, FL (2) Department of Biopharmaceutics, Department of Biopharmaceutics, Pharmaceutical University, Kiyose, Tokyo
INTRODUCTION: Warfarin is a racemic mixture of *R*- and *S*-enantiomers. Factors affecting *S*-warfarin clearance explain a significant portion of the inter-patient variability in warfarin dose requirements.
RESEARCH QUESTION OR HYPOTHESIS: Determine the impact of *R*-warfarin clearance on dose requirements, specifically in African Americans in whom less is known about factors affecting warfarin dose.
STUDY DESIGN: Prospective pharmacokinetic study of African Americans on a warfarin dose that produced a therapeutic INR on two consecutive clinic visits.
METHODS: Blood samples were collected 12–16 h after the last warfarin dose. Plasma concentrations of warfarin enantiomers were measured by a chiral HPLC method to estimate oral clearance of each enantiomer. The Pearson test was used to examine the correlation between *R*- and *S*-warfarin clearances. Differences in weekly warfarin doses were compared between patients with an *R*-warfarin clearance above or below the median *R*-warfarin clearance for the population using the Student unpaired t-test. To evaluate individual effect of *R*-warfarin clearance on weekly dose, multivariate regression analysis was performed.
RESULTS: A total of 57 African Americans were included; most were on warfarin for atrial fibrillation, and the median weekly warfarin dose was 45 mg (IQR: 30–50 mg). Median *R*-warfarin clearance was 0.92 mL/min/m^2 (0.75–1.10 mL/min/m^2), and *R*- and *S*-warfarin clearances were moderately correlated (r = 0.44, p=0.0007). The weekly warfarin dose was significantly higher among patients with an *R*-warfarin clearance of at least 0.92 mL/min/m^2 versus < 0.92 mL/min/m2 (50.8 vs. 40.4 mg/day, p=0.02). However, the effect of *R*-warfarin clearance on warfarin dose requirements was no longer significant on multivariate analysis including *S*-warfarin clearance (Table).

Variable	Beta	Standard error	p value
R-warfarin clearance (mL/min/m^2)	−0.011	0.046	0.810
Age (years)	−0.006	0.001	0.002
VKORC1 genotype	−0.2	0.05	< 0.001
S-warfarin clearance (mL/min/m^2)	0.07	0.03	0.017

CONCLUSION: Clearance of R-warfarin has no independent effect on warfarin dose requirements in African Americans.

250. Implications of polymorphisms in BCKDK and GATA-4 genetic regions on stable warfarin dose in African Americans. Salma Bargal, BS Pharm, Jennifer Kight, PharmD candidate, Felipe de Oliveira, MS, Mohamed Shahin, PhD, Taimour Langaee, PhD, Yan Gong, PhD, Issam Hamadeh, PharmD, Rhonda Cooper-DeHoff, PharmD, MS, Larisa Cavallari, PharmD; Department of Pharmacotherapy and Translational Research and Center for Pharmacogenomics, College of Pharmacy, University of Florida, Gainesville, FL
INTRODUCTION: Warfarin is a narrow therapeutic index drug, and genotype provides major contributions to the interpatient variability in dose requirements. However, the major genetic contributors to dose variability in Europeans and Asians, namely VKORC1 and CYP2C9, explain less of the variability and less accurately predict dose requirements in African Americans. Additional polymorphisms, which are near or within genes that potentially regulate VKORC1 and CYP2C9 expression and are associated with dose requirements in Europeans and Asians, include rs56314408 near BCKDK and rs2645400 and rs904006 in GATA-4. These polymorphisms have not been examined in African Americans.
RESEARCH QUESTION OR HYPOTHESIS: To determine if rs56314408, rs2645400 and rs904006 polymorphisms contribute to warfarin dose variability in African Americans.
STUDY DESIGN: This study used data from a retrospective cohort of 208 African Americans who achieved stable warfarin dosing, defined as a dose that produced a therapeutic INR for three consecutive clinic visits. Patients were previously genotyped for VKORC1 rs9923231; CYP2C9*2, *3, *5, *6, *8, and *11; and rs12777823.
METHODS: We genotyped patients for rs56314408, rs2645400 and rs904006 using PCR and pyrosequencing. Polymorphisms were tested individually for their association with warfarin dose using univariate linear regression, and the combination of genotype and clinical factors influencing dose were tested via multiple linear regression.
RESULTS: In our population of African Americans, none of the three polymorphisms were significantly associated with warfarin dose requirements on univariate or multiple linear regression analyses. Factors retained in the final regression model with significant associations (p<0.05) with warfarin dose were age, body surface area, history of stroke or transient ischemic attack, and VKORC1 rs9923231, CYP2C9 star variants and rs12777823 genotypes. Together, these factors explained 37% of the warfarin dose variability.
CONCLUSION: The rs56314408, rs2645400 and rs904006 polymorphisms do not contribute to warfarin dose variability in African Americans. These data emphasize that confirming associations identified in other populations is important in African Americans.

Pharmacokinetics/Pharmacodynamics/Drug Metabolism/Drug Delivery

252. Evaluating the appropriateness and clinical outcomes of antibiotics therapeutic drug monitoring service at a tertiary care hospital in Qatar. Ahmed Awaisu, PhD[1], Fatima Al-Sulaiti, MSc[2], Nadir Kheir, PhD[1], Ahmed Elzubair, MSc[3]; (1) Clinical Pharmacy and Practice Section, College of Pharmacy, Qatar University, Doha, Qatar (2) College of Pharmacy, Qatar University, Doha, Qatar (3) Al-Khor Hospital, Hamad Medical Corporation, Al-Khor, Qatar
INTRODUCTION: Appropriate therapeutic drug monitoring (TDM) of antibiotics has long been proven to maximize therapeutic outcomes and minimize toxicity. However, inappropriate TDM practices have been widely reported globally. Studies to evaluate the quality of TDM services are rare in the Middle East.
RESEARCH QUESTION OR HYPOTHESIS: What is the appropriateness and clinical outcomes of a TDM service conducted on antibiotics in Qatar?
STUDY DESIGN: A retrospective chart review of antibiotics TDM cases documented between January 2014 and January 2015 at Al-Khor Hospital.
METHODS: Medical records were reviewed to document serum drug concentrations, blood sampling times, indication for TDM,

clinical pharmacokinetic recommendations, and efficacy/toxicity outcomes. A priori defined evidence-based criteria were applied to evaluate appropriateness and clinical outcomes.
RESULTS: A total of 104 antibiotic samples were evaluated with the majority for gentamicin (n=58) followed by vancomycin (n=46). The indications for TDM requests were appropriate in 94.2% of the cases with the majority to rule out nephrotoxicity (42.3%) and confirm efficacy (23.1%) or both (26%). Most of the blood samples (76.9%) were taken at steady-state with no significant differences between gentamicin and vancomycin samples (p-value>0.05). Nevertheless, the majority of vancomycin samples compared to gentamicin samples were drawn at inappropriate times relative to the last dose (60.9% vs. 31%; p-value<0.05). Although 84.8% of vancomycin and 15.5% of gentamicin serum levels were out of the therapeutic window, continuing the dosing regimen without change was the most frequent recommendation. Inappropriate post-analytical actions were significantly associated with higher rates of therapeutic failures (53.3% vs. 46.7%) and lower rates of therapeutic cures (41.6% vs. 56.9%) compared to appropriate actions (p-value<0.05).
CONCLUSION: Antibiotics TDM at the hospital were at many times judged to be inappropriate in relation to sampling time and post-analytical actions, which might have contributed to significant rates of therapeutic failures.

253. Cardiovascular and stimulant effects of caffeine given orally (energy drink) or inspired (aeroshot). Steven Laizure, PharmD, Kembral Nelson, BA, Feng Chen, PhD, Robert Parker, PharmD; Department of Clinical Pharmacy, University of Tennessee Health Science Center, Memphis, TN
INTRODUCTION: Anecdotal reports suggest that Aeroshot® may produce a more rapid absorption of caffeine compared to an energy drink causing greater maximal stimulant effects of an equivalent caffeine dose.
RESEARCH QUESTION OR HYPOTHESIS: Administration of 100 mg of caffeine by oral inspiration of fine powder (Aeroshot®) produces greater stimulant effects than administration by oral solution (Guru Lite® energy drink).
STUDY DESIGN: Comparison of pharmacokinetic, cardiovascular, and stimulant effects of caffeine administered by two different dosage forms using a repeated-measures design.
METHODS: Human subjects took the two dosage forms (energy drink or Aeroshot®) on different study days. Blood samples were collected, heart rate and blood pressure monitored, and subject self-assessment of caffeine's effects were measured over an 8-h period. Pharmacokinetic, cardiovascular, and stimulant self-assessments were compared by a paired t-test with correction for multiple comparisons using the Benjamini-Hochberg procedure.
RESULTS: Seventeen subjects completed both phases (9 male, 8 female). There were no differences in pharmacokinetic parameters, heart rate, blood pressure, or subject self-assessments between the two treatments (Guru Lite® vs. Aeroshot®). Both treatments produced similar increases in cardiovascular and stimulant effects.
CONCLUSION: Aeroshot caffeine plasma-concentration disposition did not significantly differ from Guru Lite energy drink. Administration of caffeine as an inspired fine powder does not result in a more rapid onset or greater maximal cardiovascular or stimulant effects than administration by an energy drink.

254. Intravenous midazolam safety during short, outpatient procedures in individuals taking concurrent enzyme-inhibiting medications. Carolyn Brackett, BS, PharmD[1], Rohan Modi, MD[2], Alan Chen, MD[2], Loren Brook, MD, MS[2], Samuel Jersak, MD, MS[2], Kyle Porter, PhD[3], Somasheker Krishna, MD, MPH[4], Darwin Connell, MD, MS[4], Marty Meyer, MD, MPH[4]; (1) College of Pharmacy, The Ohio State University, Columbus, OH (2) Department of Internal Medicine, The Ohio State University Wexner Medical Center, Columbus, OH (3) Center for Biostatistics, The Ohio State University, Columbus, OH (4) Department of Gastroenterology, Hepatology and Nutrition, The Ohio State University Wexner Medical Center, Columbus, OH
INTRODUCTION: Historically, concern has been expressed about the potential for excessive sedation and respiratory compromise if midazolam is administered during brief procedures to individuals taking strong or moderate CYP 3A4 inhibitors.
RESEARCH QUESTION OR HYPOTHESIS: The underlying premise is that diminished systemic midazolam clearance could result in excessive pharmacologic effect; however, if midazolam is administered only to effect, this should not occur. There is no reason to suppose the magnitude of midazolam effect will be abnormal in patients concurrently taking moderate or potent CYP3A4 inhibitors.
STUDY DESIGN: An equivalence study was undertaken to detect effect or safety differences between patients taking CYP450 3A4 inhibitors who receive moderate sedation with intravenous midazolam for endoscopic procedures, compared to matched control patients not taking inhibitors.
METHODS: A retrospective study was performed for the period October 2011-December 2014. Data were obtained for outpatient endoscopic procedures from all adult patients (≥ 18 years) who received at least one dose of IV midazolam. Outcome measures included need for pharmacologic reversal of sedation, intra-operative vital signs and level of consciousness, and post-procedure recovery time. Equivalence testing was accomplished by using two one-sided tests equivalence analysis with equivalence margins of 10%.
RESULTS: Among 927 patients taking inhibiting drugs and 927 matched controls, the observed difference in mean post-procedure recovery time was 0.34 min (95% CI: −3.6, 4.3). Equivalence between both groups was also demonstrated for nadir level of consciousness (difference (Î") = 0.2%, p=0.89), nadir SBP (Î" = 0.1, p=0.90), and maximum oxygen requirement (Î" = 1.5%, p=0.22).

	Energy drink		Aeroshot®	
C_{max} (ng/mL)	1993 ± 543		1761 ± 553	
T_{max} (h)	1.8 ± 0.51		1.7 ± 0.74	
AUC (ng/mL × h)	17842 ± 7540		16672 ± 8384	
Half-life (h)	5.0		4.9	
	Max	**Min**	**Max**	**Min**
Heart rate (beats/min)	79 ± 11	71 ± 11*	80 ± 14	70 ± 10*
SBP (mmHg)	131 ± 10	118 ± 12*	127 ± 12	117 ± 15*
DBP (mmHg)	80 ± 7	73 ± 8*	81 ± 9	73 ± 10*
Alert**	87 ± 15	74 ± 26*	87 ± 17	74 ± 23*
Tense**	19 ± 23	7 ± 13*	21 ± 23	9 ± 13*
Jittery**	23 ± 26	6 ± 14*	27 ± 34	15 ± 28*
Relaxed**	93 ± 7	80 ± 25*	93 ± 8	81 ± 16*

*p<0.05, within treatment maximum effect compared to baseline; **visual analog scale.

CONCLUSION: There was no statistical or clinical difference between the CYP3A4 inhibitor group versus control group for intra-operative vital signs, level of consciousness or post-procedure recovery time. Intravenous midazolam can be used safely for brief procedures in patients taking CYP 3A4-inhibiting medications.

255. Co-administration of cyclosporine (CsA) increases plasma brincidofovir (BCV) exposure in healthy volunteers. Mary Wire, PharmD, Margaret Anderson, BS, Thangam Arumugham, PhD, Marion Morrison, MD, John Dunn, PhD, Odin Naderer, PharmD; Chimerix, Durham, NC

INTRODUCTION: BCV is a lipid conjugate nucleotide in development for treatment of dsDNA viral infections. BCV is a substrate of organic anion transporting polypeptide (OATP) 1B1 and OATP1B3. CsA is a potent OATP inhibitor and an immunosuppressant indicated for prevention of organ rejection and graft-versus-host disease in transplant patients, a target population for BCV treatment.

RESEARCH QUESTION OR HYPOTHESIS: This study evaluated the potential for CsA to increase plasma BCV exposure.

STUDY DESIGN: In this open-label, 2-period, crossover study, subjects were randomized to the order in which they received single oral doses of BCV 100 mg and BCV 100 mg + CsA 600 mg, with a 14-day washout between treatments.

METHODS: PK samples were collected over 7 days and assayed by HPLC-MS. Plasma BCV and metabolite cidofovir (CDV) PK parameters were determined by noncompartmental analysis and compared between treatments by analysis of variance. Safety assessments were collected throughout the study.

RESULTS: Twenty-six healthy volunteers, 77% male, 62% White, 26–51y, enrolled; 24 subjects completed. Co-administration of CsA increased plasma BCV Cmax 3.69-fold and AUC (0-ˆž) 4.74-fold. Plasma CDV Cmax and AUC (0–ˆž) increased < 20%.

Statistical analysis results of CsA effect on plasma BCV and CDV PK

Analyte	PK parameter	Ratio of geometric means (90% CI)
BCV	C_{max}	3.69 (3.17, 4.31)
	AUC(0–ˆž)	4.74 (4.11, 5.48)
CDV	C_{max}	1.16 (1.09, 1.24)
	AUC(0–ˆž)	1.15 (1.07, 1.25)

More subjects reported AEs when given BCV+CsA than BCV (84% vs. 28%). AEs more frequently reported for BCV+CsA versus BCV were feeling hot (48% vs. 4%), hot flush (12% vs. 0), nausea (44% vs. 4%), diarrhea (12% vs. 4%), headache (20% vs. 8%), and dizziness (16% vs. 0). All AEs were mild, except one moderate AE of headache.

CONCLUSION: Co-administration of a potent OATP1B1 and OATP1B3 inhibitor, CsA 600 mg, with BCV 100 mg markedly increased plasma BCV exposure in healthy volunteers. The effect of CsA on BCV PK and safety will be assessed in clinical patient studies.

256. Comparison of the pharmacokinetics of droxidopa after dosing in the fed versus fasted state and with 3-times-daily dosing in healthy elderly subjects. Jack J. Chen, PharmD[1], L. Arthur Hewitt, PhD[2]; (1) College of Pharmacy, Marshall B. Ketchum University, Fullerton, CA (2) Lundbeck LLC, Deerfield, IL

INTRODUCTION: Droxidopa, an oral norepinephrine prodrug, is approved by the US Food and Drug Administration for the treatment of symptomatic neurogenic orthostatic hypotension.

RESEARCH QUESTION OR HYPOTHESIS: To evaluate the pharmacokinetic profile of droxidopa in fasted versus fed states and when taken 3 times/day (TID).

STUDY DESIGN: 2-part (with 1-week washout), randomized, crossover study in 24 healthy elderly subjects.

METHODS: The 24-h pharmacokinetic profiles of droxidopa were obtained after administration of: 1) a single 300-mg dose (3 × 100 mg capsules) in fasted and fed (with a high fat/high calorie meal) states, and 2) 300 mg (3 × 100 mg capsules) TID at 4-h intervals. Pharmacokinetic parameters (eg, area under the plasma concentration-time curve [AUC], maximum plasma concentration [C_{max}], time of maximum plasma concentration [t_{max}], half-life [$t_{½}$]) of droxidopa and metabolites were calculated using noncompartmental analysis

RESULTS: Single-dose administration of droxidopa in the fed versus fasted state decreased C_{max}, (2057 ± 611 vs. 3160 ± 1089 ng/mL), AUC (10,927 ± 2801 vs. 13,857 ± 4915 h × ng/mL), and increased median t_{max} 2-fold (4.00 vs. 2.00 h). In fed versus fasted, the geometric mean ratios for C_{max} and AUC were 66% (90% CI, 60.7–71.7) and 80% (90% CI, 72.6–88.1), respectively. No differences in $t_{½}$ were noted between fed versus fasted (2.58 ± 0.39 vs. 2.68 ± 0.28 h). With TID dosing, C_{max} was similar after each dose (range, 2789–3389 ng/mL); between-dose return to baseline was not observed. Following dose 1, the norepinephrine C_{max} was 895 pg/mL; no further increases were observed with subsequent doses. Norepinephrine levels remained above baseline for 12–16 h after dose 1.

CONCLUSION: A high fat/high calorie meal slows absorption of a single dose of droxidopa, with increased t_{max}, decreased C_{max}, and AUC, but similar $t_{½}$. Minimal dose-to-dose plasma concentration changes were observed with TID administration. Pharmacokinetic parameters of droxidopa after single and TID dosing are similar.

FUNDING: Lundbeck.

257. Physiologically based pharmacokinetic modeling using SIMCYP predicts sertraline exposure in pregnant patients. Naveen Daryani, BS, PharmD candidate 2017[1], Hari Varun Kalluri, PharmD[2], Rujuta Joshi, BS[2], Steve Caritis, MD[3], Raman Venkataramanan, PhD[4]; (1) Department of Pharmacy and Therapeutics, School of Pharmacy, University of Pittsburgh, Pittsburgh, PA (2) Department of Pharmaceutical Sciences, School of Pharmacy, University of Pittsburgh, Pittsburgh, PA (3) Department of OB/GYN/RS – Maternal-Fetal Medicine Division & Department of Pediatrics, Magee-Women's Hospital & Magee-Women's Research Institute, Pittsburgh, PA (4) Department of Pathology, School of Medicine & UPMC, University of Pittsburgh/University of Pittsburgh Medical Center, Pittsburgh, PA

INTRODUCTION: Sertraline is FDA approved for the treatment of clinical depression and is the preferred therapeutic agent in pregnant population. It is primarily metabolized by CYP2D6, CYP3A4, and CYP2C19. The activity of CYP2D6 and CYP3A4 increase during pregnancy and this may lead to decreased sertraline exposure and therapeutic efficacy. Limited data exists on sertraline pharmacokinetics (PK) in pregnancy.

RESEARCH QUESTION OR HYPOTHESIS: Our objective is to optimize sertraline pharmacotherapy in pregnant women using a validated physiological based pharmacokinetic (PBPK) modeling approach.

STUDY DESIGN: Sertraline PBPK modeling and simulations were conducted using SIMCYP. Data from a published 100 mg single dose PK study in healthy volunteers was used to build the model and another model naïve dataset was used to validate it.

METHODS: Sertraline physiochemical properties and CYP-enzymatic clearance kinetics were obtained from published literature. Absorption and distribution profiles were predicted using Nonlinear-mixed-effects-modeling and "K_p" estimations proposed by Rodgers et al. Sertraline exposure at various gestational stages were simulated in virtual SIMCYP pregnant population.

RESULTS: PK parameters from model predictions were within acceptable ranges of PK parameters reported in healthy volunteers (% difference from observed values: T_{max}:3.1%; Cmax:9.5%, AUC:8.7%, CL/F:8.1%). The final model was robust in predicting drug exposure in a model naÃ¯ve validation dataset (%difference from observed values: T_{max}:6.3%;

C_{max}:9.6%; AUC: < 1%, CL/F: < 1%). PBPK modeling in SIMCYP pregnant population predicted decreased drug exposure during various stages of gestation (2nd trimester: 18.5%; 3rd trimester:22.6%; at delivery: 24.3%), when compared to healthy female volunteers. This PBPK model was able to predict dose normalized trough concentration values observed in six pregnant women.
CONCLUSION: Sertraline PBPK modeling suggests a need for higher dosage requirements during pregnancy in order to maintain exposure. These model predictions are currently further being validated in a prospective study.

258. Safety and pharmacokinetics of single and multiple doses of CD101 IV: results from two phase 1 dose-escalation studies. Taylor Sandison, MD, MPH[1], Danielle Armas, MD[2], Jonathan Lee, BS[1], Voon Ong, PhD[1], Dirk Thye, MD[1]; (1) Cidara Therapeutics, Inc., San Diego, CA (2) Celerion, Tempe, AZ
INTRODUCTION: CD101 IV is a novel echinocandin with activity against *Candida* and *Aspergillus* spp. in development as a high-exposure, once-weekly treatment for candidemia and invasive candidiasis.
RESEARCH QUESTION OR HYPOTHESIS: To establish the safety and pharmacokinetics (PK) of single and multiple weekly dosing of CD101 IV.
STUDY DESIGN: Randomized, double-blind, placebo-controlled, phase 1, dose-escalation trials.
METHODS: Sequential cohorts of 8 healthy subjects (n=6, active; n=2, placebo) received single (50, 100, 200, 400 mg) or multiple doses (100 mg ×2, 200 mg ×2, 400 mg ×3) of CD101 IV infused over 1 h, once weekly. Plasma and urine samples over 21 days were collected for PK assessments. Safety and tolerability were assessed by adverse events (AEs), vital signs, physical exams, electrocardiograms (ECGs), and safety laboratory values up to 21 days after dosing.
RESULTS: Overall incidences of AEs in the CD101 IV and placebo groups were similar. The majority of AEs were mild, and all resolved completely. The 400 mg × 3 dose group of the multiple-dose study had slightly higher incidences of AEs and mild transient infusion reactions. In both studies, there were no clinically significant postbaseline safety laboratory abnormalities; no safety issues related to ECGs, vital signs, or physical exams; and no deaths, serious AEs, severe AEs, or withdrawals due to an AE. CD101 plasma exposures were dose-proportional. CD101 IV demonstrated low apparent clearance (< 0.3 L/h), a long half-life ($t_{1/2}$ > 80 h), minimal urinary excretion (< 1%), and minor accumulation (30% to 55%, multiple-dose study).
CONCLUSION: CD101 IV was safe and well tolerated as single and multiple doses up to 400 mg once weekly for up to 3 weeks. CD101 IV demonstrated high plasma exposures that may improve treatment outcomes and a long $t_{1/2}$ that enables weekly dosing. These findings support the continued development of CD101 IV as a once-weekly therapy for treatment of invasive fungal infections.

259. Evaluation of cyclosporine (CsA) co-administration on brincidofovir (BCV) pharmacokinetics (PK) and safety in adult and pediatric transplant recipients. Mary Wire, PharmD[1], Tim Bergsma, PhD[2], Marion Morrison, MD[1], Tom Brundage, MS[1], Nathan Teuscher, PhD[2], Mark Lovern, PhD[2]; (1) Chimerix, Durham, NC (2) Certara, Princeton, NJ
INTRODUCTION: BCV is a lipid conjugate nucleotide in development for prevention and treatment of dsDNA viral infections. Co-administration of BCV with a single dose of CsA 600 mg increased plasma BCV exposure 4.7-fold in healthy volunteers.
RESEARCH QUESTION OR HYPOTHESIS: The impact of CsA co-administration on plasma BCV PK and safety in transplant recipients.
STUDY DESIGN: Data from patients enrolled in Phase 2–3 BCV studies were included in analyses.
METHODS: Data from 941 patients 0.3–78 years, 14% with concurrent CsA, 86% hematopoietic cell transplant (HCT) recipients, and BCV doses of 8–300 mg administered once or twice weekly, were analyzed using nonlinear mixed effects modeling (population PK). Data from 1146 (919 BCV and 227 placebo) patients were included in safety exposure-response analysis using proportional odds modeling. In addition, maximum ALT and TBIL grades were summarized by CsA co-administration for patients receiving BCV 200 mg/week or placebo.
RESULTS: Plasma BCV PK were described by a 2-compartment model. CsA co-administration decreased BCV oral clearance (CL/F) 34% (corresponds to 52% increase in AUC). Use of CsA increased the odds of TBIL Grade ≥ 2 (odds ratio 2.65; p<0.0001), but not of ALT. BCV and CsA had independent, not synergistic, effects on TBIL. Higher proportions of patients receiving BCV+CsA versus placebo+CsA experienced ALT Grade ≥ 2. Higher proportions of patients receiving BCV+CsA versus BCV without CsA experienced TBIL Grade ≥ 2.
CONCLUSION: The impact of CsA on plasma BCV exposure in patients was less than observed in healthy volunteers. Patients receiving BCV, with or without other drugs with hepatic signals, should be closely monitored for elevations in ALT and bilirubin.

260. Population pharmacokinetics of a novel antimicrobial compound following intravenous dosing in healthy subjects and patients. Anu Shilpa Krishnatry, PhD[1], Mohammad Hossain, PhD[2], Pragathi Kotha Venkata, MEngg[2], Etienne Dumont, MD[3], David Gardiner, MD[3]; (1) Systems Modeling and Translational Biology, GlaxoSmithKline (2) Clinical Pharmacology Modeling and Simulation, GlaxoSmithKline (3) Infectious Diseases Therapeutic Area Unit, GlaxoSmithKline
INTRODUCTION: Gepotidacin (GEP) is a novel, first-in-class triazaacenaphthylene antibiotic, which inhibits bacterial DNA replication and has in-vitro activity against susceptible and drug-resistant pathogens associated with a range of conventional and biothreat infections.
RESEARCH QUESTION OR HYPOTHESIS: To develop a population pharmacokinetic (PK) model following intravenous (IV) dosing of GEP in healthy subjects (HS) and patients with acute bacterial skin and soft structure infections (ABSSSI).
STUDY DESIGN: PK data from HS (n=140) consisted of single IV 1-h (200/600/1200/1800 mg) and 2-h infusions (1800 mg); repeat BID 2-h (400/750/1000 mg), and TID 2-h infusions (1000 mg). PK data from ABSSSI (n=109) consisted of BID 2-h (750/1000 mg) and TID 2 h infusions (1000 mg).

Population	Group	Proportion of subjects on treatment with ALT grade ≥ 2	TBIL grade ≥ 2
Prevention (HCT)	Placebo	27/171 (16%)	7/171 (4%)
	Placebo+CsA	2/33 (6%)	6/33 (18%)
	BCV	94/319 (29%)	39/319 (12%)
	BCV+CsA	26/68 (38%)	19/68 (28%)
Treatment (HCT + other immumocompromised)	BCV	87/243 (36%)	71/248 (29%)
	BCV+CsA	33/86 (38%)	39/87 (45%)

METHODS: Log-transformed plasma/blood concentrations of GEP were analyzed using NONMEM. PK data from HS (n=134) was analyzed first. External validation was conducted using remaining HS data. All HS data (n=140) was used to develop a HS model and to predict plasma concentrations for ABSSSI. The data from HS and ABSSSI were later merged and effects of covariate were explored. Selected models were evaluated through simulation with a visual predictive check (VPC).
RESULTS: A 3-compartmental model best described the data. PK in ABSSSI was found to be similar to HS, thus the final model parameters are based on the merged data set. Systemic clearance of GEP was 38 L/h. Body weight was found to be a significant predictor of clearance. The final model parameters were estimated with high precision (% relative standard error < 11%). Inter-individual variability for V1 was 67% and for all other parameters ranged from 10 to 45%. Residual variability was low (22%). External validation and VPC confirmed the final population model to be robust.
CONCLUSION: A robust IV PK model was developed for GEP. Body weight was found to be a significant predictor of GEP clearance in humans. The model will be used for PK/PD analysis in ABSSSI and other indications.

261E. Pharmacological basis of CD101 efficacy: exposure shape matters. Elizabeth A. Lakota, PharmD, MS[1], Christopher M. Rubino, PharmD, BCPS[1], Voon Ong, PhD[2], Ken Bartizal, PhD[2], Lynn Miesel, PhD[3], Sujata M. Bhavnani, PharmD, MS[1], Paul G. Ambrose, PharmD, FIDSA[1]; (1) Institute for Clinical Pharmacodynamics, Latham, NY (2) Cidara Therapeutics, Inc., San Diego, CA (3) Eurofins Panlabs, Ltd., St. Charles, MO
Presented at ASM Microbe 2016, Boston, MA, June 16–20, 2016.

Psychiatry

262. Antagonistic psychotropic polypharmacy: concomitant sedative and stimulant prescriptions. Stephanie Nichols, PharmD, BCPS, BCPP[1], Kenneth McCall, PharmD, CGP[2], Nicolette Centanni, PharmD, BCPS, CGP[3], Min Jung Clare Ki, PharmD Candidate 2017[1], Dale Stewart, PharmD[1], Brian Piper, PhD[4]; (1) School of Pharmacy, Husson University, Bangor, ME (2) Department of Pharmacy Practice, College of Pharmacy, University of New England, Portland, ME (3) Department of Pharmacy, Maine Medical Center, Portland, ME (4) Department of Basic Sciences, Commonwealth Medical College, Scranton, PA
INTRODUCTION: Polypharmacy is often due to using medications to treat adverse effects of other medications, defined as a "prescribing cascade". Polypharmacy leads to an increase in admissions and ER visits due to increased adverse effects, interactions, and reduced adherence. "Antagonistic polypharmacy", a prescribing cascade of medications with opposing actions, is frequent among patients taking psychotropic medications. Simultaneous use of prescription sedatives and stimulants is an example of antagonistic polypharmacy.
RESEARCH QUESTION OR HYPOTHESIS: What are the demographics of patients receiving overlapping concomitant sedative and stimulants (study population) compared to those with no overlap (controls)? Do prescribing patterns differ between these groups and also compared to the overall Prescription Monitoring Program (PMP)? Are there identifiable trends for targeted pharmacist, prescriber and/or patient interventions?
STUDY DESIGN: This was a retrospective cross-sectional investigation.
METHODS: Patients receiving overlapping sedatives and stimulants in 2014 were extracted from the Maine PMP. Overlap was determined by fill date and days supply. Patients were stratified, and demographics were compared between highly overlapping patients (> 50% of > 90 days) and those on both with no overlap (control). Primary endpoint: describe and compare demographics between the groups. Secondary endpoints: compare prescribing trends and identify populations for intervention. Describe demographics of very-high overlapping patients (> 75% of > 180 days).
RESULTS: There were 2072 highly overlapping patients, averaging 47 years old. This is 4.24 years older than the 569 controls ($p<0.001$). Females accounted for two-thirds of both groups. Further, there were 962 very-highly overlapping patients and 30 of these individuals were at least 70 years old. Shorter durations of concomitant use (< 100 days) were identified in populous counties and longer durations (129 days) rurally.
CONCLUSION: Antagonistic polypharmacy via receipt of concomitant sedative and stimulant prescriptions is frequent. Patients with a greater degree of overlap tended to be older and live in more rural areas, pointing to areas for future targeted intervention and/or research.

263E. Early clinical immersion as inpatient psychiatry medication education group leaders. Jacqueline McLaughlin, PhD[1], Lindsey Kennedy, PharmD[2], Shauna Garris, PharmD[2], Suzanne Harris, PharmD[1], Nicole R. Pinelli, PharmD, MS, CDE[2], Ashley Hillman, PharmD[2], Denise Rhoney, PharmD[1]; (1) Division of Practice Advancement and Clinical Education, UNC Eshelman School of Pharmacy, Chapel Hill, NC (2) University of North Carolina Medical Center, Chapel Hill, NC
Presented at the American Association of Colleges of Pharmacy, Anaheim, CA, July 23–27, 2016.

264. Effect of discharge antipsychotics on future substance-related readmission in patients with concurrent schizophrenia and substance abuse. Donna Phan, PharmD Candidate[1], Lisa Pham, PharmD Candidate[1], Amy Huang, PharmD Candidate[1], Mark Richman, MD[2], Patrick Chan, PharmD, PhD[3]; (1) Western University of Health Sciences College of Pharmacy, Pomona, CA (2) Long Island Jewish Medical Center, New Hyde Park, NY (3) Department of Pharmacy Practice and Administration, Western University of Health Sciences, Pomona, CA
INTRODUCTION: An estimated 8.4% of Americans suffer from substance-use disorder (SUD). The incidence increases to nearly 50% in patients suffering from concurrent schizophrenia. Current evidence is inconclusive for the effects of antipsychotic medications in patients with schizophrenia and SUD with regards to reducing substance use and SUD-related hospital readmission.
RESEARCH QUESTION OR HYPOTHESIS: In patients with concurrent schizophrenia and SUD (amphetamine and cocaine), is the initiation of antipsychotics upon discharge associated with a reduction in future substance use-related readmission?
STUDY DESIGN: This is a retrospective cohort study utilizing electronic medical records (EMR).
METHODS: Patients admitted with schizophrenia and SUD between 1/1/2005–12/31/2015 at a county hospital were identified. Inclusion criteria were documented schizophrenia, SUD, and no antipsychotic use at index admission; exclusion criteria were patients < 18 years old or unavailable EMR. Included for review were 126 patients. EMRs were then examined for antipsychotics given at discharge from index admission and subsequent SUD-related readmission. Fisher's Exact, Mann-Whitney, and unpaired t-tests were used for analysis with a p-value ≤ 0.05 deemed statistically significant. The primary endpoint is SUD-related readmission. Secondary endpoints are the number of days to readmission and identifying other potential risk factors for readmission.
RESULTS: The percentage of readmitted patients initially discharged with an antipsychotic medication at index admission was 18.3% compared to 18.2% for patients discharged without an antipsychotic medication (p-value >0.99). Average days to readmission for patients discharged with and without an antipsychotic medication were 441 and 670, respectively (p-value=0.47). Potential risk factors analyzed for readmission were homelessness (p-value=0.14), smoking (p-value=0.85), and alcohol use (p-value=0.60).

CONCLUSION: Study results indicate that discharging patients with an antipsychotic was not associated with reduced SUD-related readmission or increase in the number of days to readmission. Furthermore, potential risk factors were not associated with an increase in SUD-related readmissions.

265. The prevalence and management of vitamin D insufficiency and deficiency in veterans admitted to an acute inpatient psychiatric unit. Caitlin Dirvonas, PharmD, Jennifer L. Easterling, PharmD, Jennifer R. Bean, PharmD, BCPP, BCPS; Veterans Affairs Tennessee Valley Healthcare System, Murfreesboro, TN

INTRODUCTION: Studies in Europe, New Zealand, and the United States have found a high percentage of psychiatric inpatients to be vitamin D insufficient and/or deficient. Because low vitamin status has been linked to conditions beyond bone health, there is value in assessing and treating those who may be at risk for deficiency who suffer from a concomitant mental health disorder.

RESEARCH QUESTION OR HYPOTHESIS: To determine the prevalence and management of vitamin D status in Veterans admitted to an acute psychiatric unit.

STUDY DESIGN: Single-center, retrospective, observational study of adult patients admitted to the acute psychiatric units of the VA Tennessee Valley Healthcare System from January 1, 2015 through June 30, 2015.

METHODS: Review of 25(OH)D levels obtained during inpatient admission. For the purpose of this study, vitamin D levels were classified as deficient < 20 ng/mL or insufficient 21–29 ng/mL. Further assessment included whether patients were initiated on supplementation, whether a subsequent level was drawn, and what type of provider followed-up.

RESULTS: Of the 741 included admissions, only 42.6% had a 25 (OH)D level drawn. Of these, 34.5% were classified as deficient, 35.1% as insufficient. The mean 25(OH)D level on admission was 25.99 ng/mL (SD $\pm$ 11.14; range 7–78.5 ng/ml). Of the patients with suboptimal 25(OH)D levels, 48.6% were initiated on supplementation; out of those 38% had a repeat 25(OH)D level during the 6 month study time frame. The repeat levels were ordered by primary care (51.2%), mental health (46.5%), and endocrinology (2.3%). Improvement in 25(OH)D level was seen in 67.4% of patients and 27.9% achieved normalization of their vitamin D level.

CONCLUSION: Overall, results highlight the rather poor management of vitamin D deficiency in this patient population. From screening those for deficiency, to initiation of supplementation, to follow-up on levels, there is much room for improvement.

266. Metabolic monitoring for patients on second-generation antipsychotics using electronic notifications as a reminder system for providers. Stephanie Parker, PharmD, Rachel Henderson, PharmD, Traci Dutton, PharmD, BCPP, BCPS, R. Jill Pate, MD, Jennifer R. Bean, PharmD, BCPP, BCPS; Veterans Affairs Tennessee Valley Healthcare System, Murfreesboro, TN

INTRODUCTION: Metabolic monitoring of patients on second-generation antipsychotics (SGAs) is important due to the serious health risks associated with metabolic syndrome. The American Diabetes Association (ADA) and American Psychiatric Association (APA) published consensus guidelines in 2004 that recommend monitoring of fasting blood glucose (FBG) or hemoglobin A1c (HbA1c) at baseline, 12 weeks, and annually.

RESEARCH QUESTION OR HYPOTHESIS: To determine whether submitting patient-specific electronic reminders to providers would impact the number of patients on SGAs that did not have monitoring of HbA1c or FBG in the past year.

STUDY DESIGN: Single center, prospective, observational analysis.

METHODS: The Psychopharmacology Drug Safety Initiative (PDSI) was developed within Veteran's Affairs to increase the safety of psychotropic medication use. The PDSI utilizes a dashboard to identify Veterans prescribed a SGA who lack appropriate blood glucose monitoring. An electronic reminder was manually entered into each individual patient chart to alert both the primary care (PC) and mental health (MH) providers that glucose monitoring was warranted in the patient. After submission of the note, data was manually extracted to determine provider response.

RESULTS: 226 patients met inclusion criteria. 90 days after submitting the note, 99 laboratory orders (44%) had been placed. Of those 99 patients, 56 patients (25%) had labs collected. 54 labs were ordered by PC, 40 labs by MH, and 6 labs by another specialty provider (n=99). Patients had more MH appointments in the past year than PC; although patients also had more cancellations and no-shows in MH.

CONCLUSION: Providers placed a laboratory order for 44% of patients. Overall, this study improved metabolic monitoring rates by 25%. Missed opportunities likely played a large role in lack of metabolic monitoring in this population. It may be hypothesized that increasing patient awareness of the importance of laboratory monitoring while on SGAs might improve compliance with guideline recommended monitoring.

Pulmonary

267. Adherence to gold guidelines in the inpatient COPD population. Melissa Lipari, PharmD, BCACP[1,2], Amber Lanae Smith, PharmD, BCPS[1,3], Pramodini Kale-Pradhan, PharmD, FCCP[1,2], Sheila Wilhelm, PharmD, FCCP, BCPS[1,4]; (1) Pharmacy Practice, Wayne State University, Eugene Applebaum College of Pharmacy & Health Sciences, Detroit, MI (2) St. John Hospital and Medical Center, Detroit, MI (3) Henry Ford Hospital, Detroit, MI (4) Harper University Hospital, Detroit, MI

INTRODUCTION: The Global Initiative for Chronic Obstructive Lung Disease (GOLD) guidelines provide evidence-based recommendations for the inpatient management of COPD exacerbations. It is unknown how consistently clinicians adhere to these guidelines in an urban teaching hospital. The purpose of this study was to assess the management of inpatient COPD exacerbations at a large teaching institution.

RESEARCH QUESTION OR HYPOTHESIS: What is the adherence to GOLD guidelines and readmission rates following inpatient COPD management?

STUDY DESIGN: Retrospective chart review.

METHODS: Patients 18–89 years admitted between December 2010 and August 2012 with ICD9 code indicating COPD were included if they had documented shortness of breath due to COPD exacerbation in an initial inpatient note. Patient demographics, length of stay (LOS), Charlson Comorbidity score, pulmonary medications, and 30-day readmission were collected. Descriptive statistics were used to characterize guideline adherence and readmission.

RESULTS: 615 patients were screened; 94 met the inclusion criteria for analysis. The majority of patients were female (70.2%) and African American (85.1%), with a median age of 68 years (IQR 58–75 years). Median LOS was 3 days (IQR 1–5 days), and median Charlson comorbidity score was 6 (IQR 5–8). All patients received an inhaled short-acting beta agonist, 52/94 (55.3%) also received an inhaled short-acting anticholinergic agent. Seventy-eight (83%) received systemic corticosteroids, of which three patients (3.9%) received guideline-recommended doses (30–40 mg prednisolone/day). Sixty-four patients (68.1%) received antibiotics for a pulmonary indication, of which 71.9% received appropriate antibiotics for the indication. Two of 94 patients were managed in complete adherence with GOLD recommendations. A total of 24 patients (25.5%) were readmitted within 30 days of discharge, nine of these patients were readmitted for a COPD reason.

CONCLUSION: While all patients received some guideline-recommended therapy, the majority had aspects of their therapy that deviated from GOLD recommendations. This provides opportunities for further optimization of treatment of COPD exacerbations.

268. Impact of antibiotics on readmission rates for chronic obstructive pulmonary disease (COPD) exacerbations. Jason Lancaster, PharmD, MEd[1], Cyrille Cornelio, BS[2], Jennifer Hum, BS[2], Yestle Kim, BS[2], Ann Phung, BS[2], Kevin She, BS[2], Yuxiu Lei, PhD[3], Laura Hunt, PharmD[1], Elizabeth O'Gara, PharmD[1], Timothy Liesching, MD[3], Henri Balaguera, MD[4]; (1) Department of Pharmacy, Lahey Hospital & Medical Center, Burlington, MA (2) School of Pharmacy, Northeastern University, Boston, MA (3) Department of Pulmonology, Lahey Hospital & Medical Center, Burlington, MA (4) Department of Hospital Medicine, Lahey Hospital & Medical Center, Burlington, MA
INTRODUCTION: Uncertainty exists in the literature as to the exact role of antibiotic therapy in managing chronic obstructive pulmonary disease (COPD) exacerbations requiring hospitalization.
RESEARCH QUESTION OR HYPOTHESIS: Use of antibiotics for COPD exacerbation requiring hospitalization do not impact 30, 90 or 365-day readmission rates, length of stay, hospital mortality or time to next exacerbation
STUDY DESIGN: Retrospective, IRB approved, study assessed patients ≥ 18 years-old admitted to a 335-bed academic medical center between January 2008 and December 2014 for a COPD exacerbation.
METHODS: Patients were excluded if they were admitted to an intensive care unit, transferred from an outside hospital, diagnosed with acute decompensated heart failure, pneumonia and/or influenza, had a history of lung disease(s), hospitalized within the past 90 days, had an expectation of death within 48 h of admission, were immunocompromised, pregnant, lactating, or incarcerated. Non-parametric data was analyzed using the Kruskal-Wallis or Chi-square tests.
RESULTS: 305 patients met inclusion criteria, had an average age of 74 years, were predominately of female gender (55.7%), 29% were active smokers with an average FEV1 of 50% predicted, an average Charlson Comorbidity Index of 2, and 8% had positive sputum cultures. Of those included, 73% (N=223) received antibiotics while 27% (N=82) did not. No difference in 30-day readmission rate was detected 12.6% versus 12.2% (p=0.9). Additionally, there was no statistical difference in 90 or 365-day readmission rates, nor in length of stay or hospital mortality. However, a non-significant trend toward delay in time to next exacerbation was noted (352 days vs. 192 days, p=0.07) for those receiving antibiotics.
CONCLUSION: These findings suggest that, in this cohort, treatment with antibiotics did not impact readmission rates, length of stay, hospital mortality, or time to next COPD exacerbation. More studies are needed to assess the comparative effectiveness of differing antibiotic classes, as well as the relationship between antibiotic use and time to next COPD exacerbation.

269. Hepatic safety of ambrisentan and tadalafil alone and in combination – an analysis of the AMBITION trial. Krishna Patel, PharmD[1], Christiana Blair, MS[2], James Tislow, PharmD[1], Karen Miller, PhD[3]; (1) Medical Affairs, Gilead Sciences Inc, Foster City, CA (2) Biostatistics, Gilead Sciences, Inc., Foster City, CA (3) Clinical Research, Gilead Sciences, Inc., Foster City, CA
INTRODUCTION: Endothelin receptor antagonists have historically been associated with adverse hepatic events.
RESEARCH QUESTION OR HYPOTHESIS: Were elevations in alanine (ALT) and aspartate (AST) aminotransferases as well as total bilirubin (Tbili) in patients receiving ambrisentan and tadalafil in combination and monotherapy in the AMBITION trial consistent with prior studies?
STUDY DESIGN: Retrospective analysis.
METHODS: AMBITION was an event-driven, randomized, double-blind, placebo-controlled trial evaluating initial therapy with ambrisentan and tadalafil compared to ambrisentan or tadalafil in patients with Group 1 PAH with WHO/NYHA Functional Class II or III disease. Five hundred ninety six patients with normal baseline ALT/AST/TBili, and post-baseline ALT/AST/TBili, and who received at least one dose of drug were included in this analysis. The proportion of patients with elevations in ALT/AST > 3 × upper limit of normal (ULN), and those with elevations of ALT/AST > 3 × ULN plus TBili > 2 × ULN (potential Hy's Law) were determined. Case report forms of subjects with potential Hy's Law were further reviewed to determine if causes other than drug were present.
RESULTS: Overall, 22/596 patients (3.7%) had elevations in ALT/AST > 3 × ULN during the study, with an annualized risk of 2.1%. The majority of these patients, 17/22 (2.9%), were > 3 to ≤ 5 × ULN, 3/22 (0.5%) were > 5 to ≤ 8 × ULN, and 2/22 (0.3%) were > 8 × ULN. Three patients (0.5%) had ALT/AST > 3× ULN plus TBili > 2 × ULN. All three patients had probable alternative causes (cardiogenic shock, liver metastases, lymphoma) for elevations reported.
CONCLUSION: In the AMBITION trial, ambrisentan and tadalafil demonstrated hepatic safety profiles consistent with prior studies.

270. Evaluation of corticosteroid dose in acute exacerbation of chronic obstructive pulmonary disease (COPD). Alice Hemenway, PharmD[1], Alexandra Terry, PharmD[2]; (1) Department of Pharmacy Practice, University of Illinois at Chicago College of Pharmacy, Rockford, IL (2) University of Illinois at Chicago College of Pharmacy, Rockford, IL
INTRODUCTION: The REDUCE trial from Switzerland found that low doses of corticosteroids had equivalent outcomes when compared with traditional doses for treating exacerbations of chronic obstructive pulmonary disease (COPD). However, subjects were able to receive additional corticosteroids if necessary, and the average length of hospitalization in both groups was greater than the US average.
RESEARCH QUESTION OR HYPOTHESIS: In a US community hospital, do low doses of corticosteroids provide the lowest risk of adverse effects without increasing length of stay or readmission rates?
STUDY DESIGN: Single center, retrospective cohort.
METHODS: Following approval by our Institutional Review Board, records from May 1, 2013 through July 31, 2105 were found by ICD-9 code of 491.21 and confirmed using clinical criteria for COPD exacerbation. Exclusion criteria included admission to ICU, or discharge with hospice. The primary endpoints were length of hospitalization, > 30% increase in blood glucose, peak blood pressure > 140/90, and difference in 30-day readmission. The three inpatient dose range groups were: ≤ 250 mg prednisone equivalents, 251–500 mg, and > 500 mg. Analysis was performed using SPSS v.23 and included one-way ANOVA, and Kruskal-Wallis.
RESULTS: A total of 665 records were evaluated, with 371 records included (17.0% low, 30.7% medium, 52.3% high). The high dose group had the highest use of home oxygen (12.7%, 21.0%, 34.0%; p=0.001), and the highest rate of COPD verified with spirometry (34.9%, 29.8%, 53.6%; p=0.029). Other baseline characteristics were similar. There were statistically significant differences in the amount of patients with > 30% increase in blood glucose (33.3%, 54.4%, 60.3%; p=0.001) and length of hospitalization (77.9 h, 73.6, 101.5; p=0.001). There were no differences in peak blood pressure > 140/90 or 30-day readmission rate.
CONCLUSION: Compared to higher doses, patients receiving lower doses of corticosteroids achieved the lowest rates of adverse effects without increases in readmission rates or length of stay.

Rheumatology

272. Evaluation of current adherence to American College of Rheumatology Guideline Recommendations for monitoring of urate lowering therapy in U.S. Veterans. Jonathan Hughes, PharmD[1], Candace Bryant, PharmD[2], Brent Salvig, PharmD, BCPS[2], Theron N. Fourakre, PharmD, BCPS[2], Jessica Wallace, PharmD, BCPS[3]; (1) VA Tennessee Valley Healthcare System, Nashville, TN (2)

Department of Pharmacy Services, VA Tennessee Valley Healthcare System, Nashville, TN (3) College of Pharmacy, Lipscomb University College of Pharmacy, Nashville, TN
INTRODUCTION: The 2012 American College of Rheumatology (ACR) gout guidelines emphasize that timely monitoring of serum urate is key to achieving serum urate goal of < 6 mg/dL. Studies prior to the 2012 ACR guideline revealed that prescriber monitoring of urate lowering therapy (ULT) was poor in both civilian and veteran populations. Few studies have examined these quality indicators following the 2012 ACR update and, to our knowledge, none have examined a veteran population.
RESEARCH QUESTION OR HYPOTHESIS: How does current provider adherence to ULT monitoring guidelines in a veteran population compare to previously published studies?
STUDY DESIGN: A single-center, multi-site, retrospective chart review of U.S. Veterans receiving ULT for gout within the VA Tennessee Valley Healthcare System from January 1st, 2013 to June 30th, 2015.
METHODS: Primary outcome measured was percentage of patients with a serum uric acid (SUA) within 6 months of new xanthine oxidase inhibitor prescription. Secondary outcomes included medication possession ratio during the study period, percentage of patients with SUA < 6 mg/dL, and percentage of patients with a dose increase following an SUA above goal
RESULTS: 601 patients met inclusion criteria for the study; after application of exclusion criteria, 505 were included in the final analysis. 293 patients (58%) did not have a SUA drawn within 6 months and 162 patients (32%) reached the end of the study period with no SUA. Of the 226 patients with SUA above goal on initial check, only 62 (27%) had a timely response while 145 patients (64%) had no response. 237 patients (47%) had a SUA at goal within the study period.
CONCLUSION: Rates of ULT monitoring among U.S. Veterans at a major VA medical center were suboptimal and demonstrate a continued need for initiatives to improve adherence to guideline recommendations.

273. Cytokine markers of disease activity and drug response in juvenile idiopathic arthritis. Ryan Funk, PharmD, PhD[1], Marcia Chan, PhD[2], Mara Becker, MD, MSCE[3]; (1) Department of Pharmacy Practice, University of Kansas, Kansas City, KS (2) Division of Allergy, Asthma & Immunology, Children's Mercy Kansas City, Kansas City, MO (3) Division of Rheumatology, Department of Pediatrics, Children's Mercy Kansas City, Kansas City, MO
INTRODUCTION: Response to pharmacotherapy in juvenile idiopathic arthritis (JIA) remains variable and unpredictable. Cytokines are implicated in the pathogenesis of JIA and are a target of drug therapy, and therefore, may represent biomarkers of disease activity and drug response.
RESEARCH QUESTION OR HYPOTHESIS: Plasma cytokines are associated with therapeutic response in JIA and represent a clinical biomarker to guide drug therapy.
STUDY DESIGN: Samples and clinical data were obtained through the Children's Mercy Kansas City Juvenile Idiopathic Arthritis sample repository. Statistical testing was conducted by non-parametric analysis.
METHODS: Plasma from JIA patients initiated on 15 mg/m^2 methotrexate, with the option to adjust therapy at 3-months, were obtained at baseline (n=61), 3-months (n=51) and 6-months (n=35) and analyzed by multiplex analysis for concentrations of IL-1Î±, IL-1Î², IL-1Ra, IL-6, and TNFÎ±. Cytokines were evaluated for relationships with disease activity using the 71-joint count juvenile arthritis disease activity score (JADAS). Therapeutic response was evaluated by changes in JADAS and the need for therapy modification at 3-months.
RESULTS: Increased disease activity was associated with elevated IL-6 (Ï = 0.33, p=0.01) and TNFÎ± (Ï = 0.34, p=0.008). Initiation of methotrexate resulted in significant reductions in IL-1Î± (p=0.004), IL-1Î² (p=0.001), IL-1Ra (p=0.01), IL-6 (p=0.0001), and TNFÎ± (p=0.03). Therapeutic response was associated with reductions in TNFÎ± (Ï = 0.35, p=0.02). Need for a methotrexate dose-increase or the addition of etanercept at 3-months was associated with elevated TNFÎ± (p=0.0008). Initiation of etanercept was associated with a > 4-fold increase in TNFÎ± (p=0.006) and corresponded to a significant reduction in JADAS by 6-months (p=0.003). Methotrexate dose-increase and initiation of etanercept resulted in a similar reduction in disease activity by 6-months.
CONCLUSION: Plasma cytokine concentrations are associated with disease activity in JIA, and are responsive to pharmacotherapy. TNFÎ± concentrations are increased in patients failing to respond to standard dose methotrexate, and are increased following the initiation of etanercept.

Transplant/Immunology

274E. Qualitative assessment of patient-perceived treatment burden following cardiac transplantation. Kimberly Deininger, MPH[1], Jennifer Reich, PhD[1], Jan Hirsch, BSPharm, PhD[2], Sarah Graveline, BS[2], Ashley Feist, PharmD[2], Joanne LaFleur, PharmD, MSPH[3], Steven Smith, PharmD, MPH[4], Amrut Ambardekar, MD[1], JoAnn Lindenfeld, MD[5], Christina Aquilante, PharmD[1]; (1) University of Colorado, Aurora, CO (2) University of California San Diego (3) University of Utah, Salt Lake City, UT (4) University of Florida, Gainesville, FL (5) Vanderbilt University, Nashville, TN
Presented at the American Transplant Congress, Joint Annual Meeting of the American Society of Transplant Surgeons and the American Society of Transplantation, Boston, MA, June 11–15, 2016.

276E. Development of a predictive model for medication errors in kidney transplant recipients. Kelly Covert, PharmD[1], Caitlin Mardis, PharmD[1], James Fleming, PharmD[2], Nicole Pilch, PharmD[1], Holly Meadows, PharmD[1], Andrew Mardis, PharmD[1], Prince Mohan, MD[1], Maria Posadas-Salas, MD[2], Titte Srinivas, MD[1], David Taber, PharmD[1]; (1) The Medical University of South Carolina, Charleston, SC (2) Medical University of South Carolina, Charleston, SC
Presented at the American Transplant Congress, Boston, MA, June 11–15, 2016.

277. Evaluation of clinical outcomes based on the early achievement of tacrolimus target trough levels in kidney recipients receiving rabbit antithymocyte globulin induction. Cassandra Dees, PharmD[1], Heather Snyder, PharmD, BCPS[2], Amy Krauss, PharmD, BCPS[2], Sami Sakaan, PharmD, BCPS[2], Benjamin T. Duhart Jr., MS, PharmD[3]; (1) Department of Clinical Pharmacy, Methodist University Hospital/The University of Tennessee College of Pharmacy, Memphis, TN (2) Department of Pharmacy, Methodist Le Bonheur Healthcare, Memphis, TN (3) Department of Clinical Pharmacy, The University of Tennessee College of Pharmacy, Memphis, TN
INTRODUCTION: Tacrolimus (TAC) is a calcineurin inhibitor prescribed for the prophylaxis of acute rejection in transplant recipients. Aggressive dosing of TAC is limited due to its inherent nephrotoxicity.
RESEARCH QUESTION OR HYPOTHESIS: Does early achievement of target TAC trough levels have an impact on clinical outcomes in kidney transplant recipients receiving rabbit antithymocyte globulin (RATG) induction?
STUDY DESIGN: We conducted a single-center retrospective review of patients receiving an adult kidney transplant between August 24, 2010 and October 15, 2014. Exclusion criteria: multi-organ or previous non-renal transplant; death or graft loss within 30 days of transplant; induction therapy other than RATG; received sirolimus, everolimus, or belatacept; incomplete medical records; or initial post-transplant length of stay > 7 days.
METHODS: Patients were stratified into two groups based on a therapeutic (≥ 8 ng/mL) or subtherapeutic (< 8 ng/mL) TAC trough level at first clinic visit or readmission. The calculated

estimated glomerular filtration rate (eGFR) at 12 months post-transplant was compared between groups. Secondary endpoints included: time to first therapeutic TAC trough level; RATG dosing; patient and graft survival at 12 months post-transplant; incidence of biopsy-proven acute rejection (BPAR), cytomegalovirus, and BK infection within 12 months post-transplant.
RESULTS: A total of 200 were included with 69 in the therapeutic group and 131 in the subtherapeutic group. Patients were primarily African American (73%) with a mean age of 51 ± 13 years. The mean eGFR at 12 months was 58.1 ± 18 mL/min/1.73 m^2 and 59.4 ± 21 mL/min/1.73$m^2$for the therapeutic and subtherapeutic groups, respectively (p=0.66). The median time (days) to therapeutic TAC level was 9 (IQR: 7–12) and 18 (IQR: 14–30) for the therapeutic and subtherapeutic groups, respectively (p<0.0001). There were no significant differences identified among other secondary endpoints.
CONCLUSION: Despite a significantly shorter time to achieve therapeutic TAC levels in the therapeutic group, there were no differences in graft function, patient and graft survival, BPAR, and infection.

278. Does one size fit all? Outcomes in obese versus non-obese kidney transplant patients under basiliximab induction immunosuppression. Jamie Benken, PharmD, BCPS, Clare Kane, PharmD; Department of Pharmacy Practice, University of Illinois Hospital and Health Sciences System, Chicago, IL
INTRODUCTION: With surgical advancements, more obese patients are eligible for transplantation. However, initial clinical and pharmacokinetic (PK) trials in transplant patients did not include many overweight subjects. Basiliximab is an interleukin-2 (IL-2) receptor antagonist indicated for prophylaxis of renal transplant rejection and is dosed in adults at 20 mg on post-operative day 0 and 4. The initial PK studies determined that weight had a minimal, though statistically significant, impact on basiliximab kinetics. However, the average weight of study participants was only 65 and 77 kg in the two studies. At University of Illinois Hospital, the average BMI of obese patients receiving kidney transplant is 42 kg/m^2 with average weight of 110 kg. Therefore, the patients studied in the basiliximab PK and efficacy trials were not representative of our transplant patient population.
RESEARCH QUESTION OR HYPOTHESIS: Since basiliximab dosing is not weight-based and early PK studies did not include many overweight patients, does patient weight impact clinical outcomes among kidney transplant patients that received basiliximab?
STUDY DESIGN: Retrospective cohort study.
METHODS: Inclusion criteria were recipients of kidney transplant between 1/1/2009 - 9/30/2015 with basiliximab induction. Exclusion criteria were age under 18 years old and recipients of other organ transplants. Primary outcome was incidence of acute rejection at 6 months post-transplant. Secondary outcomes were acute rejection at 1, 3, and 12 months, patient and graft survival, GFR, and infection rates.
RESULTS: Acute rejection rate at 6 months was 21.3% in non-obese group and 30.8% in obese group (p=0.115). The number of rejection episodes in non-obese group was significantly lower than obese group at 6 months (n=32, n=39, p=0.03) and 12 months (n=36, n=51, p=0.01). GFR was significantly higher in non-obese group.
CONCLUSION: Under basiliximab induction, obese group had signficantly more rejection episodes and lower GFR compared to non-obese group. These results warrant the need to study basiliximab pharmacokinetics, pharmacodynamics, and outcomes in obese transplant recipients.

279. Effects of genetic polymorphism in UDP-glucuronosyltransferase (UGT), multidrug resistance-protein 2 (MRP-2), and organic anion transporter (OATP) on mycophenolate-associated neutropenia in steroid-free adult kidney transplant recipients. Tony K. L. Kiang, BScPharm, PhD, ACPR[1], Nilufar Partovi, PharmD[1], Trana Hussaini, PharmD[1], Rebecca Jean Shapiro, MD[2], Abby Collier, PhD[3], Mary Ensom, BSPharm, PharmD, FASHP, FCCP, FCSHP, FCAHS[3]; (1) Department of Pharmacy, Vancouver General Hospital, Vancouver, BC, Canada (2) Department of Nephrology, Vancouver General Hospital, Vancouver, BC, Canada (3) Faculty of Pharmaceutical Sciences, University of British Columbia, Vancouver, BC, Canada
INTRODUCTION: Mycophenolate (MPA) is frequently used in combination immunosuppressive regimens in kidney transplant recipients. Neutropenia occurs commonly post-transplant and is associated with significant co-morbidities. Our team has established an association between increased MPA exposure and reduced neutrophil count. However, the mechanisms of MPA-associated neutropenia remain unknown.
RESEARCH QUESTION OR HYPOTHESIS: Genetic polymorphisms in metabolism enzymes responsible for MPA clearance are associated with MPA-induced neutropenia.
STUDY DESIGN: Prospective, open-label study enrolling steroid-free adult kidney transplant patients at 1 month post-transplant.
METHODS: Alleles known to affect MPA clearance (UGT2B7 G211T, UGT2B7 C802T, UGT1A9 T-275A, UGT1A9 T98C, MRP-2 C-24T, MRP-2 G1249A, OATP1B1 A388G, and OATP1B1 C463A) were characterized using validated polymerase chain reaction assays. Age, glomerular filtration rate (GFR), and absolute neutrophil count (ANC) were obtained at study visit. Dose-adjusted MPA exposure was calculated using an established limited-sampling strategy. Correlations were established using regression analyses. Statistical differences (p<0.05) between groups were determined using Wilcoxon rank sum test.
RESULTS: For the entire sample (N=21): Age (56 ± 11 years) (mean±SD), GFR (54.4 ± 13.2 mL/min), ANC (4.7 ± 1.5 × 10^3 cells/μL), and MPA exposure (20.8 ± 9.1 mg × h/L/g). The frequencies of genotypes observed (wildtype/heterozygotes/homozygotes) were: UGT2B7 G211T (N=19/2/0), UGT2B7 C802T (18/3/0), UGT1A9 T-275A (16/5/0), UGT1A9 T98C (21/0/0), MRP-2 C-24T (16/4/1), MRP-2 G1249A (21/0/0), OATP1B1 A388G (5/12/4), and OATP1B1 C463A (0/3/18). Control analysis indicated significant inverse correlation between MPA exposure and ANC (r^2 = 0.3, p<0.001). However, for each gene (where polymorphic alleles identified), no difference in ANC was observed between polymorphic genotypes and wildtype. Likewise, except for elevated MPA exposure in subjects heterozygous for UGT1A9 T-275A (28.8 ± 7.23 vs. 21.5 ± 6.11 mg*h/L/g), no polymorphic genotype affected MPA exposure compared to wildtype.
CONCLUSION: The lack of correlation between genetic polymorphisms (in enzymes and transporters known to affect MPA clearance) and ANC or MPA exposure suggests factors other than genetics may be responsible for MPA-induced neutropenia. Our novel findings warrant population-based analysis in a larger sample.

280. Efficacy of high-dose acyclovir for the prophylaxis of cytomegalovirus disease in a moderate risk abdominal solid organ transplant population not receiving lymphocyte-depleting induction. Erin McCreary, PharmD, Margaret Jorgenson, PharmD, BCPS, Jillian Descourouez, PharmD, BCPS, FAST, Glen Leverson, PhD, Jeannina Smith, MD; University of Wisconsin Hospitals and Clinics (UW Health), Madison, WI
INTRODUCTION: It has been shown that high-dose valacyclovir can be an effective cytomegalovirus (CMV) prophylaxis strategy in renal transplant recipients. Mechanistically, acyclovir and valacyclovir are identical. In the absence of lymphocyte-depleting induction, it is possible that dose-optimized acyclovir may be effective CMV prophylaxis for transplant recipients previously exposed to CMV.
RESEARCH QUESTION OR HYPOTHESIS: Is high-dose acyclovir as universal prophylaxis effective in preventing CMV infection and disease in a population of seropositive abdominal solid organ transplant (aSOT) recipients that do not receive lymphocyte-depleting induction?

STUDY DESIGN: Single center, retrospective, longitudinal cohort study using medical records.
METHODS: All aSOT recipients between 1/1/2000–6/30/2013 who were CMV seropositive, did not receive lymphocyte-depleting induction, and were prescribed high-dose acyclovir prophylaxis for 3 months at the time of transplantation were included. Overall incidence of CMV disease and tissue invasive disease was collected. Rate of breakthrough infection was also determined.
RESULTS: 1525 patients met inclusion criteria: 944 renal transplant recipients (RTX), 108 simultaneous pancreas-kidney transplant recipients (SPK), 462 liver transplant recipients (LTX), and 11 pancreas transplant recipients (PTA). Overall rate of any CMV infection or disease in the first 3 months was 7%. Overall rate of tissue invasive CMV was 0.4%. Rate of breakthrough infection was 4.5%, 6.1%, 11%, and 20% for the RTX, SPK, LTX and PTA populations, respectively. Rate of tissue-invasive disease was 0.2%, 0%, 0.7% and 10%, respectively. Breakthrough infection occurred at a higher rate in the LTX versus RTX population (p=0.000005) but incidence of tissue invasive disease was similar between groups (p=0.34). There was no difference in rate of breakthrough infection between the RTX and SPK (p=0.37) or RTX and PTA populations (p=0.09).
CONCLUSION: In this population, high-dose acyclovir is likely not a suitable option for CMV prophylaxis, particularly in the liver transplant subgroup.

282E. Do morbidly obese patients have an increased risk of infection post-kidney transplant?. Sara Strout, PharmD, Nicole Pilch, PharmD, MS, Tara Veasey, PharmD, Ryan Miller, PharmD, James Fleming, PharmD, Holly Meadows, PharmD, Caitlin Mardis, PharmD, Andrew Mardis, PharmD, Prabhakar Baliga, MD, Maria Posadas-Salas, MD, John McGillicuddy, MD, Dave Taber, PharmD, MS; Medical University of South Carolina, Charleston, SC
Presented at the American Transplant Congress of the American Society of Transplantation and the American Society of Transplant Surgeons, Boston, MA, June 11–15, 2016

283. The impact of opioid-minimization using ketorolac-based pain protocol following laparoscopic living donor nephrectomy. Benito Valdepenas, BS[1], Amin Virani, BS[1], Maya Campara, PharmD, BCPS[2]; (1) College of Pharmacy, University of Illinois at Chicago, Chicago, IL (2) Department of Pharmacy Practice, University of Illinois Hospital and Health Sciences System, Chicago, IL
INTRODUCTION: Ketorolac-based analgesia was previously described as safe and effective following robot-assisted, laparoscopic living donor nephrectomy.
RESEARCH QUESTION OR HYPOTHESIS: This study aims to compare the impact of a ketorolac-based pain protocol against the opioid-based regimen in this patient population.
STUDY DESIGN: This is a single-center, retrospective study of adult donors who underwent robot-assisted, laparoscopic nephrectomy from 2010 to 2015. The ketorolac-based protocol was implemented in April 2014 and includes scheduled ketorolac 15 mg IVP q6 h along with acetaminophen (APAP) 500 mg PO q6 h. Per protocol, donors may receive additional 15 mg of ketorolac IVP q6 h PRN breakthrough pain, tramadol 50 mg PO q6 h PRN moderate pain and APAP/hydrocodone 5/325 mg PO q6 h PRN moderate-high pain. Prior to implementing ketorolac protocol, patients received opioid based analgesia as per surgical resident.
METHODS: Charts of 394 patients were screened. The primary outcome was to determine if there is a difference in the length of hospitalization following donation. The secondary outcomes included evaluating opioid exposure in morphine equivalents per day and 1-month post-donation estimated glomerular filtration rate (eGFR). Chi-square and t-test were used to analyze nominal and continuous variables respectively with alpha value set at 0.05.
RESULTS: Analysis of 394 donors was performed; 185 (47%) were in the ketorolac cohort. There was no difference between cohorts in terms of age, gender, race or BMI. The average length of stay was 2.8 ± 0.92 days in the ketorolac group versus 3.2 ± 1.2 days in the historic cohort ($p<0.001$). The overall opioid exposure was 14.4 ± 14.4 mg/day in ketorolac group versus 27.5 ± 23.9 mg/day ($p<0.001$). The 1-month post donation eGFR was 58.3 ± 13.1 mL/min in the ketorolac cohort versus 54.7 ± 13.7 mL/min (p=0.02) for the opioid based regimen.
CONCLUSION: Ketorolac-based post-operative pain management following laparoscopic donor nephrectomy is associated with decreased length of stay and reduced exposure to opioids with no impact on renal function at 1-month post-donation.

284. Obese kidney donors: the impact of opioid-minimization using ketorolac-based pain management protocol following robotically assisted, laparoscopic living donor nephrectomy. Benito Valdepenas, BS[1], Amin Virani, BS[1], Maya Campara, PharmD, BCPS[2]; (1) College of Pharmacy, University of Illinois at Chicago, Chicago, IL (2) Department of Pharmacy Practice, University of Illinois Hospital and Health Sciences System, Chicago, IL
INTRODUCTION: Obese have been excluded from living donor pool due to risk of surgical complications. Advances in robotic/laparoscopic techniques minimized complications and increased utilization of obese patients as kidney donors. This study aims to compare the impact of a ketorolac-based pain protocol against the opioid-based regimen in this patient population.
RESEARCH QUESTION OR HYPOTHESIS: Does use of ketorolac-based pain regimen impact outcomes following robotically assisted, laparoscopic nephrectomy in obese donors?
STUDY DESIGN: Single-center, retrospective study of obese, adult donors who underwent robot-assisted, laparoscopic nephrectomy from 2010 to 2015. Ketorolac-based protocol was implemented in April 2014 and includes scheduled ketorolac 15 mg IVP q6 h with acetaminophen (APAP) 500 mg PO q6 h. Per protocol, give 15 mg of ketorolac IVP q6 h PRN breakthrough pain, tramadol 50 mg PO q6 h PRN moderate pain and APAP/hydrocodone 5/325 mg PO q6 h PRN moderate-high pain. Prior to ketorolac, opioid analgesia was ordered per surgical resident.
METHODS: Adults with BMI ≥ 30 kg/m^2 were included. Primary outcome was length of hospitalization. Secondary outcomes included opioid exposure in morphine equivalents per day and 1-month estimated glomerular filtration rate (eGFR). Chi-square and T-test were used as appropriate with the alpha value set at 0.05.
RESULTS: Out of 159 obese donors; 50 (31%) received ketorolac-based analgesia postoperatively. There was no difference in age, gender or race between groups. Ketorolac group had greater BMI (36.8 ± 4.5 kg/m^2 vs. 34.7 ± 4.2 kg/m^2, p=0.01). Average length of stay was 2.9 ± 0.82 days in ketorolac group versus 3.0 ± 0.9 days in opioid cohort (p=0.53). Overall opioid exposure was 15.3 ± 12.8 mg/day in ketorolac group versus 23.7 ± 16.6 mg/day (p=0.002). The 1-month eGFR was 62.3 ± 13.9 mL/min in ketorolac cohort versus 54.6 ± 14.5 mL/min (p=0.006) for opioid regimen.
CONCLUSION: Ketorolac did not result in decreased length of stay in obese patients following kidney donation. However, there was a significant reduction in use of opioids without negative impact on eGFR 1-month following kidney donation.

Urology

286E. Comparative effectiveness of anticholinergic agents for overactive bladder in U.S. Veterans. Ali Goodson, PharmD[1], Matthew Cantrell, PharmD, BCPS[2], Brian Lund, PharmD, MS[2], Robert Shaw, PharmD, MPH, BCPS, BCNSP[2]; (1) Pharmacy Department, Iowa City VA Health Care System, Iowa City, IA (2) Iowa City Veterans Affairs Health Care System, Iowa City, IA
Presented at Midwest Pharmacy Residency Conference Omaha NE May 6th 2016.

Women's Health

287. The Women's Health PRN members and accomplishments. Kassandra Bartelme, PharmD, BCACP[1], Nicole Lodise, PharmD, TTS[2], Sally Rafie, PharmD[3], Kayce Shealy, PharmD, BCPS, BCACP[4], Rebecca Stone, PharmD[5], Veronica Vernon, PharmD, BCPS, BCACP, NCMP[6]; (1) Concordia University Wisconsin School of Pharmacy, Mequon, WI (2) Albany College of Pharmacy and Health Sciences, Albany, NY (3) University of California, San Diego, San Diego, CA (4) Presbyterian College School of Pharmacy, Clinton, SC (5) College of Pharmacy, University of Illinois at Chicago, Chicago, IL (6) Richard L. Roudebush Veterans Affairs Medical Center, Indianapolis, IN
INTRODUCTION: The American College of Clinical Pharmacy Women's Health Practice and Research Network (PRN) has over 300 members of all membership types, including resident and student members, with a variety of practice, teaching, and research experiences and interests.
RESEARCH QUESTION OR HYPOTHESIS: The objective of this study is to determine the professional characteristics of the PRN's members as well as describe the PRN's accomplishments to enhance opportunities for scholarly collaboration and future programming initiatives.
STUDY DESIGN: An electronic survey was sent to all PRN members to collect member specific information and members' accomplishments.
METHODS: The survey collected members' demographics, education, employment, practice characteristics, and research experience. Survey data was compiled and reported using descriptive statistics.
RESULTS: The survey was sent to 317 members and 99 (31.2%) completed it. Of those, 58 (59%) completed a PGY1 residency, 30 (30%) completed a PGY2 residency, and 60 (61%) are board certified as a Pharmacotherapy Specialist and/or an Ambulatory Care Pharmacist. Sixty respondents (61%) hold an academic position. The majority of participating members' are employed by a university (45%), followed by a university affiliated health care system (18%). Over half have a pharmacy practice site (62%) of which inpatient service and family practice are most common. Seventy-one respondents (72%) participate in research and 73 (74%) indicated interest in research collaboration. Sixty-three (64%) respondents have at least one peer-reviewed publication and 15 (15%) have more than 20. The PRN has published four Opinion Papers in *Pharmacotherapy* since 2011, as well as a review paper and a letter to the editor in other journals.
CONCLUSION: The ACCP Women's Health PRN members teach students, serve patients, and perform research in a variety of settings and topic areas. The PRN is very active making their voice heard on several women's health topics. The updated membership directory will include practice, teaching, and research interests to foster collaboration.

288. Inhaler technique in obstetric patients after pharmacist intervention. Alicia B. Forinash, PharmD, FCCP, BCPS, BCACP[1], Philip J. Wenger, PharmD, BCPS[1], Megan Bergstrom, PharmD, BCACP[2]; (1) St. Louis College of Pharmacy, St. Louis, MO (2) Boston Medical Center, Boston, MA
INTRODUCTION: Uncontrolled asthma complicates pregnancy, increasing risk of preeclampsia, preterm birth, low birth weight, and perinatal death. Asthma is the most common chronic medical problem present during pregnancy, affecting 8% of pregnant women. Approximately 25% of pregnant women experience worsening of asthma. Proper use of inhalers is important to asthma control. Incorrect/poor technique is common with metered-dose inhalers (MDI) (24–68%) and dry-powder inhalers (DPI) (4–94%). Improper technique limits inhaler effectiveness because patients may get too little or no medication. To assure optimum dosing, thorough technique education is necessary. Few studies have evaluated the impact pharmacists make on inhaler technique of pregnant adult patients. Pharmacists are accessible to patients and can review inhaler technique with each visit or refill.
RESEARCH QUESTION OR HYPOTHESIS: What is the effect of pharmacist-provided inhaler technique education on pregnant patients with asthma?
STUDY DESIGN: Prospective, quasi-experimental study.
METHODS: At their first clinical pharmacist visit, patients demonstrated their technique for prescribed inhalers. Technique was scored using a standardized tool. Patients then received education from the pharmacist using the teach-back method. At subsequent visits, technique was again demonstrated and scored and patients were educated teach-back to correct steps. Per-protocol and last observation carried forward through visit 5 scores were analyzed.
RESULTS: At baseline, 149 out of 150 patients (99.3%) were using a rescue inhaler and 24 were using a rescue and long-term controller. Mean baseline rescue score was 4.32 (SD 1.43) out of 9. For 106 patients at visit 2, the mean MDI score of 7.21 (SD 1.36) was significantly improved (mean difference 2.92, $p<0.001$; 95% CI 2.59–3.24). All scores significantly improved from baseline ($p<0.001$). Demographics did not impact inhaler scores.
CONCLUSION: Obstetric patients require multiple education session on inhaler technique to achieve adequate administration. Clinical pharmacists can significantly improve inhaler technique in this population.

Advances in International Clinical Pharmacy Practice, Education, or Training Community Pharmacy Practice

290. The development and outcomes study of pharmaceutical care service model for community pharmacies in Korea. Hyun-Taek Shin, PharmD[1], In-Chul Shin, PharmD, PhD Candidate[1], So-Youn Park, PhD Candidate[1], Hee-Doo Kim, PhD[1], Ock-Hee Oh, PhD Candidate[2], Kyung-Eob Choi, PharmD[2], Yong-Sook Lee, PharmD[3], Bong-Kyu Yoo, PharmD, PhD[4]; (1) College of Pharmacy, Sookmyung Women's University, Seoul, Korea (2) College of Pharmacy, Cha University, Korea (3) College of Pharmacy, Keimyung University, Korea (4) College of Pharmacy, Gachon University, Korea
SERVICE OR PROGRAM: The provision of pharmaceutical care (PC) service in the scope of Good Pharmacy Practice (GPP) guidelines jointly developed by WHO and FIP has been recognized to be an important component in improving the quality of health care delivery system in Korea. A national research project sponsored by governmental agency for health care has been conducted to develop and evaluate the standardized PC service model which may be implemented in community pharmacies. The service model including Standard Operating Procedures (SOPs) and ICT-based system applications for delivering the standardized PC services that are in compliance with GPP guidelines proposed by Korean Pharmaceutical Association was developed focusing on prescription filling service with prospective drug use review (DUR) and self-care medication counseling service with safety measures. The model was implemented in the selected community pharmacies (N = 15).
JUSTIFICATION/DOCUMENTATION: Clinical and economic outcomes data (medication compliance, DUR alerts detection, counselling and monitoring) during before- and after implementation periods of the developed model were collected and cost-benefit analysis was conducted. Cost-benefit analysis on the developed model showed high positive ratio (B/C ratio: 5.1) compared with existing service model.
ADAPTABILITY: Pharmacy softwares including in-store DUR system, electronic medication teaching system and self-care counselling system with DUR function were implemented and evaluated for adaptability. Manuals and training programs for operating the model were provided to pharmacists before model operation.

SIGNIFICANCE: The developed service model including SOPs and supportive system tools showed a high cost-benefit ratio. The model was evaluated for its adaptability by holding a public hearing with experts and pharmacy societies. Results suggest that the model should be implemented to improve the quality of community pharmacy service in Korea.

Critical Care

291. Role of clinical pharmacist inside operation rooms in pediatric oncology setting. Ibrahim Abdo, BCPS, Sherif Kamal, Msc, Sara Mohamed, Bsc, Magda Azer, PhD, Alaa Younes, PhD; (1) Children Cancer Hospital-Egypt 57357 (CCHE), Cairo, Egypt
SERVICE OR PROGRAM: Clinical Pharmacy in the OR at Children Cancer Hospital-Egypt 57357 CCHE.
JUSTIFICATION/DOCUMENTATION: The OR pharmacist duties include:

1 Checking Allergy profile for all patients before surgery, Participate in Policy of Antimicrobial Prophylaxis in Preoperative Patients at Surgical Department (Neuro Oncology, General Oncology and Orthopedic Oncology Surgeries).
2 Preparing all medications used in Preoperative area, Intraoperative and Postoperative area by calculating all doses for all medications after arrange with Anesethia Department.
3 Activate Medications Reconciliation processes and insure that patients take their medications especially chronic patients before Surgery.
4 Re-dose of Antimicrobial Prophylaxis medication inside Operation Rooms for 173 patients
5 Insure availability of all medications inside Operation Rooms and correct dose at correct time.
6 Main Member on Resuscitation team inside Operation Room.

ADAPTABILITY: The above mentioned duties can be adapted and apply on all Operation Rooms
SIGNIFICANCE: Improve the health care quality for our patients by decrease rate of the infection, medication errors,

1 21 patients detected with wrong Allergy profile and detected 2% of total Surgery Patients in 2014
2 cost saving of 824,206,7.2 L.E / Year (1 million $/year) by decrease rate of infection by about 30%
3 Save more than 41% of medications uses inside Operation Rooms
4 Medications Reconciliation for:

- 390 patients with Antiepileptic Medications 65.83% of total Neurosurgery Patients in 2014
- 130 patients with Cardiac Medications 6.53% of total Surgery Patients in 2014
- 128 patients with Antibiotic medications needed to be continued inside Operation Room 6.53% of total Surgery Patients in 2014

Education/Training

292. Exploration and construction of clinical pharmacist training innovation mode in China. Jingwen Wang Sr., Doctor, Lei Wang Jr., Doctor, Guojiao You Jr., Master, Yi Qiao Jr., Doctor, Yin Wu Sr., Doctor, Wei Zhang Jr., Doctor, Yao Lu Jr., Master, Congcong Wang Jr., Master, Aidong Wen Sr., Doctor; Department of Pharmacy, Xijing Hospital, The Fourth Military Medical University, People's Republic of China
SERVICE OR PROGRAM: The study aims at establishing a training mode for clinical pharmacists.
JUSTIFICATION/DOCUMENTATION: The rapid development of pharmaceutical care and clinical demands require the diversity of training models and establishment of a clinical pharmacist teaching system which matches the Chinese hospital development.
ADAPTABILITY: Some distinctive teaching modes such as role exchange, case discussion, mobile pharmaceutical care, virtual classroom were carried out during the training period. Twenty-eight scales were established for teaching evaluation so that students may perform quality assessment in the whole process including clinical practice, teaching ward-round, design of examination questions, etc. It plays a remarkable role in upgrading the education quality of clinical pharmacist in China.
SIGNIFICANCE: It is expected that internationalization process of clinical pharmacist training in China can be propelled, and education level and quality can be improved.

293. The evolution of the Panama Global Health Initiative. Radha Patel, PharmD, MPH, BCACP, CPH, Rachel Franks, PharmD, BCACP, CDE, Kristy Shaeer, PharmD, Jose Barboza, PharmD, CDE, Angela Hill, PharmD, BCPP, CPh; Department of Pharmacotherapeutics and Clinical Research, University of South Florida College of Pharmacy, Tampa, FL
SERVICE OR PROGRAM: Since 2011, the University of South Florida (USF) College of Pharmacy Panama Global Health Initiative has evolved from a vision to an annual interprofessional pharmacy practice experience. Five faculty members, 9 student pharmacists, and one pharmacy fellow have attended the 10 day service trip. The first week, students and faculty are hosted by a local college of pharmacy and conduct site visits to local pharmacies, hospitals, and regulatory agencies to learn more about the pharmacy curricula, healthcare infrastructure, and its impact on the practice of pharmacy. The second week entails a rural community experience outside of Panama City. Student pharmacists collaborate with the USF College of Nursing and Panamanian nursing students to conduct home visits and assist with health screenings, medication reviews, and immunization. Students also deliver service learning projects on relevant health-related topics such as Zika virus prevention and medication disposal.
JUSTIFICATION/DOCUMENTATION: The service trip was created and continues to develop in alignment with key components of the Accreditation Council for Pharmacy Education Standards 2016 and the 2013 Center for the Advancement of Pharmacy Education Outcomes. These include but are not limited to interprofessional collaboration, cultural sensitivity and competence, health literacy, health and wellness, and population-based care.
ADAPTABILITY: This international experience can be replicated by other institutions through establishing a partnership with a college or school of pharmacy abroad. Such partnerships can help identify other potential stakeholders such as local healthcare agencies to help support training opportunities for students and caring for underserved communities.
SIGNIFICANCE: This service trip provides student pharmacists with an opportunity to learn more about the profession and collaborate with an interprofessional team abroad. Students are also able to gain insight into cultural and public health implications when caring for patients in rural and international areas as well as practice opportunities for pharmacists.

295. The First Arabian Drug Information Center (FADIC), a new vision of clinical pharmacy education and training. Rasha Abdelsalam Elshenawey, BCPS, MSc[1], Heba-t-Allah Matar Ali Matar, BCPS, MSc[2]; (1) Clinical Pharmacy, Tanta University Hospitals, Egypt (2) Clinical Pharmacy, Tanta University Hospitals, Makkah
SERVICE OR PROGRAM: The past decades have witnessed a great advancement in the field of clinical pharmacy education and training. Launched on October, 2014, FADIC combined the idea of drug information centers with the flexibility of internet based services. FADIC is an online drug information center, available in both Arabic and English language. All FADIC team members are board certified pharmacotherapy specialists (BCPS). It aims at improving the quality of medication use practice and

increasing health care awareness. FADIC offers a variety of online trainings, it holds online conferences and webinars to help pharmacists stay updated with the latest in clinical practice. One of the essential programs provided by FADIC is the "Drug Information program and workshop", with four successful runs so far. FADIC team is available to answer any inquiries, providing evidence-based recommendations.
JUSTIFICATION/DOCUMENTATION: FADIC's services are available online through the website (www.fadic.net/en) and on the social media through Facebook, Twitter and YouTube. Web-Based learning is conducted through FADIC's website. Interactive and Case- Based Discussions are conducted through GoToMeeting online meeting rooms.
ADAPTABILITY: FADIC provides a first of a kind service in the Middle East. It can be easily integrated in any institution, being available online, easily accessed anywhere and at any time. It provides an affordable and easy-to-study option for the pharmacists internationally.
SIGNIFICANCE: FADIC offers its services in a convenient way, requiring only a computer or smart phone and an internet connection. The service is gaining more attention and appreciation, followers and visitors exceed 220,000 with the numbers continually rising. Thus, FADIC is expected to gain a leading position in the health care system in the following years, becoming one of the most demanded evidenced-based services in the Middle East.

296. Train-the-trainer program for faculty teaching a Patient-Centered Communication Course in Turkey. Jodie Malhotra, PharmD[1], Nese B. Aksu, PhD[2], Akgul Yesilada, PhD[3], Deniz Baykal, BA, MA[2], Kari Franson, PharmD, PhD[4]; (1) Distance Degrees and Programs, University of Colorado Skaggs School of Pharmacy, Aurora, CO (2) Istanbul Kemerburgaz University School of Foreign Languages, Istanbul, Turkey (3) Faculty of Pharmacy, Istanbul Kemerburgaz University, Bagcilar, Istanbul, Turkey (4) Department of Clinical Pharmacy, University of Colorado Skaggs School of Pharmacy, Aurora, CO
SERVICE OR PROGRAM: Istanbul Kemerburgaz University (IKBU) opened in 2012. The IKBU curriculum includes six English courses. The last course in this series, Oral Communication in Health Sciences Practice, was developed in collaboration with the University of Colorado (CU) to focus on patient-centered health care communication skills. This was a 15 week course. The first 10 weeks was taught by faculty members from the School of Foreign Languages at IKBU and the last 5 weeks was taught by CU and IKBU School of Pharmacy faculty members. CU faculty developed the course content, structure, learning methods, and assessments that were used throughout the course. CU faculty members conducted a train-the-trainer program for IKBU faculty from the Schools of Foreign Languages and Pharmacy via video conferences. The train-the-trainer program consisted of four video-conferenced training sessions. The first two sessions focused on covering didactic course content in detail. Major course activities are mock patient encounters assessed using standardized, validated grading rubrics used in the CU PharmD programs. To ensure international reliability, the last two training sessions were used to lead IKBU faculty through a standard rubric norming process.
JUSTIFICATION/DOCUMENTATION: The Turkish pharmacy community has made a call for re-professionalization of pharmacists to be more patient-centered. A critical step in addressing this call is for the current drug-centered pharmacy education in Turkey to be transformed into a patient-centered education system. The train-the-trainer program developed by CU provided the necessary training to IKBU faculty to enable them to independently deliver the Oral Communication in Health Sciences Practice course.
ADAPTABILITY: The Patient-Centered Communication train-the-trainer program could be adapted to meet the needs of pharmacy curriculum in any country.
SIGNIFICANCE: This progressive international train-the-trainer program was designed to provide IKBU faculty with the knowledge, skills and abilities necessary to train students in their curriculum to be patient-centered pharmacists.

298. Intensive workshop in Mysore, India provides clinical pharmacy preceptor training to multi-University Indian faculty. Elizabeth Sherman, PharmD[1], Mark Decerbo, PharmD[2], Krishna Kumar, PhD, MPS[3], William Wolowich, PharmD[4], Parthasarathi Gurumurthy, PhD, PG Dip Clin Pharm (Australia) [5], Ponnusankar Sivasankaran, MPharm, PhD[6], Arun Kanniyappan Parthasarathy, MPharm, PhD, DSc[6], Suresh Bhojraj,[5]; (1) Department of Pharmacy Practice, Nova Southeastern University, College of Pharmacy, Fort Lauderdale, FL (2) Roseman University of Health Sciences, Henderson, NV (3) Howard University, Washington, DC (4) Nova Southeastern University, Fort Lauderdale, FL (5) JSS University, Mysuru, Karnataka, India (6) JSS College of Pharmacy, Mysuru, Karnataka, India
SERVICE OR PROGRAM: Doctor of pharmacy (PharmD) education was introduced in India in 2008 creating a growing demand for trained pharmacy faculty preceptors. The Indian Association of Colleges of Pharmacy, JSS University, and the Pharmacy Council of India created a preceptor development workshop available to pharmacy faculty in India. US faculty developed the curriculum and delivered the 3-day program at JSS Hospital, Mysore, India. US faculty presenters focused on the following topics: writing learning objectives and outcomes, structuring rotation activities, and evaluating student performance. A 15-item voluntary post-course survey was administered to program attendees. Responses were analyzed using approrpriate descriptive and inferential methods for categorical data.
JUSTIFICATION/DOCUMENTATION: Seventy-one preceptors from institutions across India registered for the program and 58 post-course surveys were returned (82% response rate). Survey respondents were mostly male (90%), held a masters in pharmacy as their terminal degree (69%), served as a preceptor for fewer than 5 years (55%), and never received formal preceptor training (84%). Survey respondents indicated high levels of satisfaction with the program (median > 4 for all seven items on a Likert scale of 1–5 (1 = strongly disagree, 5 = strongly agree)). Self-ranked ability to precept students before and after attending the program improved significantly: median score pre-course was 1, IQR 1–1, and median score post-course was 1, IQR 1–2, ($p<0.01$) on a Likert scale of 1–3 (1 = poor, 3 = excellent).
ADAPTABILITY: Targeted training programs such as this one can bolster international expansion of the PharmD degree.
SIGNIFICANCE: The preceptor development workshop provided focused training to Indian pharmacy faculty. Program attendees reported a high level of satisfaction and an improved confidence in their ability to precept students.

299. US faculty provide infectious disease training to doctor of pharmacy students and faculty at workshops in India. Elizabeth Sherman, PharmD[1], Miranda Nelson, PharmD[2], Krishna Kumar, PhD, MPS[3], Mark Decerbo, PharmD[4], Ponnusankar Sivasankaran, MPharm, PhD[5], Gopinath Chakka, MPharm, PhD[6], Suresh Bhojraj, MPharm, PhD, DSc[7], Arun Kanniyappan Parthasarathy, MPharm, PhD[5]; (1) Department of Pharmacy Practice, College of Pharmacy, Nova Southeastern University, Fort Lauderdale, FL (2) Southern Illinois University Edwardsville, IL (3) Howard University, Washington, DC (4) Roseman University of Health Sciences, Henderson, NV (5) JSS College of Pharmacy, Mysuru, Karnataka, India (6) Annamacharya College of Pharmacy, Kadapa, Andhra Pradesh, India (7) JSS University, Mysuru, Karnataka, India
SERVICE OR PROGRAM: The Indian Association of Colleges of Pharmacy and the Pharmacy Council of India created a 3-day infectious disease (ID) pharmacy practice workshop available to doctor of pharmacy (PharmD) students and faculty in India. US faculty developed the curriculum and delivered the program at two Indian schools of pharmacy.
JUSTIFICATION/DOCUMENTATION: India maintains some of the highest rates of antibiotic resistance in the world and the

pharmacist is uniquely poised to provide appropriate care. The role of the pharmacist in India is expanding rapidly, creating a need for ID-focused training. Workshops took place at JSS College of Pharmacy in Ooty, India in March 2013 and the Annamacharya Institute of Technological Sciences in Tirupati, India in December 2013.
ADAPTABILITY: US faculty provided ID-focused training to PharmD students and faculty in India through a global partnership. The training offered expert opinion from trained clinical pharmacists.
SIGNIFICANCE: International exchange of scholarship and training strengthens pharmacy practice education.

300. Utilization of a Best Clinical Practices Program to develop Nigerian pharmacists' clinical interventions documentation skills. Angela O. Shogbon, PharmD, BCPS[1], Pamela M. Moye, PharmD, BCPS, AAHIVP[1], Kate Okpukpara, PharmD[2], Teresa Pounds, PharmD, BCNSP[2]; (1) Mercer University College of Pharmacy, Atlanta, GA (2) Department of Pharmacy, Atlanta Medical Center, Atlanta, GA
SERVICE OR PROGRAM: The Best Clinical Practices Program was implemented in Enugu, Nigeria, as a train-the-trainer program for pharmacists, including clinical pharmacy faculty and preceptors, to build their knowledge and skills on provision of optimal clinical pharmacy services and training of students. As a component of this 2-week training workshop, participants were trained on how to identify and document clinical interventions completed in their daily pharmacy practice, and were provided with documentation tools to capture these interventions.
JUSTIFICATION/DOCUMENTATION: A baseline survey was conducted to gather demographic information and identify whether or not participants performed and documented clinical interventions in their daily practice. Participants were also asked to indicate the types of clinical interventions performed. A total of 55 participants from a variety of practice settings across Nigeria, including hospital, community, academia and pharmacy administration, completed this survey. The majority of respondents, (50 (91%)), indicated that they performed clinical interventions; however, only 22 (40%) participants indicated that they documented these interventions.
ADAPTABILITY: In this train-the-trainer program, participants were trained on how to identify and document patient care interventions and were provided with a paper-based documentation tool and a computer-based spreadsheet designed for periodic transferal of the paper-based documentation to the spreadsheet for analysis. This was done because not all participants had easy access to a computer to document daily interventions. The interventions documentation tool was designed to be used in both the inpatient and outpatient settings to capture pharmacist and student pharmacist interventions, and included common interventions performed by pharmacists in daily practice.
SIGNIFICANCE: Documentation of clinical interventions helps to capture and justify the services pharmacists provide, and makes other providers aware of the scope of pharmacists' services. This can aid with expanding pharmacists' services and presence as members of the interdisciplinary team, and contribute to the advancement of international clinical pharmacy practice.

301. Pharmacy involvement in an interprofessional, international mission trip. Yvonne Phan, Doctor of Pharmacy[1], Jennifer Smith, PharmD[2], Shelley Otsuka, PharmD[3], Thaddeus McGiness, Doctor of Pharmacy[1], Jessica Adams, PharmD[4], Shannon Burke, Bachelor of Science[5], Ryan Carney, Bachelor of Science[5], Oluwadamilola Oyenusi, Bachelor of Science[5]; (1) Department of Pharmacy Practice and Administration, Philadelphia College of Pharmacy, University of the Sciences, Philadelphia, PA (2) University of the Sciences Philadelphia College of Pharmacy, Philadelphia, PA (3) Department of Pharmacy Practice and Administration, Philadelphia College of Pharmacy, Philadelphia, PA (4) Cooper University Hospital, Camden, NJ (5) Philadelphia College of Pharmacy, University of the Sciences, Philadelphia, PA
SERVICE OR PROGRAM: The Jamaica Mission Trip is supported through the Women of H.O.P.E (Health Occupation Promoting Education) and originated in 2000 by the NOVA Southeastern University College of Osteopathic Medicine. Healthcare professionals and their respective students who have participated in this short-term medical mission (STMM), include those from medicine, nursing, dentistry, optometry, physical therapy, occupational therapy, and pharmacy. In 2014, the Philadelphia College of Pharmacy at the University of the Sciences developed an international, interprofessional, advanced pharmacy practice experiential (APPE) rotation. Pharmacy students and pharmacist preceptors participate in activities before, during, and after the STMM. While on the Jamaica Mission trip, pharmacy preceptors and students provide clinical and distributional services related to the practice of pharmacy, including recommending evidence-based drug regimens, dispensing prescription and non-prescription medications, and providing counseling and education to patients and other members of the interdisciplinary team.
JUSTIFICATION/DOCUMENTATION: Literature discussing the role of pharmacy practitioners and students on an international and interprofessional experience is limited. This article aims to discuss the development and implementation of an APPE rotation on a STMM. This article will include results from three Institutional Review Board approved research projects related to pharmacy student and pharmacy clinical specialist involvement in this particular STMM.
ADAPTABILITY: The Jamaica Mission Trip has grown significantly over the years with the most recent trip consisting of approximately 135 healthcare students, providers, and volunteers, including 10 pharmacy students and 5 clinical pharmacy specialists. Moving forward, use of additional technologies should be considered to improve accuracy and efficiency of medication management and delivery.
SIGNIFICANCE: The Jamaica Mission Trip focuses on providing healthcare to a patient population in which there is an evident lack of access to medical care. This manuscript aims to review the additional benefit of having clinical pharmacy specialist and pharmacy student involved in the interdisciplinary medical team.

Geriatrics

302E. Implementation of ward-based pharmacist medication review in high risk geriatric patients: observational study of drug-related problems. Kit Yee Chu, BPharmHon, MCP, BCPS[1], Ying Ho Yuen, BPharm(Hon), MSc (Clin Pharm)1, Wilson Yun Shing Leung, BPharm, PhD, BCPS[1], Ying Fai Mak, MBBS(HK), MRCP (UK), FRCP(Edin), FHKCP, FHKAM(Medicine), PG Dip Pall Med (Cardiff)2; (1) Department of Pharmacy, Queen Elizabeth Hospital, Hong Kong (2) Division of Geriatrics, Department of Medicine, Queen Elizabeth Hospital, Hong Kong
Presented at Hospital Authority Convention 2016, Hong Kong, May 3–4, 2016. Oral presentation at the Kowloon Central Cluster Convention 2016, Hong Kong, Jan 22, 2016.

Other

304. Pharmacist clinical service in an orthopedic rehabilitation ward in Hong Kong. Yu Yeung Wong, BPharm, MCP[1], Pauline Chu, MPharm, MRPharmS[2]; (1) Pharmacy Department/Department of Orthopedics, Tuen Mun Hospital, Hong Kong, Hong Kong (2) Department of Pharmacy, Tuen Mun Hospital, Hong Kong
SERVICE OR PROGRAM: Tuen Mun Hospital of Hong Kong has started a pilot study of pharmacist clinical service in two orthopedic rehabilitation wards in early 2016. This study aims to evaluate the extent and impact of pharmacists' intervention and to recognize the potential risk factors of DRPs.

JUSTIFICATION/DOCUMENTATION: A prospective study design was applied. Drug Related Problems (DRPs) identified were classified according to the PCNE Classification V6.2. Three independent clinical pharmacists were responsible for evaluating the clinical significance of individual DRPs. Potential risk factors leading to the occurrence of a DRP were also analyzed.
ADAPTABILITY: A total of 144 patients were included in this study. DRPs were identified in 44 (30.6%) patients. The most common DRPs were categorized as "Treatment effectiveness" (44.1%) and "Adverse reactions" (39%). Common causes of DRPs were "Drug selection" (39%), "Logistics" (15.3%) and "Dose selection" (13.6%). There were 109 interventions performed at prescriber, patient/carer and drug levels. The acceptance rate from prescribers was found to be 93.9%. Majority (93.2%) of DRPs were somewhat significant to very significant. Eleven cases were rated as very significant (18.6%). Significant relationships were found between occurrence of a DRP and total medications of 9 or more (p=0.029) or regular medications of 5 or more (p=0.033). No statistical relationship between DRP occurrence and gender or age was found.
SIGNIFICANCE: The service was shown to be beneficial to patients as pharmacist was able to identify drug related problems to optimize drug therapy as a whole. With limited resources, the target patients should be those with more than 5 regular medication or 9 total medications.

Clinical Pharmacy Forum
Adult Medicine

306. Implementation of a transition of care program in a multi-hospital health system. Sandy Moreau, PharmD, BCPS[1], Karan Raja, PharmD[2], Jennifer Sternbach, PharmD, BCPS, BCACP[2], Jennifer Costello, PharmD, BCPS, BC-ADM[3], Jessica Nodzon, PharmD, BCPS[4], Sheetal Patel, PharmD, BCPS[5], Hoytin Lee Ghin, PharmD, BCPS[6], Ellen Secaras, RPh[7], Indu Lew, PharmD[8], Todd Butala, PharmD[9]; (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, Clara Maass Medical Center, Belleville, NJ (3) Department of Pharmacy, Saint Barnabas Medical Center, Livingston, NJ (4) Department of Pharmacy, Community Medical Center, Toms River, NJ (5) Department of Pharmacy, Newark Beth Israel Medical Center, Newark, NJ (6) Department of Pharmacy, Monmouth Medical Center, Long Branch, NJ (7) RWJBarnabas Health, Oceanport, NJ (8) RWJBarnabas Health, Oceanport, NJ (9) Monmouth Medical Center Southern Campus, Lakewood, NJ
SERVICE OR PROGRAM: In 2015, Legacy Barnabas Health (BH) System implemented a Transition of Care (TOC) program across seven hospitals. Admitted patients (excluding Pediatrics and Psychiatry) demonstrating signs of: Heart Failure, Chronic Obstructive Pulmonary Disease, Pneumonia, Myocardial Infarction, Stroke (one facility includes Coronary Artery Bypass Graft and Diabetes) are risk stratified by Nursing using the Modified LACE Tool and Medication Screening Tool. LACE Score of 11 or greater (indicating high risk for readmission) and Medication Score of one or greater generate a Pharmacist consult for patient counseling.
JUSTIFICATION/DOCUMENTATION: Effort to reduce readmission in key diagnoses was the justification for implementing our program. Care transition, including medication therapy counseling, is a primary goal for health systems and accrediting agencies. Counseling by a pharmacist can improve patients' medication knowledge and may reduce odds of readmission. From March 2015 to March 2016, 2,221 patients were counseled by pharmacists (out of 2,504 patients eligible) according to documentation on an electronic Consult Assessment Form. Compliance rate across the system was 88.7%, with a goal of 90% for 2016.
ADAPTABILITY: Seven hospitals contain bed-size ranging from 316 to 597. Six hospitals use electronic medication record, Cerner „¢, while one uses Cerner Soarian„¢. Resource allocation feature 1 dedicated Clinical Specialist or a combination of Clinical Specialists (including Unit-Based), Staff, and Residents. Services are offered Monday through Friday business hours with some facilities providing post-discharge follow-up. Implementation barriers included coverage during vacations, pharmacist training and comfort level in providing counseling, workload, and discharge coordination.
SIGNIFICANCE: Incorporating TOC elements in electronic workflow is essential to program sustainability. Since implementation, pharmacist patient contact nearly doubled. Successful adaptation requires engaging pharmacists at varying positions. As with any new program, there may be a slow uptake in compliance. However, compliance may be a useful short term measures for implementation success.

Ambulatory Care

308. Student pharmacist post-hospital discharge telephone medication reconciliation service in a primary care clinic. Laura Challen, PharmD, MBA, BCPS, BCACP[1], Stephanie Crist, PharmD, BCACP, CGP[2], Christine Kelso, PharmD, BCPS, AE-C[3], Heather Pautler, PharmD, BCPS[4], Paul Stranges, PharmD, BCPS, BCACP[5]; (1) Department of Pharmacy Practice, St. Louis College of Pharmacy, St. Louis, MO (2) St. Louis College of Pharmacy (3) Barnes-Jewish Hospital, St. Louis, MO (4) Department of Pharmacy, Barnes-Jewish Hospital, St. Louis, MO (5) University of Illinois at Chicago
SERVICE OR PROGRAM: To assist with post-hospital discharge transitions of care, student pharmacists on Advanced Pharmacy Practice Experience rotations at the Primary Care Medicine Clinic within Barnes-Jewish Hospital (BJH), a large, academic hospital in St. Louis, Missouri, contacted patients discharged from BJH to perform medication reconciliation (med rec). Students performed med rec via telephone calls multiple times per week, 24–72 h prior to the patient's post-hospital, primary care physician appointment.
JUSTIFICATION/DOCUMENTATION: Completed med rec encounters were documented in the electronic medical record (EMR) using a standardized note template which listed identified medication discrepancies. All notes were reviewed by the preceptor prior to entry into the EMR. Physicians were notified prior to the appointment of the patient's current medications and discrepancies via EMR upon completion of the med rec call. Students also recorded de-identified data directly into a secure online database (Research Electronic Data Capture (REDCap) System, Version 6.12.1, through Washington University School of Medicine) to allow for rapid and regular evaluation of the service and students.
ADAPTABILITY: All primary care practice sites that distinguish post-hospital visits from follow-up primary care visits could implement a similar rotation experience. This process could also be used as part of the required portion of transitional care management and education.
SIGNIFICANCE: Pharmacy-led med rec interventions have shown to be effective at identifying medication discrepancies, have a greater impact on reducing medication errors and improve patient show rates to office visits. Current literature is limited in describing how to effectively implement a prospective student pharmacist ambulatory care rotation experience to target this outpatient-based opportunity. Through this service, students will improve patient interviewing skills and become valuable members of the healthcare team, all while improving patient outcomes.

310. 2016 Updates on the accomplishments and initiatives of the ACCP Ambulatory Care Practice and Research Network (PRN). James Lee, PharmD, BCACP[1], Sweta Patel, PharmD, BCPS[2], Lydia Newsom, PharmD, BCPS[2], Jennifer Carrillo, PharmD, BCACP[3]; (1) University of Illinois at Chicago College of Pharmacy, Chicago, IL (2) Department of Pharmacy Practice, Mercer University College of Pharmacy, Atlanta, GA (3) University of Florida Health Jacksonville, Jacksonville, FL

SERVICE OR PROGRAM: The Ambulatory Care PRN membership 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 provide an update of the initiatives and achievements of the ACCP Ambulatory Care PRN and its membership, an electronic survey was developed to characterize the contributions of members 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 2306 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 developing videos to facilitate membership advocacy efforts and keeping PRN members apprised of new advocacy opportunities. PRN funding continues to support increased member participation in professional, scholarly, and clinical development PRN-sponsored grant funding. Initiatives aimed at increasing utilization of PRN professional resources and expanding PRN recruitment were advanced with the development of new editions of PRN resource guides in addition to guidelines for PRN members interested in pursuing PRN or ACCP-supported scholarship.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 Ambulatory Care 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.

311. Developing and refining residency orientation to facilitate pharmacist-physician collaboration in a family medicine residency program. Ann Yapel, PharmD[1], Danielle Macdonald, PharmD[1], Keri Hager, PharmD[2]; (1) Essentia Health Ambulatory Pharmacy Services, Essentia Health, Duluth, MN (2) Department of Pharmacy Practice and Pharmaceutical Sciences, University of Minnesota College of Pharmacy, Duluth, MN
SERVICE OR PROGRAM: Clinical pharmacy services orientation curriculum at Duluth Family Medicine Residency Program
JUSTIFICATION/DOCUMENTATION: As the healthcare field strives to achieve the quadruple aim, there has been a shift towards interprofessional collaboration. The goal of the Duluth Family Medicine Residency Program (DFMRP) is to prepare family medicine residents for collaborative rural practice to accomplish this quadruple aim. In 2012, internal restructuring of the DFMRP allowed for integration of Essentia Health clinical pharmacy services into the residency's family medicine clinic. DFMRP and Essentia Health clinical pharmacy leadership have developed several interventions to introduce and foster interprofessional collaboration between medicine and pharmacy. The aim of this poster is to describe the evolution of this clinical pharmacy orientation program at a family medicine residency teaching clinic.
ADAPTABILITY: The goal of orienting medical residents to the roles and responsibilities of pharmacists across patient care settings and integrating pharmacist faculty into their education is to promote future collaboration and improve patient care. Literature suggests it is important to define the pharmacist role "as that of preceptor and not just patient care provider" to optimize resident physician use of clinical pharmacy Incorporating clinical pharmacists into orientation, didactics, and precepting expedited relationship development and increased collaboration between the two professions. Orientation to roles and responsibilities and integration of clinical pharmacy services can be adapted across various practice settings and residency training programs.
SIGNIFICANCE: Through evaluation of this orientation process it was identified that:

- there was a need for clinical pharmacists to be part of the orientation process for incoming first-year family medicine residents
- integration of clinical pharmacy services is most effective when each new family medicine resident orients to the various pharmacy settings (hospital, clinic, community)
- it was desired to have near full time clinical pharmacy services in clinic, which led to adding a pharmacy resident to the site 2.5 days per week

312. Development of disease-specific self-management kits for at-home use: a report from the ACO Research Network, Services and Education (ACORN SEED). My-Oanh Nguyen, PharmD Candidate 2017[1], Leah Loeffler, PharmD, BCPS[1], Tina Joseph, PharmD, BCACP[2], Genevieve Hale, PharmD, BCPS[3], Renee Jones, PharmD, CPh[1], Stephanie Gernant, PharmD, MS[1], Matthew Seamon, PharmD, JD[1]; (1) Department of Pharmacy Practice, Nova Southeastern University College of Pharmacy, Fort Lauderdale, FL (2) College of Pharmacy, Nova Southeastern University, Fort Lauderdale, FL (3) Department of Pharmacy Practice, Nova Southeastern University College of Pharmacy, Palm Beach Gardens, FL
SERVICE OR PROGRAM: Progressive diseases, such as Chronic Obstructive Pulmonary Disease (COPD) and Heart Failure (HF), must be self-managed to decrease acute exacerbations leading to unnecessary hospitalizations. Pharmacists practicing in an Accountable Care Organization (ACO) have developed self-management kits for patients who have COPD or HF. The kit contains educational information about disease state and medications, disease-specific action plans, medications for exacerbations, information for nearest urgent care, and phone number for health coach or physician. Resources will be allocated to patients of all stages of the disease process.
JUSTIFICATION/DOCUMENTATION: There are many transitions of care programs developed from the hospital side to reduce readmissions, but little has been done in the outpatient setting. COPD and HF are common causes of emergency admissions to hospitals nationally, however, there is robust evidence that many admissions are avoidable. Patients at risk of having an exacerbation of COPD or HF should be given a self-management strategy. Prompt therapy in exacerbations results in fewer admissions (and subsequent readmissions) to hospitals, faster recovery and slower progression of the disease. There is limited literature regarding the use of self-management kits on the outpatient basis for prevention of hospital readmissions.
ADAPTABILITY: This can be adapted for any patient with COPD or HF, in all practice settings, including ambulatory care, hospitals, and home health care. Although developed and implemented by pharmacists, various health care professionals can be educated and instructed on this evidence-based practice.
SIGNIFICANCE: As healthcare moves towards a value-based model, primary care physicians need support creating innovative methods for reducing hospital readmissions. Implementation of self-management kits can reduce emergency room visits and hospital admissions, reduce costs, and improve quality of care. Development of self-management kits can potentially be extended to additional disease states.

313. Integration of Clinical Pharmacy in a Chronic Care Management Team within an Accountable Care Organization (ACO): a report from the ACO Research Network, Services and Education (ACORN SEED). Tina Joseph, PharmD, BCACP[1], Genevieve Hale, PharmD, BCPS[2], Renee Jones, PharmD, CPh[3], Stephanie Gernant, PharmD, MS[3], Matthew Seamon, PharmD,

JD[3]; (1) College of Pharmacy, Nova Southeastern University, 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, Fort Lauderdale, FL

SERVICE OR PROGRAM: As of January 2015, the Centers for Medicare & Medicaid Services recognizes Chronic Care Management (CCM) as one of the critical components of primary care. CCM is defined as the non-face-to-face services provided to Medicare beneficiaries who have two or more significant chronic conditions. CCM services are best designed using a multidisciplinary team approach, including physicians, nurse practitioners, pharmacists, medical assistants, paramedics, and mental health coaches. This innovative model, including home visits, pharmacist-led services (i.e. medication reviews), monthly patient education classes and weekly grand rounds, is currently being integrated within offices in an Accountable Care Organization (ACO).

JUSTIFICATION/DOCUMENTATION: The CCM service is extensive, optimally including development of an electronic care plan addressing all health issues, care coordination and medication management. Therefore, a multidisciplinary team, including pharmacists is necessary to optimize the success of these services. Pharmacists are uniquely positioned to help optimize appropriate medication use, reduce medication-related problems, improve health outcomes, and achieve quality measures.

ADAPTABILITY: The development of a CCM team within an ACO can be recreated in various primary care settings. Due to the flexibility of CCM services, this program can be reproduced by any specialty.

SIGNIFICANCE: A well-designed CCM program can generate significant revenue. Integration of clinical pharmacy within a CCM team could effectively reduce health care costs and improve outcomes for patients with chronic conditions. Clinical pharmacists are qualified and eligible to deliver and be paid for CCM services, which allows pharmacists broader opportunities to use their skills and be reimbursed for their work. Additionally, for providers participating in shared savings arrangements (i.e. ACOs), a CCM program is a structured strategy to reduce the total cost of care by preventing high-cost acute episodes such as chronic disease exacerbations, admissions/readmissions, and emergency department visits.

314. Reducing anticoagulation-related hospitalizations and emergency room visits through implementation of a pharmacist-nurse managed Anticoagulation Management Service in a rural integrated health care network. Amanda Winans, PharmD[1], Kelly Rudd, PharmD[2], John Heney, RN[3]; (1) Bassett Medical Center, Cooperstown, NY (2) Department of Pharmacy, Bassett Medical Center, Cooperstown, NY (3) Anticoagulation Management Services, Bassett Healthcare, Cooperstown, NY

SERVICE OR PROGRAM: Bassett Healthcare houses an integrated Anticoagulation Management Service (AMS), an Anticoagulation Center of Excellence recognized for reducing anticoagulation-related hospitalizations and emergency room visits while maintaining a level of therapeutic attainment above the national average. Based on the historical success of the AMS at the primary medical center, an outreach AMS was opened in 2013, expanding across a geographically distant and rural area. The outreach AMS structure modeled the primary AMS, including pharmacist collaboration with physician colleagues under a Collaborative Drug Therapy Management (CDTM) agreement, and the innovative partnership of a Registered Nurse (RN) protocol for warfarin management. This protocol permits the RN to manage warfarin therapy under direct supervision of the pharmacist clinician, allowing pharmacist devotion to the higher risk anticoagulated patients.

JUSTIFICATION/DOCUMENTATION: The outreach AMS has grown significantly and has maintained anticoagulation control above the national average, similar to the primary AMS, while reducing adverse event-related hospitalizations and emergency room visits by 75% and 66%, respectively. The service is financially cost-neutral, avoids eight major adverse drug events (stroke, major hemorrhage or death), and reduces health care expenditures by approximately $120,000 annually, as compared to usual medical care.

ADAPTABILITY: This AMS model is readily reproducible by garnering key stakeholders' and physician colleagues' support. Once a CDTM agreement between the physician(s) and pharmacist clinician(s) has been implemented, a site-specific Pharmacist/RN warfarin dosing partnership may be developed. Given the millions of anticoagulated patients nationwide, such programs have broad generalizability and impact.

SIGNIFICANCE: The innovative use of this practice model allows the pharmacist clinician to practice Comprehensive Medication Management, caring for high risk patients under a CDTM agreement with physician colleagues, while the RN manages warfarin dosing for qualified patients. This ultimately allows all members of the health care team to collaboratively take part in individualized patient care while reducing adverse event rates and associated costs.

315. Collaborative care model with clinical pharmacist care manager for depression remission optimization in primary care. Lauren J. Heath, PharmD[1], Danielle Loeb, MD, MPH[2], Isabella Dai, Student[3], Rachel Griffin, NP[2], Sarah J. Billups, PharmD[1], Katy E. Trinkley, PharmD[1]; (1) University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO (2) University of Colorado School of Medicine, Aurora, CO (3) Purdue University College of Pharmacy, West Lafayette, IN

SERVICE OR PROGRAM: Collaborative care models (CCMs) incorporating a multidisciplinary, stepped care approach to depression treatment is an evidence-based model to improve depression outcomes in primary care. CCMs include a care manager (CM), consulting psychiatrist and primary care provider (PCP). In our unique CCM for depression, a clinical pharmacist served as the CM, providing comprehensive medication management (CMM) services and psychotherapy for depression under a collaborative practice agreement. Patients diagnosed with depression or dysthymia with the most recent nine-item patient health questionnaire (PHQ-9) score > 9 were eligible for referral to the service by PCPs. The CM also called all clinic patients with a recent antidepressant medication initiation or dose increase to evaluate tolerability, adherence and suicidality.

JUSTIFICATION/DOCUMENTATION: Evaluation of process and clinical outcome measures, including time spent, is ongoing. Between February and May 2016, there were 111 eligible patients. Referral orders for 71 patients were pended using a population-based registry. Of the referrals pended, 68 were accepted and an additional 40 were proactively referred by PCPs. Of patients referred, 30 patients scheduled appointments. Additionally, the CM contacted 304 patients to follow-up on recent antidepressant changes and 202 (66.4%) were reached. Initial process-based results demonstrate the successful implementation of a pharmacist-led CCM for depression supporting two primary care clinics.

ADAPTABILITY: This model of care could be expanded to other primary care clinics with or wanting to integrate clinical pharmacists. Further, it can be adapted by clinics who are working toward improving performance of depression remission quality metrics that are newly implemented by the Centers for Medicaid and Medicare Services for value-based reimbursement.

SIGNIFICANCE: Demonstration of the value of clinical pharmacists performing CMM and improving value-based reimbursement metrics is an essential step toward incorporation of clinical pharmacists across healthcare settings.

316. Pharm to farm: on-site farmstead medication management to improve the health and medication safety of farmers. Kelly Cochran, PharmD, BCPS; Division of Pharmacy Practice & Administration, University of Missouri-Kansas City School of Pharmacy at MU, Columbia, MO

SERVICE OR PROGRAM: Pharm to Farm provides farmers, in particular Missouri AgrAbility clients, with accessible clinical pharmacy services through on-site farmstead medication management. A qualified clinical pharmacist assesses medication-related needs, provides health screenings and education, and screens for risks factors which could predispose an individual to medication-related agricultural injury. Screening results and opportunities to optimize drug therapy are communicated to primary care providers through documentation. The local community pharmacist is engaged to generate awareness of medication safety considerations among farmers, AgrAbility resources, and opportunities to advance of rural clinical pharmacy services.
JUSTIFICATION/DOCUMENTATION: One in six hospital admissions are the result of drug-related problems and 50% of hospital admissions could be avoided if these drug-related problems were identified and managed. Similarly, farm injury is a significant issue endangering the lives and productivity of farmers. One in 20 farm injuries each day result in permanent impairment and lost work. The link between these two major health, economic and safety concerns has been explored through surveys demonstrating increased risk for agricultural-related injury when a medication is used regularly. Such literature justifies the need and potential safety benefit for farmers to receive comprehensive medication management performed by a clinical pharmacist.
ADAPTABILITY: Opportunities to adapt this service through partnerships with community pharmacies, payers, rural health clinics, and rural hospitals may exist to expand clinical pharmacy services while improving care transitions and patient outcomes. Such partnerships may further enhance the capacity of Pharm to Farm to provide collaborative-drug therapy management as well as ensure coordination of monitoring and team-based care.
SIGNIFICANCE: Clinical pharmacists are equipped to assess, identify and resolve drug-related problems which may have the potential to increase the risk of farm injury among those in production agriculture. On-site farmstead medication management allows the clinical pharmacist to thoroughly evaluate the individual's medication experience.

Clinical Administration

317. Development of clinical pharmacy services within a community hospital. Kristina Bryowsky, PharmD, Lauren Odum, PharmD, Emily Buchanan, PharmD, Chris Carter, PharmD, Kylie Scimio, PharmD, Molly Thompson, PharmD, Tyson Lotz, PharmD; Department of Pharmacy, St. Clare Hospital, Fenton, MO
SERVICE OR PROGRAM: Of 4926 hospitals in the United States, the majority are community hospitals. Since many pharmacists practice in this setting and 32% of 2016 PGY1 candidates did not match, community hospitals are a great venue to expand clinical pharmacy services and training. SSM Health St. Clare Hospital is located in Fenton, Missouri and opened in March 2009. It is a 180-bed community hospital with on-campus ambulatory care providers. In January 2015, clinical pharmacy services were implemented and a PGY1 pharmacy residency program was created. The pharmacy department decentralized and two inpatient specialists, one ambulatory specialist, and two residents were hired.
JUSTIFICATION/DOCUMENTATION: The main financial justifications for the new positions were drug savings and Graduate Medical Education funds. Additional goals of the clinical pharmacy services were to improve compliance with inpatient Core Measures, increase inpatient education and medication reconciliation, and establish ambulatory care disease state management. The results are as follows: inpatient drug cost avoidance over the past 12 months was $256,074; Core Measure fallouts from Q1 2015 to Q1 2016 were reduced from 4 to 1; inpatient education and medication reconciliation opportunities from Q1 2015 to Q1 2016 improved from 11.3% to 41.2%; an ambulatory care collaborative practice agreement was implemented and 75% of managed patients achieved their disease state goal.
ADAPTABILITY: Gaining administrative support and demonstrating value of a clinical model using similar measures in other community hospital settings is possible to allow for this practice transformation. Staff preparation and support are also crucial to its success.
SIGNIFICANCE: The significance of our program is that SSM Health St. Clare Hospital is decreasing healthcare costs, improving patient outcomes, and training new clinicians in a setting that offers an area of growth for clinical pharmacy.

318. Transition of clinical pharmacists and clinical pharmacy specialists to mid-level provider status within the VA Central Iowa Healthcare System. Mary Rasmussen, PharmD[1], Mary Beth Gross, BS Pharm, PharmD[1], Jessica Coleman, BSW[2]; (1) Pharmacy Department 119, VA Central Iowa Healthcare System, Des Moines, IA (2) Credentialing, VA Central Iowa Healthcare System, Des Moines, IA
SERVICE OR PROGRAM: Clinical pharmacists with prescriptive authority at the VA Central Iowa Healthcare System have successfully transitioned to mid-level provider status within the facility. This level of practice is regulated by facility Credentialing and the Executive Committee of Medical Staff (ECOMS) to confirm the competence of all providers.
JUSTIFICATION/DOCUMENTATION: National guidance from the VA encouraged transitioning pharmacists with prescriptive authority to mid-level provider status within VA facilities. Pharmacy Service worked with the Credentialing and Privileging Coordinator to gradually implement this change. To move toward mid-level status, education was provided to ECOMS members to show what types of services pharmacists provide. Internal processes, including requirements for peer review and request for prescriptive authority, were modified to match those used by other mid-level providers such as Physician Assistants.
ADAPTABILITY: The service noted great success by first presenting pharmacist prescriptive scopes to ECOMS as informational only. Over the course of two years, the pharmacists transitioned to mid-level status. By initially presenting the pharmacists at ECOMS as informational only, the Pharmacy Chief was able to learn the normal processes followed for provider privileging, the types of questions asked when new providers are privileged, and to familiarize the committee members with pharmacist credentials and services offered. This transition was greatly aided by assistance and support from our Credentialing and Privileging Coordinator.
SIGNIFICANCE: VA Central Iowa Healthcare System successfully transitioned all pharmacists with prescriptive authority to mid-level status within our facility. Participating in this process and being recognized by ECOMS solidified the pharmacists' positions as mid-level providers by incorporating pharmacists into the existing credentialing and privileging process for all providers in the facility. The transition to being recognized and evaluated as mid-level providers validates the excellent work the pharmacists provide to Veterans and endorses the continued development and expansion of pharmacy practice.

Critical Care

319. Critical care PRN membership needs assessment/benefits survey. Jenna L. Foster, PharmD, BCPS, BCCCP[1], Pamela L. Smithburger, PharmD, MS, BCPS[2], Scott Bolesta, PharmD, BCPS, FCCM[3], Kamila A. Dell, PharmD, BCPS[4], Drayton Hammond, PharmD, MBA, BCPS, BCCCP[5], Christen Freeman, PharmD, MBA[6]; (1) Department of Pharmaceutical Services and Clinical Nutrition, Palmetto Health Richland, Columbia, SC (2) Pharmacy and Therapeutics, University of Pittsburgh School of Pharmacy, Pittsburgh, PA (3) Department of Pharmacy Practice, Wilkes University, Wilkes-Barre, PA (4) Department of Pharmacotherapeutics and Clinical Research, University of South Florida College of Pharmacy, Tampa, FL (5) Department of

Pharmacy Practice, University of Arkansas for Medical Sciences, Little Rock, AR (6) Pharmacy Department, DCH Regional Medical Center, Tuscaloosa, AL
SERVICE OR PROGRAM: The ACCP Critical Care PRN Membership Committee, which was created in the Fall 2015, evaluated members' awareness and utilization of current benefits to identify areas for improvement and growth for current and/or future services/benefits.
JUSTIFICATION/DOCUMENTATION: The ACCP Critical Care PRN Steering Committee is charged with stewarding resources and supporting initiatives that align with its members' priorities. The Critical Care PRN Steering Committee finalized questions developed by the Critical Care PRN Membership Committee then solicited responses from the Critical Care PRN members through the Listserv between April 18-May 11, 2016. Of the total respondents (n=213), the majority were full members (77.5%) of ACCP who have been members of the Critical Care PRN for < 5 years (65.3%), with post-graduate PGY2 or fellowship training in critical care (53%), and previously published in peer-reviewed journals (64.6%). Of 59 respondents who held BCCCP and at least one other board certification, 45.8% plan to maintain both certifications, while 25.4% of those with multiple certifications did not plan to maintain both, and 28.8% were unsure. The majority (64.2%) of respondents who did not currently hold BCCCP certification anticipated sitting for the exam in the future. Networking and the PRN update were perceived to be the most important/impactful parts of the annual PRN business meetings. Online platforms (i.e., PRN social media accounts, PRN website) and complimentary trainee PRN membership were benefits that members were least aware of, while the PRN Listserv (both active and archives) were the most utilized. Critical Care PRN awards and research committee scholarships/grants were the benefits with the least utilization despite awareness.
ADAPTABILITY: Our findings may resemble the opinions of other ACCP members. Other PRNs are encouraged to conduct their own needs assessment/benefit survey.
SIGNIFICANCE: Responses will be used to guide programming, committee charges, and advertisement of PRN resources and benefits in the coming year.

320. Impact of tele-ICU pharmacy services across a healthcare system. Desiree Kosmisky, PharmD, Sonia Everhart, PharmD, BCPS, BCCCP, Nehal Thakkar, MD, Michael Reif, MD, Kimberly Purtill, RN, MS, CCRN-E; Virtual Critical Care, Carolinas HealthCare System, Mint Hill, NC
SERVICE OR PROGRAM: Critical care pharmacy tele-intensive care unit (ICU) services at Carolinas HealthCare System (CHS) were implemented in September 2015 providing coverage in conjunction with tele-ICU physicians for 137 ICU beds at eight facilities during peak admission hours. TheraDoc™ alerts for abnormal electrolyte, glucose, and lactate levels trigger pharmacist evaluation and intervention. New admissions, stress ulcer and thromboembolism prophylaxis, and antimicrobial therapies are also assessed. Interventions are communicated to the tele-ICU physician. Upon physician approval, pharmacists enter orders and write a progress note in the electronic medical record. Changes are also directly communicated to the bedside by the tele-ICU nurse. The tele-ICU pharmacist also facilitates drug information questions, therapy recommendations, and order entry.
JUSTIFICATION/DOCUMENTATION: National pharmacy and critical care medicine organizations have published guidelines and position papers stating that pharmacy services provided by a trained critical care pharmacist are essential in the ICU. Critical care pharmacists have favorable impacts on costs, morbidity, and mortality in various ICU settings. Currently, CHS facilities where interventions are performed lack 24/7 intensivist coverage and only one facility has a dedicated daytime critical care pharmacist. The tele-ICU pharmacist serves to fill this gap and also implements many pharmacotherapy interventions that previously required substantial tele-ICU physician time. In nine months, 2676 interventions were performed for 1460 unique patient encounters, including 68 adverse drug events avoided.
ADAPTABILITY: A standard workflow is followed but services are flexible to meet the needs of individual patients and prescribers. The model utilized by the tele-ICU pharmacy program could be adapted for healthcare systems to extend remote monitoring and population management.
SIGNIFICANCE: Projected cost savings, improvement in glycemic control, and reduction in adverse events justify the tele-ICU pharmacist as a valuable addition to the tele-ICU team. As telemedicine continues expanding, this practice model could serve as a guide for pharmacy services.

321. Safe use of inhaled epoprostenol for inter-hospital transport of patients with severe acute respiratory distress syndrome. Christopher Paciullo, PharmD, BCCCP, FCCM[1], Tish Kuban, RPh, MBA[2], Bruce Bray, RRT, RCP[3], James Blum, MD, FCCM[4]; (1) Department of Pharmaceutical Services, Emory University Hospital, Atlanta, GA (2) Department of Pharmaceutical Services, Emory University Hospital, Atlanta, GA (3) Department of Respiratory Care, Emory University Hospital, Atlanta, GA (4) Department of Anesthesiology, Emory Unveristy School of Medicine, Atlanta, GA
SERVICE OR PROGRAM: In 2014 the Emory Extracorporeal Membrane Oxygenation (ECMO) Center was established with the goal of accepting patients with severe acute respiratory distress syndrome (ARDS) from outside institutions. A process to administer inhaled epoprostenol during inter-hospital transport was developed to improve patients' oxygenation and allow for safe transport to a facility capable of cannulating for ECMO in a controlled environment.
JUSTIFICATION/DOCUMENTATION: The use of inhaled epoprostenol during transport would allow patients who otherwise could not be transported, or would need to be cannulated remotely, to be safely transferred without the need for remote cannulation. Remote cannulation for ECMO by the Emory team while the patient is at another institution is reserved for patients who cannot be safely transported to Emory because of ongoing, life threatening hypoxia refractory to all other interventions. Inter-hospital transport of patients on ECMO carries much higher rates of complications, including death. There are currently no other inhaled vasodilators that can be administered during transport.
ADAPTABILITY: In conjunction with respiratory therapy, a process was worked out for safe distribution, compounding and administration. Changes to the normal process of transporting a ventilated patient were modified with assistance from the critical transport service. Modifications to the original protocol were made based on feedback from the transport team. Hospital administrators worked with the state Board of Pharmacy to ensure compliance with all regulations.
SIGNIFICANCE: Through a multi-disciplinary team of clinical pharmacists, respiratory therapists, emergency medical technicians and intensivists, inhaled epoprostenol can be safely used to transport patients who otherwise would be too sick to safely transfer to an institution capable of advanced therapies such as ECMO. We have successfully transferred four patients in the first six months of the program. To our knowledge, there are no previous reports of inhaled epoprostenol being used in the transport of critically ill patients.

322. Pharmacists as essential members of the intensive care unit team: development of 24/7 critical care clinical pharmacy services. Julia Balazh, PharmD, Nicole Maltese Dietrich, PharmD, Evan Telford, PharmD, Andrew Hendrickson, PharmD, Don Reeder, PharmD, Andrew Franck, PharmD; North Florida/South Georgia Veterans Health System, Gainesville, FL
SERVICE OR PROGRAM: Our institution has developed a model in which critical care clinical pharmacy specialists provide

direct patient care in the intensive care unit around-the-clock. Pharmacists are credentialed and have an advanced scope of practice that includes prescribing authority. Services provided include clinical, educational, administrative and research activities as described by SCCM/ACCP as fundamental, desirable and optimal. Pharmacists are stationed in the ICU with minimal duties in other areas. All pharmacists providing extended coverage to the ICU have completed at least two years post-doctoral residency/fellowship training.

JUSTIFICATION/DOCUMENTATION: Pharmacists are considered vital team members in the ICU. Despite ample evidence supporting the positive impact of pharmacists in this setting, around-the-clock critical care clinical pharmacy services remain rare. After an internal quality improvement initiative, our institution identified that pharmacists were underutilized in the ICU, especially during nonstandard working hours. With the goal to improve outcomes, additional pharmacist positions were created for overnight and weekend coverage to ensure continuous critical care clinical pharmacy services.

ADAPTABILITY: Successful implementation of this practice was significantly aided by receiving high level support from key institutional stakeholders, including physician and nursing advocates who recognized the value of pharmacists. Adequately trained critical care pharmacy staff was a vital component for implementation and was aided by our institution's critical care residency and fellowship programs. The practice model we have developed could be implemented in many institutions where resources allow. Our experience highlights the need for expansion of critical care training programs.

SIGNIFICANCE: Around-the-clock critical care clinical pharmacy services are an important advancement in pharmacy practice that have the potential to improve ICU outcomes. Objective evaluation of the impact of these services is underway at our institution.

Education/Training

323. Students of pharmacy and dentistry collaborate in an interprofessional predoctoral dental clinic. Jessica L. Johnson, PharmD, BCPS[1], Adrianne Mitchell, BS Pharm[1], Sandra Andrieu, MEd, PhD[2], John Okogbaa, PharmD[1], Alex Ehrlich, DDS[2], Francis T. Giacona, DDS[2], Chet Smith, DDS[2]; (1) College of Pharmacy, Xavier University of Louisiana, New Orleans, LA (2) School of Dentistry, Louisiana State University Health Sciences Center, New Orleans, LA

SERVICE OR PROGRAM: For this pilot experience, 32 pharmacy students paired with predoctoral dental students to develop care plans for patients attending a low-cost dental clinic. Student teams worked collaboratively to obtain a patient history and physical exam, then developed a corresponding care plan for documentation in the electronic health record. Pharmacy student interventions focused on blood pressure, pain management, anticoagulant/antiplatelet therapy, antibiotic stewardship, and nutrition.

JUSTIFICATION/DOCUMENTATION: Dental students receive as little as 60 contact hours of medicinal chemistry or pharmacology in their professional curriculum. Consequently, they often have questions about pharmacotherapy, drug-drug interactions, and advances in pharmacy law, particularly relating to analgesics as controlled substances. Availability of clinical pharmacy services on-site should increase dental practitioner awareness and reliance on those services to improve patient care decision-making.

ADAPTABILITY: Moving forward, the Dental Clinic at the Louisiana State University School of Dentistry (LSU-SOD) will continue to serve as an Introductory Pharmacy Practice Experience (IPPE) site for all students enrolled in the first- and third-professional years of the Xavier University of Louisiana College of Pharmacy (XULA-COP). Faculty of both LSU-SOD and XULA-COP serve as preceptors at the site to stimulate interprofessional discussion and interaction and guide collaborative care plan development. Similar rotation sites could be established at other colleges of dentistry to facilitate interactions between dental and pharmacy professional students and improve patient outcomes.

SIGNIFICANCE: The LSU-SOD predoctoral student clinic provides low-cost dental care to approximately 5,000 New Orleans residents per year. Nearly 300 pharmacy students and 120 dental students will participate each year in the interprofessional clinic once fully established, representing a full 50% of the enrollment of each college. Building trust and collaboration between pharmacy and dental professionals in a predoctoral student clinic has the potential to significantly impact interprofessional relationships and patient outcomes.

324. Hotspotting: students of pharmacy as system navigators for high-utilizing patients. Jessica L. Johnson, PharmD, BCPS[1], Jennifer Avegno, MD[2], Catherine Jones, MD[3], Sarah Candler, MD, MPh[3], Deborah St. Germain, DNP[4]; (1) College of Pharmacy, Xavier University of Louisiana, New Orleans, LA (2) School of Medicine, Louisiana State University Health Sciences Center, New Orleans, LA (3) Tulane University School of Medicine, New Orleans, LA (4) School of Nursing, Louisiana State University Health Sciences Center, New Orleans, LA

SERVICE OR PROGRAM: The "Hotstpotting" program of New Orleans allows interprofessional teams of health professions students to serve as system navigators for patients identified as high-utilizers of the healthcare system in terms of visit frequency or cost of care. Pharmacy students are paired with another health professions student and work directly with individual patients to set and achieve patient-directed health goals. Students may attend medical appointments or home visits with patients, provide appointment or medication adherence reminders, or assist in securing aid from federal or community-based welfare programs.

JUSTIFICATION/DOCUMENTATION: By serving as system navigators for these high-utilizing patients, students learn about the complex medical care system in the United States, the impact and prevalence of social determinants of health, and community resources available in their local areas. Students also practice motivational interviewing skills, develop empathetic relationships with patients, and innovate sustainable solutions to patients' barriers to health. These skills and experiences serve to help develop students into competent, compassionate, collaborative clinicians with a full understanding of the complexities of caring for the underserved.

ADAPTABILITY: In New Orleans, this experience has been run either through extra-curricular student organizations or adapted into the curriculum of local Colleges or Schools of Pharmacy, Medicine, Nursing, and Public Health. The experience for a student can range in duration from 6 months to multiple years of engagement with the program.

SIGNIFICANCE: The nature of the important work of a system navigator is not that of direct patient care, and is therefore most often done by either social workers or individuals with no formal medical training. Allowing professional students, including pharmacy students, the opportunity to engage in system navigation develops skills and attitudes consistent with collaborative, team-based practice and patient-centered care.

325. Pharmacotherapy as required rotation within a family medicine residency. Carolyn Brackett, BS, PharmD[1], Andrew Sitzmann, MD[2]; (1) Division of Pharmacy Practice and Science, Ohio State University College of Pharmacy, Columbus, OH (2) Department of Family Medicine, Mount Carmel Health System, Westerville, OH

SERVICE OR PROGRAM: A faculty pharmacist mentors a required 4-week interdisciplinary rotation for PGY1 family medicine resident physicians. The rotation is simultaneously offered as an elective for other resident physicians and for APPE pharmacy students. Together, the PGY1 physicians and APPE students complete a 20-h per week didactic curriculum of pathophysiology,

pharmacology, evidence-based evaluation of treatment, and clinical decision-making, supported by a platform of core medical conditions. The didactic component is coupled with 20 h per week of patient care in an outpatient Family Medicine clinic.
JUSTIFICATION/DOCUMENTATION: Surveys indicate residents believe the rotation improves their knowledge of medications and diseases, and refines their decision-making competence. The rotation affords PGY-1 resident physicians more patient care time than was previously possible. Surveys of faculty physicians indicate residents who have taken the rotation develop more rapid inter- and intra-year progression than unexposed residents.
ADAPTABILITY: The rotation model is easily adaptable to any specialty or practice site affiliated with a medical residency program, and with a patient population managed primarily with pharmacotherapy. Association with a College of Pharmacy is desirable as co-education of medical residents and pharmacy students affords a highly synergistic experience for all learners.
SIGNIFICANCE: Medications represent the primary, non-surgical therapy employed in Western medicine. Evidence-based pharmacotherapy, management of complex regimens, and systematic decision-making are processes typically refined over years. A rotation that focuses expressly on these skills permits medical residents and student pharmacists to become independent clinicians more rapidly, with a clearer understanding of medication-related risks and benefits than would otherwise be acquired in the early months of practice. Faculty physicians feel residents become clinically competent earlier in their training. Pharmacy students experience an interdisciplinary environment that allows them to work and learn in continuous contact with physicians. Session attendees will be granted access to all teaching materials upon request.

326. Development of a Student-Led Ambulatory Medication Reconciliation (SLAMR) Program at an academic institution. Aimon C. Miranda, PharmD, BCPS, Melissa Ruble, PharmD, BCPS, Jaclyn Cole, PharmD, BCPS, Erini Serag-Bolos, PharmD; Department of Pharmacotherapeutics and Clinical Research, University of South Florida, College of Pharmacy, Tampa, FL
SERVICE OR PROGRAM: Fourth year pharmacy students were partnered with physicians to conduct medication reconciliations during patient visits in the cardiology, family medicine, internal medicine, and general medicine/pediatric ambulatory care clinics. Students received training during the first week of each rotation regarding objectives, documentation, and a tutorial on the electronic medical record (EMR) system. Students completed a 4-h clinic block each week, providing additional opportunities to practice medication management skills within a healthcare team. This also allowed other healthcare professionals to allocate time to other areas of the patient visit, leading to more streamlined patient care. Patients were provided individual attention from pharmacy students to discuss medication-related concerns. Students were instructed to contact their pharmacy liaison for additional assistance and reported discrepancies to the physician through verbal and/or written communication.
JUSTIFICATION/DOCUMENTATION: This program originated from physician requests for additional pharmacy involvement in the medication reconciliation process. Documentation of pharmacy student interventions were initiated in January 2016. Students were provided with a standardized data collection form, which was submitted to respective pharmacy preceptors after each rotation block.
ADAPTABILITY: Services provided by students may serve as an extension of the preceptor while ensuring pharmacy participation in the healthcare team through interprofessional communication. This model could be adapted to other ambulatory care clinics since it was modified for each specialty clinic to align with their workflow.
SIGNIFICANCE: During a 3 month period, pharmacy students completed 180 medication reconciliations interventions on 135 patients, including commission of medications (37%), documentation of previously omitted medications (21%), and updated patient allergy information (19%). Students spent an average of 10 min on each encounter, prevented 12 adverse drug reactions (ADRs), and counseled select patients on their medications. Documentation from this innovative program suggests improvement in medication reconciliation for enhanced patient care with limited time required of pharmacy students and preceptors.

327. The Clinical Training Center: a layered-learning rotation model to meet hospital goals and standards of practice. Jordan Masterson, PharmD, BCPS, Aubrie Rafferty, PharmD, BCPS, Elizabeth Michalets, PharmD, BCPS, FCCP; Mission Health System and UNC Eshelman School of Pharmacy, Asheville, NC
SERVICE OR PROGRAM: The Clinical Training Center (CTC) model consists of an attending pharmacist, two fourth year (PY4) students and up to three early immersion (EI) students from UNC Eshelman School of Pharmacy. The CTC team provides all clinical services for twelve inpatient units (medical and surgical) at a 750-bed community hospital in Western North Carolina. Clinical services include renal dosing, drug therapy monitoring, medication histories, pharmacokinetic dosing, transitions of care (TOC) management, and discharge education.
JUSTIFICATION/DOCUMENTATION: The CTC was developed to provide quality, layered-learning, hands-on clinical experiences for a large volume of students without increasing preceptor burden. The model also allows for decreased pharmacist-to-bed ratios for decentralized clinical pharmacists, allowing for potential expansion of patient care services.
ADAPTABILITY: Based on the clinical services provided at baseline, the CTC requires a minimum of one pharmacist and four students to provide continuous weekday coverage. Student workload can be divided by patient care unit or clinical activity. As new clinical and operational objectives are developed or as student curriculum or volume changes, the CTC can adapt to meet evolving patient care or educational needs.
SIGNIFICANCE: Students assisted in meeting both Process of Care and Documentation Standards of Practice. During one month, EI students assessed 1,822 medications for renal dosing adjustments resulting in 44 dose changes, with 50% involving high risk medications. PY4 students completed 318 provider-generated medication dosing consults and 52 TOC consults. A total of 342 TOC management interventions were made by CTC students with 14% involving high risk medications. Learners in the CTC directly interacted with 93 patients on the covered units, which represented a 2.3 fold increase compared to baseline, prior to CTC implementation. Importantly, the CTC model accomplished a 52% decrease in pharmacist-to-bed ratio for decentralized clinical pharmacists. Additional operational and clinical evaluation is ongoing.

328. Development of a residency assistance program for fourth year pharmacy students. Leigh Gravatt, PharmD; Department of Pharmacotherapy and Outcomes Sciences, Virginia Commonwealth University School of Pharmacy, Richmond, VA
SERVICE OR PROGRAM: The Residency Advising Program was developed and initiated in Fall of 2015 at the Virginia Commonwealth University School of Pharmacy. Fourth year pharmacy students voluntarily enrolled in the program through a survey that was sent to students. This program included pairing with a Faculty mentor, a Podcast series on elements of the residency application process, mock video interviews, Phase 2 match assistance and a Match Day Celebration.
JUSTIFICATION/DOCUMENTATION: The Residency Assistance Program was developed in an effort to improve our school's match rates. This program was based on experience mentoring students through the residency along with a survey that we administered to Fourth Year Pharmacy students who just completed the residency process. Through this survey the top areas for improvement were personalized mentorship through the residency process with a faculty member, mock interviews and assistance with writing a Letter of Intent.

ADAPTABILITY: This program was easy to implement and did not require any additional financial resources. The ability to provide assistance to students who were on rotations throughout the state and country were also an added benefit of the program. The next steps of this program are to continue to expand the podcast series to include more information on fellowships and to develop programming for first through fourth year pharmacy students.
SIGNIFICANCE: Implementation of the program led to a significant 11.6% increase in the number of students who successfully matched during the residency process in 2016. This was also 17.3% higher than the national match average. Students who went through the residency advising program was surveyed and those who responded had a highly favorable view of the program and cited the podcast as one of the most useful elements of the residency advising programs.

Emergency Medicine

329. Emergency medicine pharmacists and board certification choices: a high-risk clinical practice at the intersection of simultaneous critical care, acute care and ambulatory care patients. Sandy Bartlett, PhD, PharmD, BCPS, BCCCP, Erica Meehan, PharmD Candidate, Gwen Bartlett, BS Pharm, PharmD, BCPS, BCCCP; School of Pharmacy, Husson University, Bangor, ME
SERVICE OR PROGRAM: Emergency Medicine.
JUSTIFICATION/DOCUMENTATION: Emergency medicine pharmacists practice in a high-risk environment simultaneously caring for patients at the intersection of critical care, acute care and ambulatory care. The ACCP Standards of Practice for Clinical Pharmacists discuss board certification and recommend "certification and maintenance of certification for the appropriate specialty relevant to their practice". Without a recognized board specialty certification available in emergency medicine, it is important to explore which credential is optimal to provide the highest quality of direct patient care, facilitate competence, and provide satisfying professional development for an emergency medicine pharmacist in this highly diverse practice environment.
ADAPTABILITY: This study examines board certification held by emergency medicine pharmacists using a cohort of the Emergency Medicine Practice & Research Network (EMED) at a single time period. This method of investigation can be adapted for use by other diverse clinical practice environments to examine board certification trends and to make recommendations for potential best-practice credentialing in those settings.
SIGNIFICANCE: For the EMED cohort obtaining pharmacy specialty board certifications during the Fall 2015 testing cycle, 57% obtained critical care (BCCCP), 41% received pharmacotherapy (BCPS) and 3.4% gained pediatrics (BCPPC) credentials. Initial data suggests the new critical care credential may be appealing for emergency medicine pharmacists. Another interesting trend emerging in EMED is multiple credentialing. Of the group with multiple board certifications, 10.4% hold dual board certifications (87% have BCPS and BCCCP credentials) and 0.73% hold triple board certifications. Will this become the expectation of emergency medicine pharmacists in such a diverse clinical practice without a specialty board certification in emergency medicine?

Family Medicine

331. A population health intervention by PGY2 pharmacy residents to optimize medication management in patients with atherosclerotic cardiovascular disease (ASCVD). Michael Kelly, PharmD[1], Jessica L. Norman, PharmD[1], Alvin Oung, PharmD[1], Sara Wettergreen, PharmD[1], Joseph J. Saseen, PharmD[2], Joseph Vande Griend, PharmD[3]; (1) University of Colorado Anschutz Medical Campus, Aurora, CO (2) Department of Clinical Pharmacy, University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO (3) University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO
SERVICE OR PROGRAM: From 7/2015–12/2015, PGY2 residents imbedded at three family medicine clinics (FMCs) reviewed electronic health records (EHR) of patients with ASCVD to identify medication-related problems (MRPs) and provide comprehensive medication management (CMM). Scheduled appointments for patients with ASCVD were identified with weekly automated EHR lists using diagnosis codes. Targeted MRPs included appropriateness of statin intensity and antiplatelet therapy, evaluation of ASCVD risk-reduction medications, interventions to improve hypertension and diabetes control, drug-drug interactions, immunizations, and unnecessary lipid-lowering medications. Residents sent notes through the EHR to providers, documenting recommendations regarding MRPs prior to patients' appointments. Providers could then act upon the recommendations at the patient visit.
JUSTIFICATION/DOCUMENTATION: In total, 223 patients with ASCVD were reviewed, and 89 of 223 (39%) had one or more MRPs. For these patients, 176 CMM recommendations were made, and 50% of these were implemented. Commonly identified MRPs included need for influenza/pneumococcal vaccination (48.3%), increase to high-intensity statin (13.6%), and optimization of diabetes or hypertension (5.1%). Recommendations with the highest provider acceptance rate were adding statin therapy (87.5%), optimizing hypertension or diabetes treatment (62.5% for both), and immunizations (57.7%).
ADAPTABILITY: This intervention utilized PGY2 pharmacy residents imbedded at three family medicine clinics to optimize medication management for the population of patients with ASCVD. PGY2 residents provided high-level care and identified many MRPs. This intervention could be utilized by other family medicine clinics, but may be improved by using collaborative practice agreements to optimize resolution of identified MRPs.
SIGNIFICANCE: A population health intervention improved healthcare quality for patients with ASCVD at three FMCs. Utilizing PGY2 residents to deliver clinical pharmacy services in FMCs can improve medication management for patients with ASCVD.

HIV/AIDS

332. Description of collaboration between an interdisciplinary Human Immunodeficiency Virus (HIV) clinic. Thomas Chiampas, PharmD[1], Melissa E. Badowski, PharmD[2], Rodrigo Burgos, PharmD[3], Sarah Michienzi, PharmD[1], Renata Smith, PharmD[1]; (1) Section of Infectious Diseases, Department of Pharmacy Practice, University of Illinois at Chicago College of Pharmacy, Chicago, IL (2) College of Pharmacy, University of Illinois at Chicago, Chicago, IL (3) Section of Infectious Disease Pharmacotherapy, Department of Pharmacy Practice, University of Illinois at Chicago College of Pharmacy, Chicago, IL
SERVICE OR PROGRAM: The clinical pharmacy team in HIV and Infectious Diseases (ID) at the University of Illinois at Chicago has been providing clinical care for over 20 years. Our role is vast and encompasses care at clinics on campus (ambulatory care and telemedicine) as well as six off-campus clinics throughout Chicago, in areas with the lowest socioeconomic status. The off-campus clinics are located in discrete store-front clinics in underserved communities such as Austin, Englewood, South Chicago, and others. Some clinical pharmacy responsibilities include: constructing and redesigning combination antiretroviral therapy; providing education; monitoring and assessing adherence, efficacy, safety, and tolerability to medications; ensuring cost-effective drug therapy; ensuring access to medications; coordinating clinical trials; administering immunizations; and providing harm-reduction counseling and pre-exposure prophylaxis for HIV-uninfected individuals.
JUSTIFICATION/DOCUMENTATION: HIV is now considered a chronic disease state; however, caring for HIV-infected patients remains complicated due to complex drug-drug interactions,

literacy limitations, mental health issues, lack of secure housing, substance abuse, and other dynamics. An interdisciplinary approach, including an ID physician, clinical pharmacist, nurse, social worker, case manager, outreach worker, and phlebotomist, offers unique opportunities for clinical pharmacy services as well as improved patient care.
ADAPTABILITY: Previous assessments have demonstrated the positive impacts pharmacists can have on patient care. A critical part of our model is ensuring that patients retain engaged in care working with each patient individually to develop a treatment strategy with the best likelihood of success. This approach can most likely be applied across clinic settings, regardless of the disease state.
SIGNIFICANCE: An interdisciplinary approach to HIV care offers unique opportunities for the integration of clinical pharmacy services into the healthcare team. Furthermore, off-campus clinics, within communities where HIV may be more prevalent, allow for easy access to healthcare. Additionally, by maintaining access to antiretrovirals, our clinics may assist with decreasing transmission, and reducing morbidity and mortality.

Infectious Diseases

333. Partnership between a community hospital and academic medical center to establish a sustainable antimicrobial stewardship program. Dan Fleischman, PharmD[1], Daniel Schenkat, PharmD[2], Lucas T. Schulz, PharmD, BCPS[2]; (1) Monroe Clinic, Monroe, WI (2) Department of Pharmacy, University of Wisconsin Hospital and Clinics, Madison, WI
SERVICE OR PROGRAM: A non-infectious diseases trained clinical pharmacist initiated antimicrobial stewardship (AMS) at a 58-bed community hospital (CH) in 2013, which focused on IDSA/SHEA supplemental strategies. A 1-year partnership between the CH and an academic medical center (AMC) was established in 2014 to advance the CH's AMS program. The AMC reviewed CH patients remotely for seven months and wrote daily, non-permanent, electronic medical record notes to communicate with CH pharmacists. Community hospital pharmacists recommended interventions to CH providers. All AMS strategies developed during partnership were continued post-partnership by the CH team.
JUSTIFICATION/DOCUMENTATION: Effective AMS teams are ideally led by an infectious diseases (ID) physician and ID-trained clinical pharmacist. The inability to access internal ID specialists should not inhibit AMS development within small CHs. Short-term, AMC partnership can help a CH develop sustainable AMS.
ADAPTABILITY: Community hospital and AMC partnerships are becoming easier with advancing technology. Partnerships can help a CH implement successful AMS, especially if the organizations' pharmacy departments collaborate.
SIGNIFICANCE: Outcomes were compared between seven-month periods (June-December) over four years (2012–2015) to assess the impact and sustainability of AMS partnership. Partnership reduced readmission rate (18.83% vs. 12.58%, p=0.019) and hospital onset *Clostridium difficile* infection rate per 1000 patient days (1.26 vs. 0.2, p=0.044); both were sustained post-partnership. Partnership reduced length of stay (4.64 vs. 4.16, p=0.017), but this was not sustained post-partnership. Mortality rate remained unchanged. Partnership decreased days of therapy per 1000 patient days (DOT) for imipenem-cilastatin (82.78 vs. 30.85, p<0.0001), levofloxacin (123.46 vs. 99.2, p<0.0001), piperacillin-tazobactam (153.1 vs. 142.16, p=0.116), and vancomycin (103.82 vs. 85.14, p=0.001). Imipenem-cilastatin and levofloxacin DOT decreased post-partnership (30.85 vs. 10.4, p<0.0001; 99.2 vs. 81.66, p=0.002, respectively) but piperacillin-tazobactam and vancomycin DOT increased post-partnership (142.16 vs. 202.96, p<0.0001; 85.14 vs. 114.24, p<0.0001, respectively). Partnership improved clinical outcomes, decreased broad-spectrum antibiotic use, and established a sustainable CH AMS program.

334. An interdisciplinary team approach to hepatitis C evaluation and treatment: assessing the impact of clinical pharmacist involvement on HCV clinical practice and treatment. Autumn D. Bagwell, PharmD, BCPS[1], Cody Chastain, MD[2]; (1) Vanderbilt Specialty Pharmacy, Vanderbilt University Medical Center, Nashville (2) Division of Infectious Diseases, Vanderbilt University Medical Center, Nashville
SERVICE OR PROGRAM: The objective of this pilot program was to assess the benefit of integrating a clinical pharmacist (CP) in an existing infectious diseases (ID) clinic to manage patients with hepatitis C virus (HCV) infection. Following an initial clinical evaluation by a prescribing provider, patients were referred to the CP for pre-treatment evaluation and counseling. The CP then navigated the process of procuring medication assistance for the patient. Once patients were approved by insurers and prepared for treatment, the CP provided patient-specific medication education and action plans. A prescribing provider evaluated patients by week 4 of treatment and 12 weeks after treatment completion, and the CP assessed patients in clinic and by phone at these and other as needed intervals.
JUSTIFICATION/DOCUMENTATION: In the first two quarters, the pharmacist performed 73 visits that would have previously have been performed by a prescribing provider (36% of all clinic visits). The time to HCV treatment approval decreased by 78% and the time to treatment initiation decreased by 74%. Patient satisfaction surveys have shown that patients involved in the multidisciplinary clinic model believe they receive better care because of the team approach.
ADAPTABILITY: This clinic model is easily adaptable for clinical pharmacists involved in the treatment of human immunodeficiency virus (HIV), viral hepatitis, or within an ID or ambulatory care clinic. The pharmacist is integrated into the clinic work flow and maintains close contact with the patient beyond clinic.
SIGNIFICANCE: A greater number of patients are eligible for HCV treatment, stressing a limited number of clinical providers, as noted in the 2014 ACCP Joint Opinion of the GI/Liver/Nutrition and Infectious Diseases Practice and Research Networks. Pharmacists are in an ideal position to mitigate this disparity. With the high cost of these agents, it is imperative that patients receive the appropriate treatment regimen and are supported to facilitate treatment completion.

335. Pharmacist-directed penicillin skin testing as an antimicrobial stewardship initiative: overview of results from a citywide approach. Christopher Bland, PharmD, BCPS, FIDSA[1], Bruce Jones, PharmD, BCPS[2], Jason Lin, PharmD[3]; (1) Clinical and Administrative Pharmacy, University of Georgia College of Pharmacy, Savannah, GA (2) St. Joseph's/Candler Health System, Savannah, GA, GA (3) Memorial Health, Savannah, GA
SERVICE OR PROGRAM: Antimicrobial stewardship pharmacists at two institutions collaborated with infectious diseases physicians and nursing to develop a citywide model of penicillin skin testing (PST).
JUSTIFICATION/DOCUMENTATION: From May 2015 until May 2016, 54 patients received PST with 47% of these being direct recommendations from the stewardship pharmacist. Positive skin tests were found in 3 patients (6%). One patient refused the second step of the PST and one patient did not react to the initial histamine skin test. Of the 49 negative PSTs, 37 (76%) were switched directly to a beta-lactam. The two most common antimicrobial changes were meropenem to piperacillin/tazobactam and vancomycin to either nafcillin or cefazolin most often for invasive methicillin-susceptible *Staphylococcus aureus* infections.
ADAPTABILITY: Our model demonstrates that not only can this program provide benefit to the individual hospital but also can be expanded to other hospitals in the city. Furthermore, the two hospitals represented were an academic hospital and a community hospital, confirming that this program can be adapted to different health systems. We have recently facilitated PST training for two other long-term care facilities, as these patients often require long

courses of antimicrobials in which PST could result in significant cost savings.
SIGNIFICANCE: As many as 10% of patients report a penicillin allergy, with as many as 90% of these shown to be negative upon skin testing. This results in limited treatment options, increased healthcare costs, and increased resistance with the use of non-beta lactam broad-spectrum agents. Our program demonstrates that pharmacist-directed PST can result in significant antimicrobial stewardship benefits including de-escalation of therapy and maximizing drug of choice for a particular infection. PST can be further expanded in a citywide approach to maximize clinical benefit. Further research is being performed to ascertain longitudinal benefit on outcomes such as utilization of beta-lactam therapy on future admissions.

Managed Care

336. Effects of implementing a comprehensive assessment form in the intensive care unit of a regional hospital on the performance of pharmacist rounds. Su-Han Hsu, BS[1], Pei-Chun Chen, MS[1], Tsai-Hsuan Lei, BS[1], Donna Shu-Han Lin, MD[2,3], Chi-Ting Tseng, MS[1], Lih-Chi Chen, Doctor[4], Yenming J. Chen, PhD[5]; (1) Department of Pharmacy, Taipei City Hospital Yangming Branch, Taipei, Taiwan (2) Doctor of Medicine, School of Medicine, National Yang Ming University, Taipei City, Taiwan (3) Department of Medical Education, Taipei Veterans General Hospital, Taipei, Taiwan, Taiwan (4) Department of Pharmacy, Taipei City Hospital, Taipei, Taiwan (5) National Kaohsiung 1st University of Science &Technology, Kaohsiung City, Taiwan
SERVICE OR PROGRAM: In light of the rapidly-evolving conditions of intensive care patients, we suggest an assessment with comprehensive items to maintain a high-quality pharmacist rounding. Our goal is to maximize efficiency and sustain consistency of pharmacist interviews through an effective process of assessment.
JUSTIFICATION/DOCUMENTATION: An intensive care pharmaceutical assessment form was designed referring to clinical pharmacy service standards of the Joint Commission of Taiwan, restricted antibiotics audit by the Centers for Disease Control, Ministry of Health and Welfare, and evaluation sheets from other regional hospitals. The assessment includes examination of antibiotics usage, serum drug levels, drug-drug interactions, usage of high-alert medications, and propriety of crushed drugs. Application of this assessment began on February 1st, 2016. Its effects were retrospectively studied by comparing the following outcomes in the three-month period prior to application, and the three-month period immediately after: number of patients interviewed per day, frequency of interviews during one patient's ICU stay, time from ICU admission to first interview, frequency of pharmacist recommendations and physicians' acceptability of these advices.
ADAPTABILITY: This assessment is also suited for regional hospitals where medical professionals are insufficient. It heightens interview efficiency, improves interview frequency, maintains consistency of interview quality, and enhances drug use safety and appropriateness.
SIGNIFICANCE: All outcomes reached statistical significance. The number of patients interviewed by pharmacists increased from 2.37 to 5.47 per day ($p<0.001$). The mean interval between pharmacist visits of each intensive care patient shortened from 6.7 to 4.1 days ($p<0.001$). The average time from ICU admission to first interview decreased from 1.98 to 1.46 days ($p=0.007$). Frequency of pharmacist recommendations rose from 14 to 16.67 cases per month, with physicians accepting 14.9% and 52.5% of these advices, respectively ($p=0.025$). Our results indicate that this assessment is concise but comprehensive, and is suited for clinical pharmacist use in intensive care.

Medication Safety

337. Evaluation of information management system intervention to prevent medication errors with retrospective data analysis. Wang Pin HSin, BS College[1], Su-Han Hsu, BS[1], Lih-Chi Chen, Doctor[2], Pei-Chun Chen, MS[1], Chi-Ting Tseng, MS[1], Tsai-Hsuan Lei, BS[1]; (1) Department of Pharmacy, Taipei City Hospital Yangming Branch, Taipei, Taiwan (2) Department of Pharmacy, Taipei City Hospital, Taipei, Taiwan
SERVICE OR PROGRAM: This was a retrospective study between January 2014and April 2016 in a regional hospital in Taipei. Health Information System (HIS) is system that physicians prescribe medications on a computer. Pharmacists give recommendations to physicians and analyze the types of medicalproblems monthly. After careful consideration, three HIS system changes were used to reduce medication errors.
JUSTIFICATION/DOCUMENTATION: A total of 511 medication errors were discovered during January 2014 to April 2016. The top five categories of medication error were: over dosage (n=142; 28%), under dosage (n=75; 15%), repeat with the same pharmacological effects of medications (n=65; 13%), inappropriate formation (n=62; 12%), and medications do not meet the diagnoses (n=37; 7%). Among these errors, over dosage, repeat with the same pharmacological effects of medications, and medications do not meet the diagnoses, could be reduced by altering the factors in HIS. First, over dosage (n=142; 28%): set the maximum daily dose on HIS. Ever after, there was no case of prescribing over medication's maximum daily dose. Second, repeating medications with the same pharmacological effects (n=65; 13%): use warning window while prescribing. Compared to 2011–2013, the proportion of repeating medications reduced by 23% with the warning window. Last, medications do not meet the diagnoses (n=37; 7%). After the analysis, we found out medication errors often caused by look-alike, sound-alike brand names. Therefore, we modified brand names in HIS to avoid doctor being confused.
ADAPTABILITY: This method with reviewing pharmacists' recommendations regularly and analyzing medication errors is also suited for the other regional hospital in Taiwan.
SIGNIFICANCE: Through the precautionary approach in computer system, medication errors have been significantly reduced. It can't be underestimated the unnecessary medical expenses reduction after the changes in HIS. The total medical expenses reduction was TWD 362,094.37. Above all, pharmacists should regularly analyze prescription problem data to find the way to prevent them.

339. Making a pilot program a reality: bridging gaps in healthcare through direct pharmacist involvement in hospital admission, discharge, and patient education. Deanna Rossi, PharmD, BCPS, Deborah Fernandez, PharmD, BCPS, Andria Brantley, PharmD, Shalonda Barnes, PharmD, BCPS, Ira Schatten, PharmD, BCPS, Vishwas Dave, RPh, MBA; Memorial Hospital Pembroke, Pembroke Pines, FL
SERVICE OR PROGRAM: At Memorial Hospital Pembroke we have implemented a hospital wide transition of care (TOC) pharmacist-led service to improve patient outcomes during care transitions.
JUSTIFICATION/DOCUMENTATION: It is estimated that over 98,000 deaths occur annually due to medication errors in the United States. More than 40% of medication errors result from inadequate medication reconciliation during admissions, transfers, and discharges. Of these, about 20% result in patient harm. A growing body of evidence demonstrates that pharmacists play a pivotal role in improving care transitions. However, many of these publications focus on only one element of care transitions or type of patient population. As a result, we initiated a pilot to include all elements of care transitions in all patients on one telemetry unit. A total of 661 patients were included. A pharmacist completed 94% and 75% of admission and discharge medication reconciliations respectively, and a total of 1,579 interventions were made. Discharge education was completed at a rate of 73%. The HCAHPS scores for "Communication about medications" and "Care Transitions" had a sustained average improvement of 36% and 32.9% respectively.

ADAPTABILITY: Our quality improvement pilot was one of the first initiatives that targeted all care transitions (medication reconciliation at admission and discharge along with patient teaching) in all applicable patients. As a result, this may motivate other institutions to evaluate their current process and justifies the need for a pharmacist to be involved throughout the continuum of care.
SIGNIFICANCE: As a result of this pilot initiative, two full-time TOC pharmacists were designated to implement a hospital wide service. The continuation of the program, which is in its infancy, has achieved 93% and 87% of admission and discharge medication reconciliations respectively, and 63% of discharge education. The program is expected to optimize care transitions and improve patient satisfaction scores.

Nutrition

340. Creation and implementation of an interdisciplinary parenteral nutrition dosing service in a community hospital. Amanda Hembree, PharmD, BCPS[1], Laura Brunson, RD/LD, CNSC[2]; (1) Department of Pharmacy, Saint Francis Hospital, Tulsa, OK (2) Department of Nutrition, Saint Francis Hospital, Tulsa, OK
SERVICE OR PROGRAM: Creation and implementation of an interdisciplinary parenteral nutrition dosing service in a community hospital
JUSTIFICATION/DOCUMENTATION: Parenteral nutrition is a complex therapy that has been associated with significant adverse events including death. The appropriate use of parenteral nutrition is to maximize therapeutic benefit and reduce the risk of adverse events to patients. The American Society for Parenteral and Enteral Nutrition (A.S.P.E.N.) recommends standardized prescribing, ordering, preparation, labeling, and administering of parenteral nutrition.
ADAPTABILITY: In June 2014, an interdisciplinary team from the departments of Nutrition and Pharmacy at Saint Francis Hospital in Tulsa, OK, developed a parenteral nutrition dosing consult policy. This policy outlined appropriate indications for parenteral nutrition, evaluation for Refeeding syndrome and macronutrient adjustment if risk is present, as needed electrolyte supplementation, laboratory monitoring, standardized electrolyte formulations based on patient renal function, and responsibilities of team members. A pharmacy Clinical Specialist and dietitian with the Certified Nutrition Support Clinician designation meet on a Monday through Friday basis to assess patients on consult. The patient evaluation includes but is not limited to laboratory information, medications, diet status, patient status, and disposition. A consult note is completed in the electronic medical record and orders for the parenteral nutrition are entered by the pharmacist. If a patient has a significant electrolyte deficiency, the team can supplement the electrolyte separately based on the approved policy. Weekend coverage is provided by pharmacy staff that has completed approved department education and dietitian is available on call if assistance is necessary.
SIGNIFICANCE: The Parenteral Nutrition team has improved the prescribing of parenteral nutrition and now manages 90–100% of patients receiving therapy. Monitoring and adjustment of the formulation has significantly improved since implementation of the consult service with no significant adverse events noted.

Other

341. Why your OR needs YOU – stories from our journey with integrating clinical pharmacy into perioperative services. Sara Jordan, PharmD, BCPS, Brian Kramer, PharmD, Elise Weyrauch, PharmD, BCPS, Adam Trimble, PharmD, Lauren Wood, PharmD; Grant Medical Center (OhioHealth), Columbus, OH
SERVICE OR PROGRAM: A novel Clinical Operating Room (OR) Pharmacist service was instated August 2013 at Grant Medical Center (GMC). This single full-time equivalent (FTE) has focused on daily clinical functions including optimizing institutional use of peri-operative antibiotics and high-risk therapies, improving medication distribution, optimizing medication-related continuity of care and compliance. The position has also sought to address more global process-improvement initiatives and to improve inter-professional relationships through extensive project and committee work.
JUSTIFICATION/DOCUMENTATION: During the first six months of the initial Clinical OR Pharmacist service, an average of 78 interventions were completed monthly by the position to optimize pre-op antibiotic selection, dose, timing, and stewardship. This contributed to a 66.7% reduction in SCIP misses (compliant 579/582 in FY13 to 543/544 in FY14) and a 57.1% reduction in HOPS misses (compliant 430/437 in FY13 and 491/495 in FY14) for the Antibiotic Selection Core Measures. The service also provided 1–4 expert reviews monthly for post-operative infections, readmissions, and compliance misses, contributing to major process improvement initiatives. The position also helped increase pharmacy charge capture through improved distribution and billing of anesthetic medications, totaling > $1.9 million annually. The results of the provider survey also demonstrated positive impacts on physician and staff satisfaction with Pharmacy Services.
ADAPTABILITY: We describe numerous opportunities to improve pharmacotherapy and medication safety and compliance in the perioperative arena with sound financial justification of services. We feel our experience and results are likely to be adaptable to other institutions with surgery centers.
SIGNIFICANCE: We describe a novel application of clinical pharmacy to the OR setting. The increase in revenue through improved medication charge capture, paired with the positive impacts on clinical quality and provider demand for services, have provided sound financial viability for dedicated pharmacy resources. We continue to positively impact clinical outcomes and garner allies in Surgery and Anesthesia, allowing for further expansion of services.

Pain Management/Analgesia

342. A novel, validated smart phone application to quantify opioid overdose probability for justification of in-home naloxone. Jeffrey Fudin, BS, PharmD, FCCP, FASHP[1], Mena Raouf, PharmD[2], Nadia Shahzad, PharmD[3], Nicholas Jarrett, BS, MA, MS, PhD[3], Erica Wegrzyn, BA, BS, PharmD[4]; (1) Stratton Veteran Affairs Medical Center, Albany, NY (2) VA Tennessee Valley Healthcare System, Nashville, TN (3) Remitigate, LLC (4) Department of Pharmacy (119), Stratton VA Medical Center, Albany, NY
SERVICE OR PROGRAM: We developed a smart phone application to quantify risk for opioid overdose and qualify patients for naloxone. The software is based on the risk index for overdose or opioid-induced respiratory depression (RIOSORD) developed by Zedler, et al in 2015. The RIOSORD questionnaire includes 16 weighed variables attributable to overdose or serious opioid-induced respiratory depression (OSORD): substance abuse, psychiatric disorder, pulmonary disease, renal impairment, heart failure, cerebrovascular disease, chronic headache, pancreatitis, fentanyl use, methadone use, hydromorphone use, extended-release or long-acting opioid use, benzodiazepine use, antidepressant use, morphine equivalent $\geq$ 100 mg/day, and recent hospitalization or emergency department visit. The scores are added to calculate the RIOSORD, which correlates with an OSORD probability ranging from 3% to 86%. The phone application is designed to allow the user to navigate through a 16-item questionnaire of unique variables. Upon completion, the software calculates the percent probability of opioid-induced respiratory depression.
JUSTIFICATION/DOCUMENTATION: Recent fast-tracked approval of in-home naloxone and rapid shifts in state legislation has authorized pharmacists to dispense or prescribe naloxone. However, there remains a need for strategies to identify patients at-risk for overdose and guide naloxone distribution.

ADAPTABILITY: The mobile software provides healthcare professionals with a convenient evidence-based screening instrument to calculate a numerical risk score for overdose or opioid-induced respiratory depression. The tool enables prospective drug evaluation for opioids to employ risk mitigation strategies including education, monitoring, and naloxone distribution with adaptability to encrypted, computer-generated mobile phone text or printed report.
SIGNIFICANCE: Opioid induced respiratory depression is often unpredictable for chronic pain patients requiring opioids and also those with opioid use disorder. Pharmacists are well positioned to encourage overdose risk reduction by assessing risk and providing in home-naloxone to the community through proper medication management including patient and caregiver counseling.

Pharmacogenomics/Pharmacogenetics

343. Implementing a multidisciplinary pharmacogenomics clinic: reporting on 1 year of experience. Henry M Dunnenberger, PharmD[1], Annette Sereika, APN[1], Peter Hulick, MD[2]; (1) Center for Molecular Medicine, NorthShore University HealthSystem, Evanston, IL (2) Center for Medical Genetics, NorthShore University HealthSystem, Evanston, IL
SERVICE OR PROGRAM: Pharmacogenomics clinic.
JUSTIFICATION/DOCUMENTATION: There is a strong desire from our health system's community to utilize pharmacogenomic data in clinical care. We are working on integrating pharmacogenomics system-wide, which is a time consuming process. To meet the needs of our community and bridge the gap until integration is complete, we created a multidisciplinary pharmacogenomics clinic. Patients may be self-referred or clinician referred to the clinic. The clinic experience is divided into two visits. The objective of the first visit is to discuss benefits, risks, limitations, and costs of testing so the patient can make a value based decision about testing. Between visits the results are reviewed by a pharmacist, and discussed with pertinent clinicians. Results are discussed with patient at the second visit and any questions or concerns are addressed. The patient is provided with a summary report and a progress note is entered in the electronic health record.
ADAPTABILITY: The initial visit has changed significantly over time. It originally utilized a genetic counselor (GC) and medical geneticist (MG). The GC was responsible for collecting the patient and family history. The MG was the billable provider and furnished all other content for the visit. The clinic now utilizes an advanced nurse practitioner (APN) and a pharmacist. The APN serves as the billable provider and collects a focused patient history. The pharmacist provides all other content for the visit.
SIGNIFICANCE: All data was collected for quality assurance. In the first year we had 162 clinic visits representing 109 unique patients. To our knowledge all visits were covered by insurance. No patient has reported having to pay more than $500 out-of-pocket for multi-gene testing. After the first visit, 12% of patients did not proceed with testing. Of the patients, tested 97% had at least one actionable genetic variant.

Psychiatry

344. Collaborative treatment of depression by a psychiatric pharmacist integrated within a Community Health Center Primary Care Clinic. Richard Silvia, PharmD, BCPP; Department of Pharmacy Practice, MCPHS University, Boston, MA
BACKGROUND: Depression is one of the most common mental illnesses affecting patients presenting to a primary care (PC) clinic, with an annual prevalence of nearly 7% and lifetime prevalence of 15–25%. Many of these patients receive treatment thru PC settings, where PC providers (PCP's) have limited time and resources to treat depression. Collaborative treatment of depression in a PC setting has become more common, where patients can receive depression treatment while allowing PCP's to focus on other patient concerns. Integration of a psychiatric pharmacist in a collaborative care model within a PC clinic to provide medication management of depression would help meet the needs of these patients and the clinic providers.
DESCRIPTION OF INNOVATIVE SERVICE: The program initiated within a private, urban community health center in the summer of 2013. The psychiatric pharmacist is a faculty member at a local pharmacy school, board certified in psychiatric pharmacy with over 10 years clinical experience; he was placed within the PC clinic of the center as his faculty clinical practice site. He obtained a CMM-based collaborative practice agreement and state and federal DEA numbers. Services provided included: patient evaluation for psychiatric conditions, medication assessment and initiation, referral to other psychiatric services as needed, and patient education. All services were provided based upon primary care provider referral.
IMPACT ON PATIENT CARE: A 2-year analysis performed in Summer, 2015 showed a significant impact on patients' depression. Of 440 patients referred to the pharmacist, 107 patients treated had a primary psychiatric diagnosis of depression. Illness severity demonstrated significant changes in 96 patients with repeat PHQ-9 scores from baseline to first follow-up appointment (17.8 to 14.8, $p<0.001$) and maintained changes through follow-up #5 (12.9, $p<0.0001$). Response rates ($\geq$ 50% reduction from baseline PHQ-9 score) approached 55% by the fifth follow-up appointment also. A 7-question patient satisfaction survey administered to 39 depressed patients showed uniformly high satisfaction scores for patients treated by the pharmacist (mean = 26.8, maximum = 28).
CONCLUSION: Collaborative depression treatment by the pharmacist showed significant effects on patients' depression. Patients showed sustained improvements in their depression and were satisfied with their treatment.

Case Reports
ADR/Drug Interactions

463. Hypoglycemia resulting from delayed subcutaneous insulin absorption following substantial diuresis in a patient with a left ventricular assist device. Christopher Paciullo, PharmD, BCCCP, FCCM[1], Lyndsay Head, MD[2], Elrond Teo, MD[2]; (1) Department of Pharmaceutical Services, Emory University Hospital, Atlanta, GA (2) Emory University School of Medicine, Atlanta, GA
INTRODUCTION: Edema decreases the absorption of oral medications in patients with heart failure. Similarly, subcutaneous absorption of medications is decreased in patients with edema.
CASE: A 50 year-old male with type 1 diabetes and LVAD implant was admitted to the ICU for shortness of breath, 3 + pitting edema to hips, JVD to the angle of the mandible and low urine output despite treatment with oral torsemide. He had significant crackles on the right side and decreased breath sounds. He was continued on his home insulin regimen of insulin detemir and aspart. He was converted to an insulin infusion due to hyperglycemia (point-of-care blood glucose 253–371 mg/dL) which was stopped 8 h later after normalization of his blood glucose. His diuresis was increased to acetazolamide, metolazone, spironolactone and a furosemide infusion. Over the next 24 h, the patient had 9820 mL of urine output. His physical exam findings were then notable for JVD to 5 cm above the sternal notch at 45 degrees, absence of crackles in the right lung field, and no pitting edema in the lower extremities; additionally, the patient was difficult to arouse, with a point-of-care blood glucose reading that was below the limit of the device. Following administration of IV dextrose, the glucose reading was 129 mg/dL and the patient became more arousable. Over the next hour, the glucose reading again declined to 35 mg/dL, highly suggestive of insulin overdose.
DISCUSSION: It is likely that the patient's acute decrease in peripheral edema lead to an increase in previously administered subcutaneous insulin absorption and hypoglycemia. Based on the

Naranjo adverse drug event probability scale, the association of subcutaneous insulin administration and hypoglycemia was categorized as probable.
CONCLUSION: Subcutaneous insulin should be used with caution in patients with peripheral edema, as resolution of the edema may lead to hypoglycemia.

465. Proton pump inhibitor-induced hypomagnesemia in a U.S. Veteran: case report and population study. Jonathan Hughes, PharmD[1], Daniel Neu, PharmD Candidate[2], Brian Christman, MD[1], M. Shawn McFarland, PharmD[1]; (1) VA Tennessee Valley Healthcare System, Nashville, TN (2) University of Tennessee College of Pharmacy, Memphis, TN
INTRODUCTION: Severe hypomagnesemia is a serious clinical condition with a growing body of literature describing long-term proton pump inhibitor (PPI) as a major drug-related cause. Herein we report the case of a U.S. Veteran presenting with severe hypomagnesemia requiring inpatient admission, as well as efforts at our institution to proactively identify patients at risk for this side effect.
CASE: A 63-year-old female was admitted to our facility after presenting with severe generalized weaknesses and muscle spasms. Her medications were significant for continuous use of PPIs since 2008, a one-time fill of hydrochlorothiazide approximately six months prior, and magnesium oxide. On admission, her magnesium was found to be 0.3 mg/dL. The PPI was discontinued and intravenous magnesium sulfate initiated for a total of 6 g, along with continued oral supplementation. By day 3 of admission, the veteran's symptoms had resolved and she was discharged with ranitidine and oral magnesium supplements. On follow-up, magnesium levels had returned to normal levels.
DISCUSSION: This case illustrates an emerging serious adverse drug reaction to long-term PPI therapy that is preventable with routine monitoring. Per assessment with the Naranjo scale, the reaction was highly probable (score of 8) to be due to the patient's PPI. Our experience with this veteran reinforces the need to routinely evaluate indication and duration of therapy with PPIs and to monitor serum magnesium, especially in those at risk. Finally, we are currently evaluating serum magnesium monitoring and use of magnesium supplements to identify patients with this adverse drug reaction.
CONCLUSION: Severe hypomagnesemia is a serious, emerging concern for patients with long-term PPI use. This adds to the recommendation that PPIs be used at the lowest dose and shortest duration possible. Monitoring for concomitant prescription of magnesium supplements with PPI therapy may be useful to identify patients already suffering from this side effect.

Adult Medicine

466. Azathioprine and allopurinol – a deadly combination. Bradley Wagner, PharmD; Virginia Commonwealth University Health System, Richmond, VA
INTRODUCTION: The drug combination of azathioprine and allopurinol is a known drug-drug interaction causing significant morbidity through bone marrow suppression as evidenced in various case series.[1–2] Allopurinol, a xanthine oxidase inhibitor, inhibits azathioprine's metabolism to its inactive metabolite, 6-thiouracil, while increasing 6-thioguanine metabolites leading to myelosuppression. [3]
CASE: A 70-year-old African American female who received a deceased donor kidney transplant in 2004 on azathioprine, prednisone and tacrolimus, with atrial fibrillation, and hypertension was initiated on allopurinol as an outpatient for gout. One month later, the patient presented to the hospital with shortness of breath on exertion. Initial laboratories demonstrated pancytopenia (absolute neutrophil count 300, hemoglobin 6.6 g/dL, platelets 7,000). Allopurinol and azathioprine were stopped on admission, blood and platelet transfusions were given and filgrastim was initiated for neutropenia. Microbiology was remarkable for *clostridium difficile* positive stool. She was started on oral vancomycin combined with intravenous metronidazole. Seven days later, broad spectrum antibiotics were started after the patient became cognitively altered, hypothermic, with acute respiratory failure requiring intubation. Two days later, the patient cardiac arrested and died secondary to septic shock from *clostridium difficile* and *pseudomonas* bacteremia.
DISCUSSION: The most likely etiology of her pancytopenia was deemed by transplant nephrology and hematology consults to be the drug interaction of allopurinol and azathioprine. The drug interaction probability scale (DIPS) by Horn and colleagues,[4] supports the azathioprine and allopurinol interaction as the "probable" cause of her pancytopenia.
CONCLUSION: The combination of azathioprine and allopurinol served as the probable cause of pancytopenia in this patient precipitating sepsis and eventually death. These two agents should be avoided at all cost. Alternative agents such as non-steroidal anti-inflammatories, corticosteroids or colchicine should be considered as alternatives for gout treatment in patients concomitantly receiving azathioprine.

Ambulatory Care

467. Case report: nebivolol use in a patient with the Raynaud Phenomenon and previous ST-elevated myocardial infarction. Jason Zupec, PharmD, Jennifer Smith, PharmD; University of the Sciences Philadelphia College of Pharmacy, Philadelphia, PA
INTRODUCTION: Beta-blockers are recommended for patients without contraindications following ST-elevated myocardial infarction. Worsening of the Raynaud Phenomenon has been associated with beta-blockers, which could make beta-blockers difficult to tolerate.
CASE: A 64 year-old Caucasian male was referred with a history of hypertension, Raynaud Phenomenon, and coronary artery disease status post STEMI (10 weeks). He had been receiving antihypertensives for 8 years and was previously controlled on lisinopril 30 mg daily and chlorthalidone 25 mg daily. He previously did not tolerate atenolol due to cold extremities at room temperature consistent with the Raynaud Phenomenon, and calcium channel blockers did not improve symptoms. Following his hospitalization for STEMI, he did not tolerate metoprolol succinate 25 mg daily or carvedilol 6.25 mg twice daily due to the Raynaud Phenomenon. Carvedilol 6.25 mg twice daily was changed to nebivolol 5 mg daily and lisinopril 5 mg daily was continued. The patient reported improvement in Raynaud's symptoms three weeks after starting nebivolol and the follow up office blood pressure was at goal.
DISCUSSION: In patients with history of acute coronary syndrome and left ventricular dysfunction, studies have demonstrated reduction in mortality with metoprolol succinate, bisoprolol, carvedilol, and nebivolol per the 2015 AHA/ACC/ASH Scientific Statement on the Treatment of Hypertension in Patients With Coronary Artery Disease. However, this patient did not have left ventricular dysfunction. Nebivolol was chosen instead of other beta-blockers given the vasodilatory properties attributed to enhanced nitric oxide release, which may be helpful in a patient with the Raynaud Phenomenon. It is possible that this patient's tolerability of nebivolol is dose-related.
CONCLUSION: This case generates the hypothesis of a therapeutic application for nebivolol in patients with the Raynaud Phenomenon who do not tolerate other beta-blockers. Additional research is needed to address the routine use of nebivolol as a treatment option in these patients.

Cardiovascular

468. A case report of intravenous treprostinil conversion to oral selexipag in a patient with functional class IV chronic thromboembolic pulmonary hypertension (CTEPH). Kristina

Thurber, PharmD[1], Breann Williams, PharmD[2], Ruth Bates, MD[2], Robert Frantz, MD[2]; (1) Pharmacy Services, Mayo Clinic Hospital, Rochester, MN (2) Mayo Clinic Hospital, Rochester, MN

INTRODUCTION: Intravenous (IV) prostacyclins, such as treprostinil, are potent vasodilators recommended for management of severe (functional class III-IV) chronic thromboembolic pulmonary hypertension (CTEPH). Long-term outpatient parenteral therapy may present challenges for patients, particularly in the setting of complex comorbid conditions.

CASE: A 42 year old male with functional class IV CTEPH, paraplegia, and stage IV gluteal ulcers was admitted with sepsis. At the time of admission, his CTEPH regimen consisted of treprostinil 17 ng/kg/min IV and riociguat 2.5 mg by mouth three times daily. After stabilization, it was determined the patient needed post-hospital placement for wound care. Intravenous treprostinil was a significant barrier to this. As a result, treprostinil was transitioned to selexipag, an oral prostacyclin receptor agonist. Treprostinil was reduced by 3 ng/kg/min every 24 h until reaching 2 ng/kg/min, and then discontinued on day 6. Selexipag was started at 200 μg twice daily and increased to 400 μg twice daily by day 2. On day 3, selexipag was increased by 200 μg per dose until reaching the maximum of 1600 μg twice daily on day 6. The cross-taper was well tolerated. Pre- and post-echocardiograms were unchanged. Approximately 6 weeks after hospital dismissal, the patient was readmitted with a right heart failure exacerbation secondary to worsening CTEPH.

DISCUSSION: This is the first report describing conversion of IV treprostinil to selexipag. The rapid transition from treprostinil to selexipag was well tolerated from a side effect perspective because of the prior prostanoid use, but sustained efficacy could not be shown. More data is needed regarding transitioning from other prostanoid therapy.

CONCLUSION: In patients selected as candidates for transition from IV treprostinil to selexipag, a 6 day cross-taper as described above represents a reasonable approach in the hospital setting.

Critical Care

469. Low-dose ketamine infusion for adjunct management during vaso-occlusive episodes in adults with sickle cell disease: a case series. Nicole Grimmer, PharmD[1], Catherine Floroff, PharmD, BCCCP, BCPS[2], Tanna Hassig, PharmD, BCPS[3]; (1) Department of Pharmacy, Cleveland Clinic Foundation, Cleveland, OH (2) Sentara Healthcare, Norfolk, VA (3) Medical University of South Carolina, Charleston, SC

INTRODUCTION: Sickle cell disease (SCD) pain is difficult to manage and is the primary reason for emergency department and hospital admissions. The optimal management of recurrent painful episodes in SCD is unclear. Opioid analgesics are a mainstay of therapy, but side effects limit use of these medications. Patients with SCD experiencing hyperalgesia or opioid-related adverse events are in particular need of adjunct therapies. Few reports have described the use of ketamine for opioid-refractory pain. At sub-anesthetic doses, ketamine modulates opioid tolerance and can protect against hyperalgesia, without causing respiratory depression or hemodynamic instability, and has shown benefit for treatment of post-operative and cancer pain.

CASE: Five patients with SCD pain were treated with continuous-infusion low-dose ketamine (1–5 μg/kg/min) after insufficient pain control with opioids. Four patients reported reduced pain scores with ketamine. Pain was better controlled when ketamine was initiated at 5 μg/kg/min and maintained at a steady rate compared to those who were started on a lower rate and titrated to effect. Total daily morphine equivalents were reduced in four patients with ketamine during ICU stay, and three patients were discharged on reduced opioid doses. All patients experienced reduced opioid-induced adverse effects. Only one patient experienced mild sedation and another reported vivid dreams secondary to ketamine. No patients required ketamine discontinuation for side effects.

DISCUSSION: There is no proven optimal treatment for pain related to SCD. Current literature regarding ketamine is limited and opioids are commonly associated with adverse events. Although previous literature shows variable results, our patients were treated with sub-anesthetic dosing with positive results. Nearly all patients had reduced opioid requirements, and those experiencing opioid-induced adverse effects had resolution of symptoms.

CONCLUSION: This series demonstrated that sub-anesthetic dose ketamine is safe and may be considered as adjunctive treatment for SCD pain refractory to high-dose opioid therapy.

470. *Lactobacillus* bacteremia from probiotic administration in a critically ill cardiac surgery patient: a case report. Andrea S. Newsome, PharmD, BCPS, BCCCP[1], Zachary Reuge, PharmD Candidate[2]; (1) Department of Pharmacy, University of Georgia College of Pharmacy, Athens, GA (2) University of Georgia College of Pharmacy, Athens, GA

INTRODUCTION: Probiotics may prevent *Clostridium difficile* infection (CDI) and ventilator associated pneumonia (VAP), which are correlated to increased length of stay, cost, and mortality. However, the safety of administering live cultures to critically ill patients has not been fully elucidated. We report a unique case of *Lactobacillus*sepsis following probiotic treatment in a cardiac surgery patient.

CASE: A 60 year old male with a history of diabetes mellitus, hyperlipidemia, hypertension, and heart failure was admitted for chest pain and shortness of breath. He underwent a multi-vessel coronary artery bypass graft (CABG) procedure with unplanned intra-aortic balloon pump placement. His post-surgical course was complicated by sepsis, hemodynamic compromise, renal failure, failure to thrive, requirement for parenteral nutrition, and tracheostomy and gastrojejunostomy tube placement. On hospital day 21, *lactobacillus* (Culturelle®) one capsule twice daily was initiated. On hospital day 34, blood cultures revealed polymicrobial bacteremia due to *staphylococcus lugdunesis*, *vancomycin-resistant enterococcus*, and *lactobacillus spp*. Infectious disease recommended discontinuation of probiotics and a two week course of daptomycin and meropenem.

DISCUSSION: Critically ill patients display suppressed immune response and are at increased risk of hospital acquired infection making probiotics an appealing intervention. However, by the same mechanisms, probiotics may pose significant threat to critically ill patients due to depressed integrity of the intestinal mucosa and increased digestive tract permeability that can permit bacterial translocation. Possibility exists that studies supporting probiotic use were underpowered to detect more rare safety concerns. To our knowledge, this is the first report of *lactobacillus* bacteremia following probiotic supplementation after CABG procedure.

CONCLUSION: This report may be included in a growing body of evidence that suggests the use of probiotics in high-risk critically ill patients may pose safety concerns that outweigh benefits. Further retrospective investigation of lactobacillus use in the critically ill at our institution is currently ongoing.

471E. Aluminum toxicity from combination therapy of sucralfate and citric acid in a cardiac surgery patient. Andrea S. Newsome, PharmD, BCPS, BCCCP[1], Emily Higdon, Doctor of Pharmacy[2], Dwayne Pierce, PharmD[2], Mohamed Gaber, MD[2], Vikas Kumar, MD[2]; (1) Department of Pharmacy, University of Georgia College of Pharmacy, Athens, GA (2) Augusta University

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Emergency Medicine

472. Gabapentin toxicity and associated blood levels in emergency room patients with renal insufficiency: case reports. James A. Damilini, PharmD, MS, BCPS, John J. Radosevich, PharmD,

BCPS, BCCCP; St. Joseph's Hospital & Medical Center – Dignity Health, Phoenix, AZ
INTRODUCTION: The proposed therapeutic range for gabapentin serum levels is 2.2–15 μg/mL. There is a paucity of data describing gabapentin serum levels in patients with renal insufficiency experiencing toxicity. We describe three patient cases that presented to the emergency department with symptoms of gabapentin toxicity who had gabapentin serum levels measured.
CASE: The first case is a 48 year old female on gabapentin 1500 mg/day who presented with nausea, vomiting, progressive weakness, lethargy and nystagmus. Her serum creatinine (SCr) was 3.7 mg/dL (CrCl = 20 mL/min) with a gabapentin level of 24.7 μg/mL. Her symptoms resolved and creatinine normalized within 3 days of presentation with intravenous (IV) fluids. The second case is an 82 year old female on gabapentin 900 mg/day for herpetic neuralgia who presented with fatigue, myalgias and slurred speech. Her SCr was 5.3 mg/dL (CrCl = 8 mL/min) with a gabapentin level of 59.1 mcg/mL. Her symptoms resolved and creatinine normalized within 3 days of presentation with IV fluids. The third case is a 79 year old female on gabapentin 1200 mg/day who presented with progressive weakness, dizziness and fall. Her SCr was 5.7 mg/dL (CrCl = 8 mL/min) with a gabapentin level of 38.2 mcg/mL. She was initiated on hemodialysis due to fluid overload and her neurologic status improved by the next day. Her cardiovascular status worsened secondary to pneumonia and septic shock which led to death on hospital day 4.
DISCUSSION: Gabapentin is primarily eliminated unchanged in the urine and renal insufficiency causes elevated gabapentin levels. The cases described demonstrate elevated gabapentin concentrations in renal insufficiency resulted in adverse neurologic effects which were not directly life-threatening and resolved when renal function improved or dialysis was initiated.
CONCLUSION: These three case reports demonstrate that renal insufficiency can lead to gabapentin accumulation and elevated serum levels resulting in adverse neurologic effects.

473. Edrophonium overdose and toxicity: a case report. James A. Damilini, PharmD, MS, BCPS, John J. Radosevich, PharmD, BCPS, BCCCP; St. Joseph's Hospital & Medical Center – Dignity Health, Phoenix, AZ
INTRODUCTION: Edrophonium is a short-acting acetylcholinesterase inhibitor used for the diagnosis of myasthenia gravis (MG). There is a paucity of data describing cases of edrophonium toxicity and no reports of overdose have been published to our knowledge. We report a case of edrophonium overdose and toxicity.
CASE: A 19 y/o male with no previous medical history presented to the emergency department for headache and right eye visual changes diagnosed as fatigable eye movement abnormalities. Neurology recommended an edrophonium diagnostic test for suspected MG. Edrophonium 100 mg/10 mL vial was obtained from pharmacy with physician at bedside and order for 10 ml to be given via slow intravenous (IV) push. Within 5 min the patient developed agitation, hypersalivation, miosis, opthalmoplegia and bradycardia (heart rate of 55 beats per min). Approximately 5 min later, atropine 0.4 mg was administered IV with abrupt increase in HR to 63 bpm, then 79 bpm, and eventual resolution of symptoms over the next 20 min. Patient was monitored for 6 h with no recurrence of cholinergic symptoms. The test was inconclusive for diagnosis due to toxicity symptoms.
DISCUSSION: Edrophonium is a short-acting acetylcholinesterase inhibitor and has a duration of action of 5–10 min. Complications with the edrophonium test are rare and estimated to be 0.16%, with the most serious effects being bradyarrhythmias and syncope. This patient received ten times the recommended edrophonium dose of 10 mg for diagnosis of MG and displayed typical cholinergic toxidrome symptoms which were readily reversible with atropine. Confusion between dose, volume, and drug concentration appears to have caused this inadvertent overdose which the patient recovered from completely.
CONCLUSION: This case demonstrates that acute edrophonium overdose resulted in cholinergic symptoms which were reversible with atropine and did not result in any lasting sequelae. Close attention to edrophonium concentration and dose is essential in preventing inadvertent overdoses.

474. Intracavernosal phenylephrine as a probable cause of hypertensive emergency and intracranial hemorrhage: case report. Drayton Hammond, PharmD, MBA, BCPS, BCCCP[1], Jorge Kamimoto, MD[2], William Atchley, MD, PhD[2], Marcia Erbland, MD[2]; (1) Department of Pharmacy Practice, University of Arkansas for Medical Sciences, Little Rock, AR (2) University of Arkansas for Medical Sciences, Little Rock, AR
INTRODUCTION: Phenylephrine is a selective alpha-1-adrenergic receptor agonist used for multiple indications. The potential for phenylephrine to precipitate hypertensive emergency and intracranial hemorrhage, while well described with parenteral administration, has been described infrequently with alternative routes of administration. We describe the second reported case of a patient who developed hypertensive emergency and intracranial hemorrhage following intracavernosal phenylephrine administration.
CASE: A 43-year-old male with a history of hypertension and combined kidney-pancreas transplant presented to the emergency department with recurrent, idiopathic priapism. His medication list included lisinopril, metoprolol tartrate, mycophenolate mofetil, prednisone, sulfamethoxazole-trimethoprim, and tacrolimus. Within minutes of administering 100 μg of phenylephrine by injection in each corpus, the patient complained of excruciating headache, nausea, diaphoresis, and crushing chest pain. The highest blood pressure recorded was 240/120 mm Hg. On neurological exam, the patient had partial left hemianopia, right pronator drift, and decreased strength 3/5 on the right arm and leg. A head computed tomography scan revealed a hyperdense lesion in the pons, extending to the cerebellum. Magnetic resonance imaging was compatible with a hemorrhage in the left pons with extension to the left middle cerebellar peduncle. A computed tomography scan of the head, neck, and chest did not reveal evidence of aneurysms, arteriovenous malformations, or aortic dissection. The patient was admitted to the medical intensive care unit for conservative management of hypertensive emergency and intracranial hemorrhage. Priapism recurred during hospitalization, necessitating shunt placement. Neurologic deficits improved during hospitalization; however, mild diplopia and gait impairment persisted at discharge.
DISCUSSION: Our patient scored a 5 on the Naranjo probability scale, suggesting a probable association between intracavernosal phenylephrine and hypertensive emergency. Metoprolol may have contributed to unopposed alpha-1 activity, increased vasoconstriction, and subsequent hypertensive emergency.
CONCLUSION: Careful review for pharmacologic interactions and close observation after intracavernosal phenylephrine use in high-risk patients is recommended.

Hematology/Anticoagulation

475. A protocol for intraarterial tirofiban administration for thromboembolic complications during neuroendovascular treatment: a case report. Deepa Patel, PharmD[1], Mikayel Grigoryan, MD[2]; (1) School of Pharmacy, Philadelphia College of Osteopathic Medicine, Suwanee, GA (2) Department of Interventional Neurology, WellStar Atlanta Medical Center, Atlanta, GA
INTRODUCTION: Thromboembolic complications are a keen concern with neuroendovascular procedures, and there is a paucity of data on pharmacological options for acute management. Rapid treatment with glycoprotein IIb/IIIa inhibitors may be considered. We describe a case of superselective transcatheter tirofiban administration during coil embolization of subarachnoid hemorrhage.

CASE: A 52 year-old woman with a past medical history of hypertension and tobacco use, noncompliant to medical therapy, was admitted for a subarachnoid hemorrhage of the anterior communicating artery with a Hunt Hess grade 2 at presentation. She underwent emergent catheter angiography with intention of endovascular treatment of the aneurysm with coil embolization. Two coils were advanced into the aneurysm. The first coil was successfully deployed and detached. Upon advancement of the second coil, nonocclusive thrombus formation was evident on a repeat angiographic run. The second coil was successfully withdrawn without detachment. Rapid administration of an intraarterial (IA) bolus dose of tirofiban per institution protocol resulted in an interval decrease in the size of the thrombus at 5 and 25 min after tirofiban administration. Repeat imaging the following day confirmed interval resolution of the nonocculsive thrombus. No safety concerns from tirofiban administration were noted.
DISCUSSION: Though glycoprotein IIb/IIIa inhibitors are widely used for acute coronary syndromes, currently, there is limited guidance on use of this class of medications for thromboembolic complications during neuroendovascular procedures. At present, most case reports in the literature describe intraarterial eptifibatide use. We developed a protocol for intravenous and intraarterial tirofiban for prophylactic and rescue therapy at our institution following a formulary change from eptifibatide to tirofiban. To date, use of this protocol has yielded positive outcomes and no safety concerns.
CONCLUSION: Intraarterial tirofiban administration can be an effective option for acute thromboembolic complications during emergent neuroendovascular procedures.

Infectious Diseases

476. A case of rapid onset daptomycin-induced neutropenia. Jason Lancaster, PharmD, MEd[1], Christine Vaudo, PharmD[2], Satinder Singh, MD[3]; (1) School of Pharmacy, Northeastern University, Boston, MA (2) Department of Pharmacy, Lahey Hospital & Medical Center, Burlington, MA (3) Department of Hospital Medicine, Lahey Hospital & Medical Center, Burlington, MA
INTRODUCTION: We describe a rapid onset case of daptomycin-induced neutropenia in a patient with a polymicrobial pressure ulcer.
CASE: A 75-year old woman was transferred to our tertiary academic medical center for management of an foul smelling, nondraining, unstageable sacral pressure ulcer. The patient's past medical history was significant for a subdural hematoma, cerebrovascular accident, dementia, essential hypertension, hyperlipidemia and type 2 diabetes mellitus. Upon admission the patient's laboratory data was notable for a white blood cell count of 14.90 K/μL and absolute granulocyte count of 12.24 K/uL. After a complicated hospital course, including antimicrobial and surgical management, the patient was initiated on daptomycin 6 mg/kg (300 mg) intravenously each day in response to wound cultures demonstrating the presence of *Enterococcus faecium*. After 96 h the *E. faecium*sensitivities were reported, with the bacteria being sensitive only to daptomycin and linezolid. The patient was maintained on daptomycin therapy and experienced a profound reduction in her white blood cell, reaching a nadir of 1.63 K/μL after 12 days of therapy. Prior to documented resolution of her blood dyscrasia the patient was transferred to hospice care and use of antimicrobial therapy was withdrawn.
DISCUSSION: Unlike previous case reports of daptomycin-induced neutropenia or thrombocytopenia in which patients received high dose therapy, ranging from 8 to 10 mg/kg/day, or with prolonged courses of therapy, this case describes a much more rapid onset at a lower daily dose. The Naranjo Adverse Drug Reaction Probability Score demonstrated a probable relationship (score equal to 6) between daptomycin and her neutropenia.
CONCLUSION: The occurrence of daptomycin-induced neutropenia and thrombocytopenia may occur in patients receiving traditional dosing, not just at higher doses, and over a shorter time-frame than previously documented. Healthcare providers should be cognizant of this worrisome, and potentially life threatening, adverse reaction associated with daptomycin use, even when used for short courses or at traditional doses.

477. Case report of a combined albendazole and praziquantel therapy in an adult female with neurocysticercosis and generalized tonic-clonic seizures. Katerina Petrov, PharmD, BCPS[1], Faith Ihongbe, PharmD Candidate[2], Sarfraz Choudhary, MD, FACP[3]; (1) Bernard J. Dunn School of Pharmacy, Shenandoah University, Winchester, VA (2) Bernard J. Dunn School of Pharmacy, Shenandoah University, Ashburn, VA (3) INOVA Loudoun Hospital, Leesburg, VA
INTRODUCTION: Neurocysticercosis is a leading cause of seizures and epilepsy worldwide and is an increasingly important health issue in the United States. Neurocysticercosis is difficult to treat. Albendazole monotherapy has been favored as the treatment option for neurocysticercosis. However, a recent clinical trial suggests that combined therapy of albendazole and praziquantel is superior to abendazole monotherapy.
CASE: We describe a 32-year-old woman with a 5-year history of generalized tonic-clonic seizures who was seizure-free for 2 years. She presented to the emergency room with generalized tonic-clonic seizures which lasted for more than 1 min. MRI of the brain revealed a 5 mm ring-enhancing lesion in the posterior, right frontal lobe of the cerebral cortex, with surrounding vasogenic edema suggestive of an infective neurocysticercosis lesion. A positive serological antibody test utilizing western blot assay for cysticercosis IgG antibody confirmed the diagnosis. The patient was commenced on combined therapy of albendazole 400 mg orally twice daily and praziquantel 1,200 mg orally 3 times daily for 14 days. Patient tolerated both albendazole and praziquantel without any adverse reactions and was seizure free on day 2 of combined therapy. Patient was discharged on day 3 with a follow-up appointment in one month.
DISCUSSION: Neurocysticercosis is a rare condition in the United States with an estimated 1000 cases annually. The CDC currently recommends albendazole monotherapy for treatment of neurocysticercosis. However, a 2016 clinical trial reported that the combined therapy of albendazole and praziquantel is superior to albendazole monotherapy. This case report aligns and supports the trial conclusion for effective and quick resolution of symptoms. It confirms the excellent safety profile and tolerability of the combined therapy of albendazole and praziquantel in neurocysticercosis.
CONCLUSION: Clinicians should consider the efficacy and safety of combined albendazole and praziquantel therapy for the treatment of neurocysticercosis.

Neurology

478. Copper deficiency related neuropathy in a gastric bypass patient: a case report. Emily Murray, PharmD Candidate, Jody Rocker, PharmD, BCPS, Susan C. Fagan, PharmD, BCPS, FCCP; University of Georgia College of Pharmacy, Athens, GA
INTRODUCTION: Copper deficiency in post-gastric bypass surgery patients is a potentially severe deficiency that can result in hematologic abnormalities and profound and often irreversible neurological issues.
CASE: A 43-year-old white female presents to the neuromuscular clinic for chronic lower extremity pains initiating one year ago. The symptoms migrated superiorly, and her symptoms now extend beyond her knees to her mid-thighs and have begun to afflict her hands. She has developed weakness and has fallen several times due to it. She cannot walk and is now wheelchair bound. Her past medical history was significant for gastric bypass surgery 10 years prior. The patient was admitted to Augusta University Medical Center, and after a complete workup, it was

determined the patient had a copper deficiency with levels of only 0.13 μmol/L [1.6Ð2.4 μmol/L]. To remedy this, an IV infusion of copper was administered to the patient.
DISCUSSION: Bariatric surgery candidates are already at higher risk of being deficient in copper. Further depletion can result from the loss of the duodenum and proximal jejunum (predominant sites for copper absorption) in Roux-en-Y gastric bypass (RYGB) surgery. The current guidelines published by ASMBS suggest that gastric bypass patients should take a multivitamin with 2 mg/day of copper. However, this is only a Grade D recommendation due to the fact that there is little scientific literature to recommend this dose. Additionally, the guidelines state that copper screening is only indicated if there is a cause for concern and is not routinely indicated following bariatric surgery.
CONCLUSION: Delaying the treatment of copper deficiency can result residual neurological disability. Thus, there is need for discussion if routine copper monitoring at baseline and post-gastric bypass surgery should be mandatory to ensure that any hematologic or neurological harm to our patients is avoided.

Nutrition

479. Avoiding patient harm with parenteral nutrition during electrolyte shortages: a case study. Eric Brown, PharmD[1], Nicole McClellan, PharmD[2], Gayle Minard, MD[3], George Maish III, MD[3], Roland Dickerson, PharmD[4]; (1) University of Tennessee Health Science Center, Memphis, TN (2) Regional One Health (3) Department of Surgery, University of Tennessee Health Science Center, Memphis, TN (4) Department of Clinical Pharmacy, University of Tennessee Health Science Center, Memphis, TN
INTRODUCTION: Drug shortages, including electrolytes, can potentially cause patient harm if not adequately addressed.
CASE: A 65 year old male with reflux esophagitis, delayed gastric empting, and an unintentional 20 pound weight loss over two months was admitted to the hospital. Prokinetic pharmacotherapy was unsuccessful. Parenteral nutrition (PN) was initiated. Multiple attempts for jejunostomy tube feeding failed due to severe abdominal distension and ileus. The tube was left to gravity drainage (average output of 844 mL/d, range: 175 to 2400 mL/d). Chloride and acetate intakes from PN averaged 138 and 115 mEq/d. Supplemental intravenous fluids provided 370 mEq of chloride/d. The hospital experienced a shortage of intravenous potassium and sodium acetate. Serum total CO_2 content decreased from 25 to 18 mEq/L, and he developed a hyperchloremic metabolic acidosis (pH 7.28, PCO_2 36, anion gap 16, base excess −9.1, delta ratio 0.2, serum chloride 107 mEq/L) after 10 days of acetate-free PN. The patient was given 50 mEq sodium bicarbonate intravenously daily for three days (estimated bicarbonate deficit: 233 mEq), and his supplemental intravenous fluid was changed to Lactated Ringers. Serum total CO_2 content increased to 28 mEq/L, and pH normalized to 7.36 eleven days later.
DISCUSSION: Electrolyte balance during PN therapy requires quantitative and qualitative evaluation of drainage losses. Small bowel fluid contains 30 to 80 mEq/L of bicarbonate. The intravenous acetate shortage persisted longer than anticipated, which prompted unique intervention to avoid ensuing severe acidemia.
CONCLUSION: This case report illustrates that drug shortages require clinicians to be innovative to avoid potential patient harm.

Pharmacogenomics/Pharmacogenetics

481. A case report of complete warfarin resistance and clinical application of pharmacogenetic testing. Eric Parod, PharmD[1], Dave Dixon, PharmD[1], Evan Sisson, PharmD, MSHA[1], Kendra Ogbonna, PharmD[2]; (1) Department of Pharmacotherapy and Outcomes Science, Virginia Commonwealth University School of Pharmacy, Richmond, VA (2) Virginia Commonwealth University Health System, Richmond, VA
INTRODUCTION: Warfarin resistance is defined as failure to achieve a therapeutic INR despite > 70 mg/week. Complete warfarin resistance is much less common and occurs when a patient doesn't respond regardless of the dose. The following is a case of complete warfarin resistance confirmed by pharmacogenetic testing.
CASE: A 46-year-old African-American female presented to clinic with recurrence of palpitations and fatigue attributable to atrial fibrillation (AF) confirmed by ECG. Upon exam, her BP was 124/86 mmHg and HR 76 BPM. She was previously treated with warfarin by another clinic for paroxysmal AF, but was de-escalated to aspirin monotherapy after returning to NSR. Based on coexisting hypertension and diabetes, and $CHADS_2$-VASc score of 3, anticoagulation was initiated with warfarin 5 mg daily. Over the next 3 months, her INR never exceeded 1.1 despite continued dose titrations to warfarin 15 mg daily. Excessive vitamin K consumption and relevant drug-drug interactions were ruled out. Non-adherence could not be ruled out, so there was reluctance to switch to a direct oral anticoagulant (DOAC). Prior to further dose titration, a serum warfarin level and pharmacogenetic testing were obtained to objectively rule out non-adherence and inherited warfarin resistance. The resulting serum warfarin level of 4 mcg/mL (reference range: 2–10 μg/mL) supported adherence to warfarin. Her VKORC1 genotype was NonA/NonA and CYP2C9 genotype was *1/*1, indicating inherited warfarin resistance. Warfarin was discontinued and the patient was switched to rivaroxaban 20 mg daily and has remained stable without adverse events.
DISCUSSION: Although routine pharmacogenetic testing is not recommended by current guidelines to direct warfarin dosing, it verified that this individual was a poor candidate for warfarin therapy. Additionally, it supported switching to a DOAC by helping rule out medication nonadherence.
CONCLUSION: Pharmacogenetic testing was useful in this individual to identify inherited warfarin resistance and rule out nonadherence before switching to a DOAC.

Psychiatry

482E. Depakote as an alternative treatment for benzodiazepine withdrawal and anxiety in an elderly patient with a history of chronic benzodiazepine use. Hina Patel, PharmD, MBA[1], Stephanie Parker, PharmD[2], Jennifer R. Bean, PharmD, BCPP, BCPS[2]; (1) Department of Pharmacy, University of Tennessee College of Pharmacy, Nashville, TN (2) Veterans Affairs Tennessee Valley Healthcare System, Murfreesboro, TN
Presented at ASHP Mid-Year Meeting 2015

Systematic Reviews/Meta-Analysis ADR/Drug Interactions

484. Is the combination of piperacillin/tazobactam and vancomycin associated with nephrotoxicity – a meta-analysis. Pramodini Kale-Pradhan, PharmD, FCCP[1,2], Chandni Patel, BS Biological Sciences[1], Christopher A. Giuliano, PharmD[1,3]; (1) Department of Pharmacy Practice, Wayne State University, Eugene Applebaum College of Pharmacy & Health Sciences, Detroit, MI (2) St. John Hospital and Medical Center, Detroit, MI (3) St. John Hospital and Medical Center, Detroit, MI
BACKGROUND: The purpose of this meta-analysis is to evaluate the association of nephrotoxicity when piperacillin/tazobactam is added to vancomycin (V/PT) compared to either an alternate beta-lactam added to vancomycin (V/B) or vancomycin alone.
METHODS: The meta-analysis included all studies in hospitalized patients that evaluated the association of nephrotoxicity with V/PT versus V/B. Pediatric studies were excluded. PubMed, EMBASE, Cochrane, CINAHL, Scopus and Google Scholar were searched from 1966 to present. Quality of studies was assessed using the Newcastle Ottawa Quality Assessment Scale

(NOQAS). Two investigators independently extracted data into standardized data collection forms which was confirmed by a third investigator. Sensitivity analysis was performed to explore if results differed for vancomycin alone or V/B comparison groups, unpublished data and quality of studies (NOQAS ≤ 6). Overall association was analyzed using the fixed effects model (Comprehensive Meta analysis®Ver 2.0).
RESULTS: Seven studies were included in the analysis involving 1102 patients: 4 studies used vancomycin, 3 used V/B as the comparator. NOQAS scores ranged from 6 to 8 out of 9. Overall there was an association with nephrotoxicity and V/PT compared to V/B and vancomycin (OR 3.936, 95%CI 2.468–6.278; $I^2 = 0\%$). This association remained for both the V/B (OR 5.022, 95%CI 2.332–10. 817, $I^2 = 0\%$) and vancomycin (OR 3.411, 95% CI 1.894–6.142, $I^2 = 0\%$) comparison groups. Similar associations were found for NOQAS score (OR 3.869, 95%CI 2.353–6.360, $I^2 = 0\%$) and unpublished data (OR 2.958, 95%CI 2.117–4.132, $I^2 = 30.6\%$).
DISCUSSION: An association exists between the use of V/PT and nephrotoxicity. These results remained similar when comparing V/PT to V/B or vancomycin alone. Excluding lower quality studies and including unpublished data showed consistent results. The main limitation of these results is only observational data was available, however heterogeneity was not present. Practitioners need to be vigilant about a possible association between V/PT and nephrotoxicity.
OTHER: Not funded.

Drug Information

486. Venous thromboembolism prophylaxis in surgical and medical obese patients: a systematic review of randomized and cohort studies. John Ericson Margallo, PharmD Candidate 2017, Tram Cat, PharmD, BCPS; Department of Pharmacy Services, Cedars Sinai Medical Center, Los Angeles, CA
BACKGROUND: To evaluate current literature for venous thromboembolism (VTE) prophylaxis in surgical and medical obese patients with BMI ≥ 30 kg/m^2.
METHODS: A systematic literature search was performed using PubMed with the following key terms: VTE prophylaxis, deep vein thrombosis, pulmonary embolism, bariatric surgery and obesity. The inclusion criteria included: randomized and cohort studies published from January 2000 to August 2015, studies comparing pharmacologic VTE prophylaxis in obese patients with outcomes of VTE and bleeding events, and studies evaluating pharmacologic VTE prophylaxis in surgical and medical obese patients. The exclusion criteria were animal studies, non-peer-reviewed studies, and studies not evaluating clinical outcomes. Risk of bias was assessed regarding study design, confounding factors, and selective outcome reporting.
RESULTS: Seven studies met the inclusion criteria. Three studies evaluating enoxaparin 40 mg BID in surgical and medical patients with BMI ≥ 40 kg/m^2 found lower VTE rates, no difference in bleeding risk, and shorter lengths of stay. One study evaluating heparin 7,500 units TID in surgical and medical patients with BMI ≥ 40 kg/m^2 also found lower VTE rates and no increase in bleeding risk. Four studies evaluating enoxaparin 0.5 mg/kg BID or daily in medical patients with BMI ≥ 30 to < 40 kg/m^2 found minimal cases of VTE or bleeding. In studies evaluating anti-Xa levels, higher prophylactic doses of enoxaparin and heparin achieved prophylactic levels (0.2–0.5 IU/mL) better than standard doses.
DISCUSSION: The use of high-dose enoxaparin and heparin regimens appear to be reasonable recommendations for obese patients. Anti-Xa measurements could be considered in patients with BMI ≥ 30 kg/m^2 to ensure adequate prophylaxis. Limitations included: study design, small sample size, single-center only studies, and the use of different inclusion and exclusion parameters.
OTHER: N/A.

Education/Training

487. Development of critical thinking among health professions students: an updated systematic review and meta-analysis of longitudinal studies. Matthew Reale, PharmD, BCCCP[1], Benjamin Witt, PharmD, BCPS[2], Daniel Riche, PharmD, FCCP, BCPS, CDE, ASH-CHC[3], William Baker, PharmD, FCCP, FACC[4], Michael Peeters, PharmD, MEd, FCCP, BCPS[5]; (1) Mercy Medical Center, Canton, OH (2) University of Utah Health Care, Salt Lake City, UT (3) University of Mississippi School of Pharmacy, Jackson, MS (4) University of Connecticut School of Pharmacy, Storrs, CT (5) University of Toledo College of Pharmacy and Pharmaceutical Sciences, Toledo, OH
BACKGROUND: Authors systematically summarized available evidence for development in critical thinking among health professions students, as evidenced by use of standardized tests of critical thinking [California Critical Thinking Skills Test (CCTST), Health Sciences Reasoning Test (HSRT), and Defining Issues Test (DIT)].
METHODS: Through February 2016, we searched multiple databases (Pubmed, EMBASE, CINAHL, PsychINFO, ERIC, Academic Search Complete, Proquest Dissertation and Theses A&I, Google Scholar, and conference proceedings from the *American Journal of Pharmaceutical Education, Medical Education, and Academic Medicine*) for English and non-English longitudinal studies using the CCTST, HSRT, or DIT. Using a random-effects model, mean changes in test scores were reported as Cohen's *d* with 95% confidence intervals (CIs). Heterogeneity was assessed using the I^2 statistic while publication bias used Egger's weighted regression statistic. Sensitivity analysis was conducted with limiting studies to > 9 months duration (i.e., one academic-year).
RESULTS: 50 studies were included (25 CCTST, 22 DIT, 3 HSRT; inter-screener kappa = 0.82, strong agreement); 6884 students were analyzed. There was a significant change in CCTST (0.334, 95%CI 0.216–0.452; $I^2 = 86.4$, Egger p=0.024) and DIT (0.289, 95%CI 0.193–0.386; $I^2 = 81.8$, Egger p=0.003) composite scores, but not HRST scores (0.057, 95%CI −0.031–0.145; $I^2 = 44.4$, Egger p=0.08). Sensitivity analysis revealed no substantive differences.
DISCUSSION: This updated meta-analysis demonstrated that student performance on critical thinking assessments were often consistent, though some professions varied with one assessment instrument. The CCTST and DIT showed cognitive development among health professions students; HSRT did not. While a prior meta-analysis did not show any development of DIT among pharmacy students, this updated analysis demonstrates an improvement in the cognitive development of pharmacy students —similar to improvement of students from other health professions. Our systematic study was limited by publication bias, as are all meta-analyses. Heterogeneity was also noted, appearing to come from differences among professional programs.
OTHER: No external funding or registration.

Endocrinology

488. Quality of the evidence on barriers to medication adherence in patients with diabetes mellitus: a systematic review of systematic reviews. Ahmed Awaisu, PhD[1], Myriam Jaam, BSc (Pharm)[2], Mohamed Izham, MI, PhD[2], Nadir Kheir, PhD[1]; (1) Clinical Pharmacy and Practice Section, College of Pharmacy, Qatar University, Doha, Qatar (2) College of Pharmacy, Qatar University, Doha, Qatar
BACKGROUND: Several systematic reviews have investigated barriers to medication adherence in patients with diabetes, but their methodological qualities have not previously been appraised. Furthermore, these reviews report a remarkably diverse complex network of barriers to medication adherence, making it challenging to develop holistic evidence-based interventions. Objective: We systematically evaluated existing systematic reviews focusing on barriers to medication adherence in patients with diabetes in

an effort to synthesize the evidence and to identify gaps in the literature.
METHODS: Information sources: Fourteen databases and grey literature sources were systematically searched through April 2016. Eligibility criteria: Reviews must be systematically conducted, reported in English and reporting barriers to medication adherence in patients with diabetes (type 1 or type 2). Risk of bias: Data were extracted using a pre-tested data extraction tool. Risk of bias was assessed using "A Measurement Tool to Assess Systematic Reviews (AMSTAR)".
RESULTS: Included studies: Seventeen systematic reviews including 542 primary studies most of which were cross-sectional qualitative studies, were included. Synthesis of
RESULTS: All the reviews were rated as low to moderate quality and exhibited common methodological pitfalls. Barriers to medication adherence identified were categorized into: patient–, medication–, disease–, healthcare provider–, healthcare system–, and social–related factors.
DISCUSSION: Strengths and limitations of evidence: Duplicates of primary studies included in the reviews were not checked and the quality of the original studies was not evaluated. Interpretation: Barriers to medication adherence are multi-factorial with remarkably consistent findings across the existing reviews; yet, most reviews were judged to be of low to moderate quality. Further comprehensive and well conducted systematic reviews on this topic shall be conducted taking into considerations the pitfalls of the existing ones.
OTHER: Funding: This review did not use any funding. Registration: There was no prior registration of protocol.

Gastroenterology

489. Doxycycline for the eradication of *Helicobacter pylori*: a meta-analysis. Pramodini Kale-Pradhan, PharmD, FCCP[1,2], Reem Ismail, BS Health Sciences[1], Chandni Patel, BS Biological Sciences[1], Sheila Wilhelm, PharmD, FCCP, BCPS[1,3]; (1) Department of Pharmacy Practice, Wayne State University, Eugene Applebaum College of Pharmacy & Health Sciences, Detroit, MI (2) St. John Hospital and Medical Center, Detroit, MI (3) Harper University Hospital, Detroit, MI
BACKGROUND: This meta-analysis evaluates eradication rates of *Helicobacter pylori* when a doxycycline regimen is compared to triple or quadruple therapy.
METHODS: A systematic literature search of PubMed, Scopus, Web of Science, and Cochrane Central Register of Controlled Trials databases (from inception through May 2016) was conducted to identify English-language, randomized controlled trials that compared doxycycline-based therapy with triple or quadruple treatment regimens in *H. pylori*-infected, treatment-naive adults. All selected trials confirmed pre-treatment *H. pylori*infection and post-treatment eradication. Studies involving pediatric patients or patients who failed previous therapy were excluded. Risk of bias was assessed using Jadad score. Overall analysis was performed using Review Manager 5.2. Treatment effect was determined with a random-effects model by using the Mantel-Haenszel method and was reported as an odds ratio (OR) with 95% confidence interval (CI).
RESULTS: Four randomized controlled trials were included (N = 631 patients, Median Jadad Score 3 out of 5). Doxycycline-based regimens successfully eradicated *H. pylori*compared to triple or quadruple therapy (Intention to treat analysis 254 of 391 (65%) versus 139 of 289 (48%), respectively; OR = 1.64, 95% CI 1.16–2.33; Per-protocol analysis 254 of 365 (70%) versus 139 of 266 (52%), respectively; OR 1.77, 95% CI 1.21–2.59).
DISCUSSION: The meta-analysis supports the use of doxycycline based therapy for *H. pylori* eradication. The treatment regimens used in the included trials varied, which presents a limitation of the analysis. The doxycycline regimens varied in the studies, and not all triple or quadruple regimens used reflect the current American Gastroenterological Association guidelines. The treatment durations also varied from 7 to 14 days. In the event of a tetracycline shortage, doxycycline may be a viable alternative for eradication of *H. pylori* infections.
OTHER: This work was not funded.

Infectious Diseases

490. Acute kidney injury with concomitant piperacillin/tazobactam and vancomycin: systematic review. Drayton Hammond, PharmD, MBA, BCPS, BCCCP[1], Melanie Smith, PharmD[2], Sarah Hayes, PharmD[3], Chenghui Li, PhD[4], Katherine Lusardi, PharmD[5], P. Brandon Bookstaver, PharmD, FCCP, BCPS, AAHIVP[6]; (1) Department of Pharmacy Practice, University of Arkansas for Medical Sciences, Little Rock, AR (2) Department of Pharmacy, Medical University of South Carolina, Charleston, SC (3) Fairview Health Services and University of Minnesota Medical Center, Minneapolis, MN (4) Department of Pharmacy Practice, Pharmaceutical Evaluation and Policy Division, University of Arkansas for Medical Sciences College of Pharmacy, Little Rock, AR (5) University of Arkansas for Medical Sciences (6) Department of Clinical Pharmacy & Outcomes Sciences, University of South Carolina College of Pharmacy, Columbia, SC
BACKGROUND: Concomitantly administered vancomycin and piperacillin/tazobactam compared to vancomycin with or without another beta-lactam may be associated with an increased incidence of acute kidney injury (AKI).
METHODS: Medline, Cochrane Library, and Scopus were searched through June 2016 for English language-only controlled trials and observational studies using "vancomycin" and "piperacillin" and "tazobactam" and "AKI" or "acute renal failure" or "nephrotoxicity." All patient populations were included. Risk of bias was assessed using tools recommended by National Heart, Lung, and Blood Institute.
RESULTS: From 301 results, fourteen observational studies totaling 3358 patients met inclusion criteria. AKI Network; Risk, Injury, Failure, Loss, End-stage; or both classification criteria were utilized in 12 studies (86%). Twelve studies (86%) included only patients 18 years or older and two included only neonatal or pediatric patients. Eight studies (57%) required at least 48 h of therapy. Three studies (21%) included a significant percentage (> 40%) of patients who received care in an intensive care unit (ICU). Eight studies (57%) concluded either the addition of piperacillin-tazobactam to vancomycin was an independent predictor of AKI or concomitant piperacillin-tazobactam and vancomycin was associated with significantly greater AKI than vancomycin alone or vancomycin plus another beta-lactam: both (100%) neonatal or pediatric-only studies, six (50%) adult-only studies, five (56%) studies in non-ICU patients, and one (33%) study in ICU patients. Seven studies were of good quality, four were fair, and three were poor.
DISCUSSION: AKI with concomitant piperacillin-tazobactam and vancomycin was described with various AKI definitions in neonatal, pediatric, and adult populations who were acutely and critically ill. The majority of studies were of good or fair quality. Only observational studies were included. Addition of piperacillin-tazobactam to vancomycin may be associated with an increased incidence of AKI in acutely ill but not critically ill patients.
OTHER: No funding was used. The review was not registered.

491. Antimicrobial treatment of preoperative asymptomatic bacteriuria prior to orthopedic arthroplasty and postoperative infectious complications: a systematic review. Ryan Dull, PharmD[1], Kailin Crowley, PharmD[2], Carmen Frerichs, PharmD[2], Kim Pham, PharmD[2], Allyson Cord, PharmD[2]; (1) Department of Pharmacy Practice, Creighton University School of Pharmacy and Health Professions, Omaha, NE (2) Creighton University, Omaha, NE
BACKGROUND: Bacteriuria is implicated in prosthetic joint infection (PJI) but the nature of this relationship is not certain. A

paucity of research yields conflicting recommendations regarding treatment of asymptomatic bacteriuria (ASB) prior to orthopedic arthroplasty (OA). The objective of this report is to systematically review the literature to determine the effects of preoperative antimicrobial treatment of ASB prior to OA on postoperative infectious complications.
METHODS: Medline (1947–2015) and Cumulative Index to Nursing and Allied Health Literature (1961–2015) were searched using the terms "preoperative urine culture", "asymptomatic bacteriuria", "urinary tract infection", "orthopedic surgery", "arthroplasty", "surgical site infection" and "prosthetic joint infection". The bibliographies of relevant articles were assessed. Results were limited to trials conducted in adult humans and published in the English language. Randomized controlled trials (RCT), cohort studies, case-control studies, and meta-analyses were eligible if they compared postoperative infectious complications among treated and untreated subjects who underwent OA. Articles were excluded if they evaluated preoperative screening and treatment of ASB prior to a non-orthopedic surgical intervention or preoperative treatment of symptomatic bacteriuria. The Cochrane Risk of Bias Tool was used to assess bias risk.
RESULTS: The search yielded 19 articles; 3 fit the criteria. One study was a RCT and 2 were cohort studies. Preoperative urinalysis was collected from 3,181 OA subjects, ASB was diagnosed in 360 and treated in 184. PJI was reported in 27 subjects. Antimicrobial treatment of preoperative ASB prior to OA was not associated with less postoperative urinary tract infections or PJI at 3 months and 1 year. The bacteria isolated from PJI cultures were different than isolated from preoperative urine cultures.
DISCUSSION: The risk for bias is high and the quality of evidence is low. Treatment of ASB prior to OA is not associated with fewer postoperative infectious complications. This practice should be discouraged.
OTHER: This study is unfunded.

492. Fecal microbiota transplantation for the treatment of recurrent *Clostridium difficile* infection. Jennifer Mijares, PharmD, Patricia Gonzalez-Abreu, PharmD, Shara Parrish, PharmD, Kristina Contreras, PharmD; Gregory School of Pharmacy, Palm Beach Atlantic, West Palm Beach, FL
BACKGROUND: *Clostridium difficile* is a prevalent infection in the community, associated with antimicrobial use. Fecal Microbiota Transplantation (FMT) is a controversial alternative therapy used to treat recurrent CDI by taking donor stool and transplanting into infected recipient to reset their bowel flora. The objective of this review is to determine whether addition of FMT to current treatment guidelines could impact overall cure of recurrent CDI.
METHODS: We performed comprehensive literature searches to date through OVID with the following search terms "fecal microbiota transplantation", "*Clostridium difficile*" for randomized controlled trials. Four studies were found all Phase I trials; Describing the microbiota of patients with recurrent CDI; Assess safety and rate of resolution of diarrhea in patients with recurrent CDI given frozen FMT; Evaluate efficacy of FMT in treatment of refractory/relapsing CDI; Determine superiority of FMT compared with VAN and VAN + lavage to resolve CDI.
RESULTS: Phase I trial of 9 patients demonstrated statistically significant improvement between microbial genus between donors and patients from 41% at day 0 to 13% ($p<0.05$) at day 70. Phase I trial of 20 patients demonstrated statistically significant difference ($p<0.02$) in pretreatment overall health scores between patients requiring one treatment opposed to two. Phase I trial of 20 patients demonstrated NGT route equally effective as Colonoscopic route, with overall cure rate of 90% at 8 weeks. Phase I trial of 41 patients demonstrated statistical significant difference between FMT and VAN only, as well as between FMT and VAN +lavage.
DISCUSSION: All four trials were limited by small sample sizes. FMT therapy is limited by Pt/MD reluctance to use due to stigma of feces and procedural requirements as well as cost. However, studies showed that treatment with FMT helps in restoration of healthy intestinal microbiota and demonstrated significant improvement after failing first line therapy treatment.
OTHER: Authors have no conflict of interests to disclose.

493. Simeprevir for the treatment of chronic hepatitis c infection: a systematic review. Andrea Mezentsef, PharmD Candidate, Mara Poulakos, PharmD; Palm Beach Atlantic University, LLoyd L. Gregory School of Pharmacy, West Palm Beach, FL
BACKGROUND: Prior to the approval of HCV protease inhibitors (PI) in 2011, the standard treatment of HCV genotype 1 infection involved the combination of pegylated interferon and ribavirin for 48 weeks or longer. Limitations of this treatment involve its long duration of therapy, safety profile and sustained virologic response (SVR) of 40% to 50% in patients with HCV genotype 1.
OBJECTIVE: To evaluate the safety and efficacy of simeprevir for the treatment of chronic HCV infection.
METHODS: A systematic literature search was conducted utilizing PubMed and OVID MEDLINE with the following terms: "simeprevir", "TMC 435", "NS3/4A protease inhibitor" and "hepatitis C virus". One randomized, double-blind, multicenter, noninferiority phase III trial (ATTAIN) and three randomized, double-blind, placebo-controlled, multicenter phase III trials (QUEST-1, QUEST-2, and PROMISE) were reviewed.
RESULTS: Trials involved 1,941 treatment-naive and treatment-experienced participants being randomly assigned to receive simeprevir plus pegylated interferon and ribavirin (simeprevir group) or placebo plus pegylated interferon and ribavirin (placebo group). In QUEST-1 and QUEST-2 trials, 80% of treatment-naïve participants in the simeprevir group achieved a SVR in 12 weeks, compared to 50% of participants in the placebo group ($p<0.0001$). In the PROMISE study involving treatment-experienced participants, 79.2% of participants in the simeprevir group achieved SVR in 12 weeks compared to 36.1% of participants in the placebo group ($p<0.001$).
DISCUSSION: Safety and SVR at 12 weeks were the primary end-points of the trials. Limitations involved the exclusion of patients with HAV, HBV, or HIV coinfection; non-genotype 1 HCV; and patients < 18 years of age. All trials were funded by Janssen. In the ATTAIN trial, simeprevir proved noninferiority to telaprevir. In QUEST-1, QUEST-2 and PROMISE trials, simeprevir improved SVR without worsening the known adverse events associated with pegylated interferon and ribavirin.
OTHER: Authors have no conflicts of interest to disclose.

Neurology

495E. Systematic literature review of droxidopa in clinical trials for neurogenic orthostatic hypotension (nOH) in parkinsonism. Jack J. Chen, PharmD[1], Khashayar Dashtipour, MD, PhD[2], Stephanie Tashiro, MPH[2], Ivan Portillo, MLIS[3]; (1) College of Pharmacy, Marshall B. Ketchum University, Fullerton, CA (2) Department of Neurology, Loma Linda University, Loma Linda, CA (3) Marshall B. Ketchum University, Fullerton, CA
Published in Neurology 2016;86(16 Suppl):P4.323.

496E. Systematic literature review of quetiapine for hallucinosis/psychosis in Parkinson's disease (PD). Jack J. Chen, PharmD[1], Khashayar Dashtipour, MD, PhD[2], Lilian Massihi, MD[2], Stephanie Tashiro, MPH[2], Ivan Portillo, MLIS[3]; (1) College of Pharmacy, Marshall B. Ketchum University, Fullerton, CA (2) Department of Neurology, Loma Linda University, Loma Linda, CA (3) Marshall B. Ketchum University, Fullerton, CA
Presented at the 20th International Congress of Parkinson's Disease and Movement Disorders, Berlin, Germany, June 19–23, 2016.

497E. The role of microdose lithium in patients with Alzheimer's disease-a systematic review. Jose Valdes, PharmD[1], Jessica Greenwood, BA Biology Specializing in Neuroscience[2], Erika Canizares, RN[2], Huy Pham, BS Chemistry[2], Melissa Espinosa, BS Biology[2]; (1) Department of Pharmacy Practice, Nova Southeastern University College of Pharmacy, Palm Beach Gardens, FL (2) Nova Southeastern University College of Pharmacy, Doral, FL
Presented at Annual Conference of the College of Psychiatric and Neurologic Pharmacists, Colorado Springs, CO, April 16–18, 2016.

Oncology

498. Clinical pharmacist impact in outpatient oncology practices: a systematic review. Justin Gatwood, PhD, MPH[1], Katie Gatwood, PharmD[2], Ezra Gabre, PharmD[3], Maurice Alexander, PharmD[4]; (1) Clinical Pharmacy, University of Tennessee College of Pharmacy, Nashville, TN (2) Pediatric Stem Cell Transplant, Monroe Carell Jr. Children's Hospital at Vanderbilt, Nashville, TN (3) University of Tennessee College of Pharmacy, Memphis, TN (4) Oncology, UNC Medical Center, Chapel Hill, NC
BACKGROUND: The incorporation of clinical pharmacists into outpatient oncology clinics has steadily risen in recent years throughout the US; however, the evidence base behind the services these professionals have provided has not been well articulated. This review summarizes the evidence from published literature detailing the impact of clinical pharmacists in this setting on discrete outcomes.
METHODS: Peer-reviewed, published literature evaluating services provided by clinical pharmacists in outpatient oncology clinics in the US was reviewed according to a study-specific protocol. To be considered, each publication must have indicated the evaluation of measurable services and outcomes focused on the care of oncology patients, such as symptom management, medication use, and healthcare costs. Data from eligible studies from 1970 to 2016 (January) were extracted using a standardized tool and agreement by a majority of the authors was required for a publication to be included in the final review.
RESULTS: Seven publications were included in this review; all studies were observational and employed either existing data, accessible medical records, or surveys, both validated and study-derived. Results indicated that pharmacists were effective in several areas of clinical interest: identifying treatment issues or medication misuse; delivering satisfactory and valued services according to patients and providers; and addressing and alleviating treatment-related symptoms, particularly pain. Additionally, oncological pharmacists identified up $210,000 in avoidable care and were able to generate upwards of $840,000 in departmental revenue to justify services.
DISCUSSION: While the prevalence of clinical pharmacists providing direct patient care in outpatient oncology practices is growing across the country, the peer-reviewed evidence demonstrating their impact is lacking and deserves further inquiry through larger more robust analyses. The evidence reviewed suggests that oncology practices may benefit from leveraging clinical pharmacy services in their care models to more efficiently and holistically address the needs of patients with cancer.
OTHER: N/A.

Pulmonary

500. Selexipag in pulmonary arterial hypertension: a comprehensive review. David S. Dakwa, BA, PharmD/MBA Candidate, Lisa Mella, PharmD Candidate, Natalie Mella, PharmD Candidate, Mara N. Poulakos, PharmD; Palm Beach Atlantic University, West Palm Beach, FL
BACKGROUND: Pulmonary arterial hypertension (PAH) is a rare and life-threatening disease with poor prognosis despite available oral prostacyclin analogue options. The objective of this study is to evaluate the long-term clinical efficacy and safety of a novel prostacyclin-receptor agonist with a unique pharmacology profile, selexipag, in the treatment of PAH.
METHODS: A comprehensive literature search was conducted to date utilizing MEDLINE and PUBMED with the following search terms "selexipag", "prostacyclin agonist", and "pulmonary arterial hypertension" to retrieve clinical trials. The following three studies were found: a Phase I randomized, controlled trial measuring single and ascending doses of selexipag; a Phase II evaluating individualized selexipag doses versus placebo at 17 weeks and a Phase III (GRIPHON) trial up to 6 months. Risk of bias was decreased through randomization, randomized schedule, randomized stratification, and blinding.
RESULTS: In the Phase I trial involving 76 patients, there were two pharmacokinetic patient withdrawals and no clinically relevant adverse events. In the Phase II study, there was a statistically significant reduction in geometric pulmonary vascular resistance ($p=0.0045$) in 43 patients at 17 weeks. The GRIPHON trial assessed the risk of death in 397 patients after termination of placebo versus selexipag (hazard ratio = 0.60, 99% CI, 0.46 to 0.78; $p<0.001$).
DISCUSSION: Two trials (Phase I and II) had limitations on long-term safety with study durations of up to 17 weeks, generalization of the results, and small sample size. The GRIPHON trial also had several limitations such as an observational post-treatment observation period, premature discontinuation, and subjective components of primary end point recommendations. The overall evidence of tolerability with increased doses, oral administration with food, and efficacy, demonstrate selexipag's ability to reduce mortality risk or complication in patients with PAH.
OTHER: Authors have no conflicts of interest to disclose.

Substance Abuse/Toxicology

502. Patient outcomes for phenobarbital use with or without benzodiazepines in alcohol withdrawal syndrome: systematic review. Jordan Rowe, PharmD[1], Drayton Hammond, PharmD, MBA, BCPS, BCCCP[2], Tessa Wiley, PharmD[3], Kristen Lee, PharmD[4], Sandra Kane-Gill, PharmD, MSc, FCCM, FCCP[5]; (1) University of Tennessee Medical Center – Knoxville, Knoxville, TN (2) Department of Pharmacy Practice, University of Arkansas for Medical Sciences, Little Rock, AR (3) Nebraska Medicine, Omaha, NE (4) Orlando Regional Medical Center, Orlando, FL (5) Department of Pharmacy and Therapeutics, University of Pittsburgh School of Pharmacy, Pittsburgh, PA
BACKGROUND: Benzodiazepines are the drug of choice for alcohol withdrawal syndrome (AWS); however, phenobarbital is an alternative agent used with or without concomitant benzodiazepine therapy. In this systematic review, we evaluate patient outcomes with the use of phenobarbital for AWS.
METHODS: Medline, Cochrane Library, and Scopus were searched through June 2016 for controlled trials and observational studies using "phenobarbital" or "barbiturate" and "alcohol withdrawal" or "delirium tremens." Risk of bias was assessed using tools recommended by National Heart, Lung, and Blood Institute and ranked as good, fair, or poor.
RESULTS: From 569 identified articles, four controlled trials and six observational studies (n=1068) with AWS of any severity were included. Two studies were of good quality, six were fair, and two were poor. In six studies (n=711) that used phenobarbital without concomitant benzodiazepine therapy, phenobarbital decreased AWS symptoms ($p<0.00001$), had a similar rate of intensive care unit (ICU) admissions (phenobarbital: 16% and 9% vs. benzodiazepine: 14%) and hospital length-of-stay (phenobarbital: 5.85 ± 6.3 days and 5.30 ± 2.6 days vs. benzodiazepine: 6.64 ± 4.2 days), and displayed a similar rate of treatment failure versus comparator therapies (38% vs. 29%, $p=0.70$). In four studies (n=357) with phenobarbital plus benzodiazepine therapy, the phenobarbital group had a decreased or similar rate of ICU admission (8% vs. 25%) and mechanical ventilation (21.9% vs. 47.3%, $p=0.008$); decreased benzodiazepine requirements by 50–

90%; and similar ICU length-of-stay (primarily benzodiazepine therapy: 3.8 days versus concomitant benzodiazepine and phenobarbital therapies: 4.5 days, $p<0.05$), hospital length-of-stay, and AWS symptom resolution versus comparator groups. Adverse effects with phenobarbital included dizziness and tiredness but rarely occurred.
DISCUSSION: Most studies were of fair quality and reported a variety of outcomes. Phenobarbital, with or without concomitant benzodiazepine therapy, may provide similar or improved outcomes compared with benzodiazepine therapy or other comparators.
OTHER: No funding was used. The review was not registered.

Women's Health

503. SSRI use in pregnancy and congenital heart defects: a meta-analysis of population-based cohort studies. Elizabeth Kowalik, PharmD Candidate[1], Kristina Ward, BS, PharmD, BCPS[2], Yizhou Ye, BS, PhD Candidate[2]; (1) University of Rhode Island College of Pharmacy, Kingston, RI (2) Department of Pharmacy Practice, University of Rhode Island College of Pharmacy, Kingston, RI
BACKGROUND: Depression occurs in approximately 10–23% of pregnancies in the United States. Antidepressants, commonly SSRIs, are used during pregnancy without clear safety evidence. A concern with SSRI use during pregnancy is the risk of congenital malformations, including congenital heart defects (CHDs). The purpose of this meta-analysis was to determine if use of SSRIs in pregnancy is associated with CHDs in children.
METHODS: Three biomedical databases were systematically searched: PubMed, EMBASE, and Cochrane. Searches were conducted in July 2015, with no date limitations. Only population-based cohort studies were included. For inclusion, the studies must have reported the number of women exposed and unexposed to SSRIs, and the number of CHDs in both exposed and unexposed women. Studies were excluded if they included other classes of antidepressants. A funnel plot was constructed to analyze publication bias. Tests for heterogeneity, Q and I^2, were used to measure variance between studies.
RESULTS: Eight studies were selected for further analysis. A total of 65,710 women were exposed to SSRIs during pregnancy and 719 cases of CHD were reported. Of the 2,960,492 women not exposed to an SSRI, 27,405 CHD outcomes were reported. A random effects meta-analytic model showed a 34% increased risk of an infant developing a CHD when exposed to an SSRI during pregnancy (OR 1.34, 95% CI 1.11–1.61, p=0.002). The results were associated with substantial heterogeneity (I^2 69.01%, p=0.004).
DISCUSSION: Based on the results of this meta-analysis, an increased risk of CHDs in infants was present in women exposed to SSRIs during pregnancy. The odds of an infant developing a CHD when exposed to SSRIs were 34% higher than those unexposed. The true population effect was between 11% and 61%. Heterogeneity could be explained by variable populations between studies.
OTHER: The authors have no disclosures.

Original Research
Infectious Diseases

505. Evaluation of vancomycin through concentrations in obese patients. Tiffany Dickey, PharmD[1], Bradley Gann, PharmD[2]; (1) College of Pharmacy, University of Arkansas for Medical Sciences, Fayetteville, AR (2) School of Pharmacy, University of Arkansas for Medical Sciences, Fayetteville, AR
INTRODUCTION: Guidelines currently recommend weight based dosing of vancomycin at 15–20 mg/kg/dose using actual body weight of adult patients to achieve a trough concentration of 15–20 mcg/mL. Guidelines also suggest for a loading dose of 25–30 mg/kg should be given for more serious infections. Obesity is commonly defined by a body mass index that exceeds 30 kg/m^2. Studies involving vancomycin dosing in the obese population is limited.
RESEARCH QUESTION OR HYPOTHESIS: Primary – What is the percentage of obese patients who achieve therapeutic steady state vancomycin trough concentrations using guideline recommendations? Secondary – Do vancomycin trough concentrations in obese (BMI: 30–39 kg/m^2) and extremely obese (BMI $\geq$ 40 kg/m^2) patients differ?
STUDY DESIGN: This was single center, retrospective chart review conducted in a 210 bed community hospital from January 1, 2013 to July 31, 2015.
METHODS: Patients 18 years or older were included if their BMI exceeded 30 kg/m^2, had a baseline serum creatinine $\geq$ 0.8 mg/dL, received vancomycin dosed per institution protocol, and had a steady state vancomycin trough concentration during admission. Patients were excluded if they received vancomycin dosed less than 15 mg/kg, if the dosing interval was inappropriate based on estimated creatinine clearance and half-life, or if vancomycin was administered prior to admission. A total of 359 patients were included. Patient outcomes were compared using statistical analysis tools such as two-sample t-test and Pearson chi-square.
RESULTS: Seventy seven (77) obese patients (21.4%) achieved an initial therapeutic steady state trough concentration with 176 obese patients (49.1%) having initial supertherapeutic levels. Average trough concentrations did not differ between the obese (p=0.9) and extremely obese (p=0.07) populations in both vancomycin goal trough ranges of 10–15 μg/mL and 15–20 μg/mL.
CONCLUSION: This study suggest that current guidelines for vancomycin dosing fail to achieve initial therapeutic steady state trough concentrations in obese and extremely obese patient.

510. Assessment of a pharmacist-managed outpatient transition clinic in a community hospital. Kristin Morse, PharmD, Julia Nickerson-Troy, PharmD, Ruthan Tattersall, PharmD, Elizabeth Clements, PharmD, Lindsay Celauro, PharmD; Clinical Pharmacy Services, Florida Hospital Celebration Health, Celebration, FL
INTRODUCTION: With Medicare moving toward a pay-for-performance model, hospitals are instituting transition of care programs to improve outcomes and avoid penalties. Outpatient clinical pharmacists are in an ideal position to aid in the safe transition from hospital to home. Though outcome data is available, little research includes revenue generation and healthcare referrals of these programs.
RESEARCH QUESTION OR HYPOTHESIS: Would an outpatient pharmacist-managed Transition Clinic (TC) reduce 30-day hospital readmissions and number of medication discrepancies, while generating reimbursement and healthcare referrals?
STUDY DESIGN: Retrospective review of charts from January 1-December 31, 2015.
METHODS: Patients with at least one TC visit within 30 days of hospital admission were included in analyses. Readmission data was obtained from the hospital analytics department. Data for medication discrepancies and referrals was obtained through chart documentation. The hospital billing system was utilized to obtain reimbursement data. Visits without insurance response within three months were excluded from analysis. The readmission analysis included a control group, which consisted of patients referred to, but not followed by TC. Controls were chosen randomly in equal number and were compared utilizing Fisher's exact test ($p<0.05$). All other analyses used descriptive statistics.
RESULTS: Analysis included 110 patients. Thirty-day readmission was 5% in TC patients versus 17% for controls (p=0.0069). TC identified 465 discrepancies and resolved 256 within 30 days. Average visit reimbursement was $99, and 130 referrals were generated.
CONCLUSION: Patients seen by TC were 3.4 times less likely to be readmitted within 30 days and resulted in 13 prevented readmissions. An average of 4.4 medication discrepancies per patient were identified with 55% resolved. Pharmacists billing via facility-fee generated a gross of $30,190.51. Additionally, TC

generated referrals to community physicians and other departments in the hospital. These results demonstrated the benefit of a pharmacist-managed TC, which improved patient outcomes and generated revenue and referrals.

511. Evaluation of the impact of a pharmacist-led electronic visit program for diabetes and anticoagulation management. Erika Lambert, PharmD, CPP[1], Mark Gwynne, DO[2], Emily Hawes, PharmD, BCPS, CPP[2]; (1) Department of Pharmacy, University of North Carolina Medical Center, Chapel Hill, NC (2) School of Medicine Department of Family Medicine, University of North Carolina, Chapel Hill, NC

INTRODUCTION: Electronic visits (e-visits) between patients and providers are gaining popularity for management of non-urgent medical conditions. In North Carolina, Clinical Pharmacist Practitioners (CPP) are licensed to provide direct patient care and can obtain privileges to order labs and send prescriptions within the protocol scope. CPPs have the skill set to offer chronic disease services as an e-visit and provide high value population-based clinical interventions.

RESEARCH QUESTION OR HYPOTHESIS: What is the impact of pharmacist-led e-visits for chronic disease management on patient outcomes?

STUDY DESIGN: Retrospective electronic medical record review of patients enrolled in e-visits with a CPP through MyChart messaging at an academic family medicine center for anticoagulation or diabetes management from May 2014 through July 2016.

METHODS: This study was approved by the Institutional Review Board of the University of North Carolina. Data collected included demographic information, laboratory data, and clinical information. The primary outcome was difference in INR time in therapeutic range or change in hemoglobin A1c (HbA1c) pre- and post-enrollment. For diabetes management, the secondary outcomes were change in aspirin or statin use and blood pressure control. Final statistical analysis pending.

RESULTS: Seven patients were enrolled for anticoagulation management using home INR testing, and 47.5% of encounters were billed using CPT 99444. INR was therapeutic 56% of the time compared to 73.5% of the time post-enrollment. For diabetes management, 29 patients were enrolled with 39.8% of encounters in person and 60.2% as e-visits. HbA1c was 10.9% pre-enrollment and 7.4% post-enrollment. Of patients indicated for aspirin, 78.2% were taking aspirin pre-enrollment compared to 91.3% post-enrollment. Of patients indicated for a statin, 82.1% were taking pre-enrollment compared to 100% post-enrollment. Prior to enrollment, 51.7% had blood pressures at goal compared with 93.1% post-enrollment.

CONCLUSION: E-visits conducted by clinical pharmacists can be a convenient and cost-effective way to improve the management of diabetes and anticoagulation in primary care.

512. Implementation and evaluation of the impact of pharmacists' interventions in transitions of care (TOC): evidence from a Critical Access Hospital. Sweta Andrews, PharmD, MBA[1], Melody L. Hartzler, PharmD, AE-C, BCACP, BC-ADM[2], Aleda M. H. Chen, PharmD, MS, PhD[2], Melissa Lemle, PharmD[3]; (1) School of Pharmacy, University of Texas at El Paso, El Paso, TX (2) Cedarville University School of Pharmacy, Cedarville, OH (3) Pharmacy, Fayette County Memorial Hospital, Washington Court House, OH

INTRODUCTION: Approximately 60% of medication-related errors occur during transitions of care (TOC), leading to hospital readmissions, avoidable costs, and poorer outcomes. Because of their medication-related expertise, pharmacists may positively impact health outcomes and expenditures by providing TOC services. Thus, it is important to assess the impact of integrating pharmacists in TOC.

RESEARCH QUESTION OR HYPOTHESIS: The primary objectives were to determine (1) impact of pharmacist involvement in TOC 30-day readmissions and ED visits and (2) number of interventions made. Secondary objectives included evaluating differences in the number of 60-day readmissions and cost differences between patients who received pharmacist intervention and those who did not.

STUDY DESIGN: Retrospective matched cohort.

METHODS: After IRB approval, retrospective chart review of patients treated at a CAH in southern Ohio from July 1, 2015 through April 30, 2016 was conducted. Patients with a primary/secondary diagnosis of heart failure, pneumonia, COPD exacerbation, and diabetes were included. The intervention group consisted of patients who had contact with a pharmacist during care transitions (ED visit, hospital stay, post-discharge). Pharmacists conducted medication reconciliation, discharge counseling, and/or post-discharge follow-up via phone or face-to-face appointments. The control group consisted of patients that had no contact with a pharmacist during their care transitions.

RESULTS: Pharmacists conducted 58 TOC appointments with an average of 2.68 accepted interventions per patient. Common interventions included: restarting medications (31.3%); discontinuing duplicate therapy (13.3%); correcting drug dose/quantity (10.7%); ordering labs (28%); immunizations (16%); and resolving other problems (10%). There was a significant difference between the intervention and control group in 30-day and 60-day readmissions (3 vs. 38, $p<0.001$; 5 vs. 32, $p<0.001$, respectively). Projected cost savings were $124,355 in the intervention group.

CONCLUSION: Involving pharmacists in TOC services is associated with reduced readmission rates and cost savings.

513. Hyperchloremia versus non-hyperchloremia in intracerebral hemorrhage patients treated with hypertonic saline: a pilot study. Heidi Riha, PharmD[1], Kimberly E. Davidson, PharmD[1], Michael Erdman, PharmD, BCPS[2], Lauren Kimmons, PharmD, BCPS, BCCCP[1], Nitin Goyal, MD[3], Abhi Pandhi, MD[3], Michael Samarin, PharmD, BCPS, BCCCP[1], Morgan Jones, PharmD, BCPS, BCCCP[1]; (1) Department of Pharmacy, Methodist Le Bonheur Healthcare – University Hospital, Memphis, TN (2) Department of Pharmacy, UF Health Jacksonville, Jacksonville, FL (3) Department of Neurology, University of Tennessee Health Sciences Center, Memphis, TN

INTRODUCTION: Hyperchloremia has been associated with acute kidney injury (AKI), metabolic acidosis, worsened morbidity and higher mortality in critically ill patients. While previous research has demonstrated an association between hypertonic saline (HTS) and hyperchloremia, limited data exists to elucidate its impact on clinical outcomes in neurocritical care patients.

RESEARCH QUESTION OR HYPOTHESIS: Is hyperchloremia (chloride > 110 mmol/L) associated with worse clinical outcomes in patients with intracerebral hemorrhage (ICH) treated with continuous infusion 3% HTS?

STUDY DESIGN: Retrospective, multicenter case-control study.

METHODS: We included neurocritical care patients admitted with ICH who received continuous infusion 3% HTS for at least 12 h. Exclusion criteria included creatinine clearance < 15 mL/min or end-stage renal disease requiring hemodialysis, palliative withdrawal within 48 h of admission, anticoagulant-induced ICH other than warfarin, warfarin-induced ICH if international normalization ratio (INR) was not reversed to ≤ 1.4 within 12 h of admission, and ICH diagnosis secondary to trauma, surgery, or hemorrhagic conversion of acute ischemic stroke. The primary objective was to examine the association between hyperchloremia and in-hospital mortality, which included conducting a multivariable analysis to identify factors independently associated with mortality. Secondary outcomes included hospital and ICU length of stay and incidence of AKI.

RESULTS: A total of 219 patients were included (hyperchloremia n=181; non-hyperchloremia n=38). In a univariate analysis, in-hospital mortality was significantly higher in those with hyperchloremia compared to non-hyperchloremia (32% vs. 7.9%; $p<0.01$). Multivariable logistic regression analysis identified five factors independently associated with mortality, including

hyperchloremia (odds ratio 4.6). Those with hyperchloremia also had higher rates of AKI (30.4% vs. 5.3%; p<0.01) and longer hospital (median: 13.9 vs. 7.5 days; p<0.01) and ICU lengths of stay (median: 8 vs. 4 days; p<0.01).
CONCLUSION: Our study observed significantly higher rates of mortality and AKI in patients with ICH who developed hyperchloremia with continuous infusion 3% HTS.

514. The impact of pharmacist-led model transition of care clinic. Ashley MacWhinnie, PharmD, Karen Francoforte, PharmD, CPh, Amber Beals, PharmD, BCACP; Florida Hospital East Orlando, Orlando, FL
INTRODUCTION: With the implementation of the Center of Medicare & Medicaid Services Readmissions Reduction Program, many hospitals are implementing programs to improve the transition from hospital to home to limit readmissions and improve patient care. As medication-related issues are a common contributing factor to hospital readmissions, pharmacy plays a critical role in avoiding re-hospitalization.
RESEARCH QUESTION OR HYPOTHESIS: What is the impact of a pharmacist-led transition of care clinic on hospital readmission rates and which medication-related discrepancies were most often identified?
STUDY DESIGN: A retrospective chart review evaluating the 30-day readmission rates of patients 18 years and older who attended at least one appointment at the pharmacist-led clinic compared to those who were referred but did not attend. Descriptive statistics were calculated and variables compared using SPSS software. For age, independent t-test was used. For the patient's gender and all additional comparisons, a two tailed Fisher's exact test was used.
METHODS: Patients referred to the outpatient Transition of Care Clinic between January 1, 2015 to January 31, 2016 were included. The primary outcome was readmission within 30-days of discharge; readmissions to other health systems were not considered. Medication-related discrepancies were also identified and categorized using a pre-specified tool.
RESULTS: Of the 229 referred patients, 82 patients had at least on appointment with the Transition of Care Clinic pharmacist. Eleven percent of the clinic patients were readmitted within 30-days of their initial hospitalization compared to 27% of the non-clinic patients (p=0.004). In the 82 clinic patients, 292 patient-level and 155 system-level medication-related discrepancies were identified.
CONCLUSION: A pharmacist-led transition of care clinic significantly decreased the 30-day readmission rate, while also identifying medication-related discrepancies at both the system and patient level.

515. Establishing a common language for comprehensive medication management: applying implementation science methodologies to the patient care process. Carrie Blanchard, PharmD[1], Donna Steinbacher, BS Candidate[1], Caryn Ward, PhD[2], Todd Sorensen, PharmD[3], Mary Roth McClurg, PharmD, MHS[1]; (1) UNC Eshelman School of Pharmacy, Chapel Hill, NC (2) FPG Child Development Institute UNC Chapel Hill, National Implementation Research Network, Chapel Hill, NC (3) Pharmaceutical Care & Health Systems, University of Minnesota College of Pharmacy, Minneapolis, MN
INTRODUCTION: Clinical pharmacists' interventions, particularly in the primary care setting, have demonstrated positive findings, but rarely translate into impact and scale. Specifically, comprehensive medication management (CMM) is often poorly understood, not well defined, and lacks a measure of fidelity. While payment is needed to sustain such services, a consistent approach to delivery of CMM is critical to ensure impact.
RESEARCH QUESTION OR HYPOTHESIS: The purpose of this study was to create a common language document for the CMM process of care.
STUDY DESIGN: We are utilizing the Active Implementation Frameworks, an evidence-based implementation science methodology, to carry out a multi-state study to identify best practices of CMM in 42 primary care practices. A key first step is to "define the usable innovation" (CMM), which is critical to ensure consistency in the delivery of an intervention and guide assessments of fidelity and impact.
METHODS: Using semi-structured interviews and literature review, we identified guiding principles, essential functions, and operational definitions of CMM. The document underwent vetting and consensus building with clinical pharmacists and stakeholders. This led to the creation of a common language document for the CMM process of care. While aligned with existing literature, the document was created independent of existing frameworks.
RESULTS: We identified guiding principles and five essential functions of CMM: 1) collect relevant information, 2) assess the information, 3) develop the care plan, 4) implement the care plan, and 5) monitor the care plan through follow-up. Each function was operationally defined. The common language document and the specific insight gathered through consensus building will be presented.
CONCLUSION: Creation of a common language document is a necessary first step toward identifying best practices in CMM. The document has served to ensure a shared philosophy and clear definition of CMM, and validates existing CMM frameworks.

516. Stratified exposure of broad-spectrum antibiotic in the critically Ill and development of new resistance. Scott Vouri, PharmD, MSCI, BCPS, CGP, FASCP[1], Besu Teshome, PharmD, MSPS, BCPS[1], Nicholas Hampton, PharmD[2], Marin Kollef, MD[1], Scott Micek, PharmD[1]; (1) Department of Pharmacy Practice, St. Louis College of Pharmacy, St. Louis, MO (2) BJC Center for Clinical Excellence, Saint Louis, MO
INTRODUCTION: Minimizing the duration of broad-spectrum antimicrobials (BSA) in the critically ill is a common practice aimed at limiting the development of new resistance.
RESEARCH QUESTION OR HYPOTHESIS: We hypothesize that increased stratified duration of exposure to BSA is associated with increased development of new resistance.
STUDY DESIGN: Retrospective Cohort.
METHODS: All adult patients with a discharge diagnosis for severe sepsis or septic shock between 2010 and 2015 at a tertiary care hospital were identified. Cohort entry was defined as the first day of BSA that covered both methicillin-resistant *Staphylococcus aureus* and *Pseudomonas aeruginosa*. Primary outcome was the development of new resistance to antipseudomonal beta-lactams (AP) specifically cefepime (C), piperacillin-tazobactam (P), and meropenem (M) three or more days after initiation of BSA. Patients with no outcome at day 60 or death were censored. Cox proportional hazards models were performed to assess risk of development of new resistance to any AP. Exposures were categorized to AP-exposure days (the summation of days covered by AP) of ≤ 3 (reference), 4–7, and ≥ 8. Secondary analyses assessed individual AP.
RESULTS: The incidence of resistance was 0.77 per person-year. Among those receiving an AP, the risk of developing new resistance was hazard ratio (HR) 2.2 (95%CI 1.5–3.2) with 4–7 AP-exposure days and HR 5.7 (95%CI 4.1–8.0) with ≥ 8 AP-exposure days compared to reference. When comparing each AP, there was increased risk for resistance with C for ≥ 8 days (HR 1.7 (95%CI 1.2–2.3)), P for 4–7 days (HR 1.5 (95%CI 1.001–2.1)), and P for ≥ 8 days (HR 1.7 (95%CI 1.2–2.6)) when compared to the reference of each AP. All other comparisons of individual AP were not significant.
CONCLUSION: Among patients with severe sepsis or septic shock who receive BSA, overall duration of AP therapy and duration for certain AP, when stratified, were associated with an increased risk for new resistance.

517. Pronounced variability of berberine content among 15 commercial dietary preparations. James M. Backes, PharmD[1], Janelle F. Ruisinger, PharmD[2], Robert Winefield, PhD[3], Rakesh Singh, PhD[4], Patrick M. Moriarty, MD[5], Ryan Funk, PharmD, PhD[4]; (1) Departments of Pharmacy Practice and Medicine, University of Kansas Atherosclerosis and LDL-Apheresis Center, Kansas City, KS (2) University of Kansas School of Pharmacy Department of Pharmacy Practice, University of Kansas Atherosclerosis and LDL-Apheresis Center, Kansas City, KS (3) Pharmacology, Toxicology and Therapeutics, University of Kansas Medical Center, Kansas City, KS (4) Department of Pharmacy Practice, University of Kansas, Kansas City, KS (5) Department of Internal Medicine, University of Kansas Atherosclerosis and LDL-Apheresis Center, Kansas City, KS

INTRODUCTION: Berberine is a dietary supplement that was recently introduced in the United States. The agent is an isoquinoline plant alkaloid possessing multiple pharmacological properties including cholesterol- and glucose-lowering. Randomized-controlled trials demonstrate significant reductions in low-density lipoprotein cholesterol (~25%) and HbA1c (~1–2%). Despite these promising data many clinicians have concerns regarding dietary supplements because of minimal regulatory oversight and the potential for inconsistencies with formulation and content.

RESEARCH QUESTION OR HYPOTHESIS: Does actual berberine content correspond to the stated label amount in commonly available berberine dietary supplements?

STUDY DESIGN: Cross-sectional analysis of berberine content in commercially available dietary supplements.

METHODS: An internet search for commercial products advertising 400 mg to 500 mg of berberine yielded 15 various preparations. All products were purchased online from common retailers (e.g. Amazon) in May 2016. Formulations containing additional ingredients (e.g. policosanol, red yeast rice) were excluded. Three capsules from each product were individually assessed for berberine content by HPLC-MS using the USP berberine standard and 1,3-diphenylguanidine as an internal standard. Berberine content was assessed as a percentage of label claim using the USP standard of +/-10%.

RESULTS: Our analysis demonstrated a high variability of berberine content, range 31 ± 8% to 101 ± 8%, among the 15 products. In regards to advertised label amount, six products were within ± 10%, two products contained approximately 80%, and 7 products were < 80%.

CONCLUSION: We found marked variability in content among 15 proprietary supplements, with 60% of products containing < 90% of advertised berberine. Although, the agent has demonstrated promise in treating dyslipidemia and diabetes mellitus, these data strongly suggest the need for standardization of berberine preparations. Presently, clinicians should be cautious when recommending berberine for any purported therapeutic treatment.

518. Veterans Health Administration's ability to target care intensification in diabetic patients using clinical informatics. Heather Campbell, PharmD, PhD[1], Allison Murata, BS, MS[2], Gerald Charlton, MD[2], Ann Nawarskas, PharmD, CDE[2], James Pontzer, BFA, MA[1], Glen Murata, MD[2]; (1) Clinical Research Pharmacy Coordinating Center, VA Cooperative Studies Program, Albuquerque, NM (2) Informatics Section, New Mexico VA Health Care System, Albuquerque, NM

INTRODUCTION: Pharmacists' clinical knowledge can optimize the patient-centered medical home, if appropriately utilized. The Veterans Health Administration (VHA) has three-times the prevalence of diabetes compared to the U.S. population. Although glycemic control reduces complication risk, many patients remain above VHA's HbA1c goal (< 9%), flooding pharmacists with referrals.

RESEARCH QUESTION OR HYPOTHESIS: To verify the ability to identify and describe patients with one or more above-goal HbA1cs, using datasets extracted from electronic health records.

STUDY DESIGN: Cohort.

METHODS: Inclusion criteria were HbA1c > 6.5%, diabetes diagnosis, or diabetes medication. We identified patients having an HbA1c result July 1, 2013-June 30, 2014 (baseline) and followed them July 1, 2014-July 31, 2016. Among patients above-goal at baseline, primary endpoints were the proportion ever achieving an HbA1c at or below goal ("at goal") and the proportion with an HbA1c at goal on the final HbA1c measured in follow-up.

RESULTS: Of 1.63 million diabetic patients, 145,659 (9.00%) had an above-goal baseline HbA1c. Of these, 82,460 patients (56.61%) had two or more consecutive above-goal HbA1cs, 56,869 patients (39.04%) had a previous at goal HbA1c, and 6,330 patients (4.35%) did not have a previous HbA1c. Following those with an above-goal baseline HbA1c, 132,276 patients had an HbA1c measured: 97,330 (73.58%) had one or more HbA1cs at goal and 73,035 patients (55.21%) had a final HbA1c at goal. Mean±standard deviation (median) follow-up was 1.76 ± 0.46 (1.86) years.

CONCLUSION: Most patients with HbA1c > 9% had a previously-elevated value – raising questions whether VHA alerts regarding the former are useful. While most reached goal, only half maintained at their final measure. Because the prognosis is poor for many, efforts should be made to identify those for whom treatment intensification is most likely to be effective. This study reveals which patients need more attention and the problem's scope; clinical informatics methods utilizing risk stratification relating to glycemic burden can inform resource allocation, improving patient care.

519. The cytotoxicity of vinorelbine when combined with nutraceuticals in a MCF-7 human breast cancer cell line. Adwoa Nornoo, PhD[1], Jessica Hernandez, BS[2]; (1) Palm Beach Atlantic University, West Palm Beach, FL (2) Gregory School of Pharmacy, Palm Beach Atlantic University, West Palm Beach, FL

INTRODUCTION: Human, animal, and cell culture studies have shown the cancer chemopreventive effects of nutraceuticals (Keum, 2011; Sreelatha et al., 2011). Nutraceuticals alone failed to produce the expected outcome in clinical trials; therefore, combinations of nutraceuticals with established anticancer agents are currently of interest.

RESEARCH QUESTION OR HYPOTHESIS: It is hypothesized that the combination of the nutraceuticals (curcumin, moringa, resveratrol, sulforaphane) with vinorelbine would produce synergistic or additive cytotoxic effects in MCF-7 breast cancer cells. This combination therapy could provide an alternative to present chemotherapy regimens that utilize multiple anti-neoplastic agents, in so doing reduce the dose of the anti-cancer agent to minimize side effects whilst maintaining treatment efficacy.

STUDY DESIGN: In-vitro studies were conducted to measure the cytotoxicity of vinorelbine when combined with curcumin, resveratrol, sulforaphane, and moringa in a MCF-7 human breast cancer cell line.

METHODS: MCF-7 cells were seeded into 96-well plates at 37°C under 5% CO_2. Cells were treated with vinorelbine alone or in combination with nutraceutical at a constant concentration ratio (12.5–500 mM) versus control cells (no treatment). Luminescence (SpectraMax microplate reader) of viable cells was measured at 4, 24, 48 and 72 h using a RealTime-Glo MT Cell Viability Assay. Data Analysis: Fraction of cells inhibited was determined and combination indices were calculated using Compusyn®, a software for drug combinations and general dose-effect analysis. A combination index less than 1 (CI < 1) is indicative of synergism, CI = 1 additive and CI > 1 antagonistic.

RESULTS: Vinorelbine exhibited a synergistic cytotoxic effect when combined with all the nutraceuticals (curcumin, 0.567 < 1; moringa 0.189 < 1; sulforaphane 0.732 < 1) except for resveratrol (1.78 > 1).

CONCLUSION: The results from this study suggest that nutraceuticals in combination with anti-cancer agents can potentially be used in cancer therapy by reducing the dose of neoplastic agents to minimize side effects and maintain efficacy.

520. Mechanisms of fosfomycin resistance in carbapenem resistant *Enterobacter* sp.. S. Travis King, PharmD, BCPS[1], Bryan White, PharmD[2], Kayla R. Stover, PharmD, BCPS[3], Katie E. Barber, PharmD[3], Regina Galloway, BASc[2], Donna Sullivan, PhD[2]; (1) School of Pharmacy, University of Mississippi School of Pharmacy, Jackson, MS (2) University of Mississippi Medical Center, Jackson, MS (3) Department of Pharmacy Practice, University of Mississippi School of Pharmacy, Jackson, MS

INTRODUCTION: Fosfomycin is a bactericidal antibiotic with broad gram-negative activity, including multidrug resistant Enterobacteriaceae. Prevalence of plasmid-mediated resistance mechanisms in carbapenem-resistant Enterobacteriaceae remains largely unexplored.

RESEARCH QUESTION OR HYPOTHESIS: This study sought to determine the distribution frequency of plasmid-mediated fosfomycin resistance determinants in carbapenem-resistant *Enterobacter* spp. in the United States. Additionally, we assessed the distribution of resistance genes across both CLSI and EUCAST breakpoint categories.

STUDY DESIGN: Single-center gene association study.

METHODS: Nineteen unique, carbapenem-resistant isolates of *Enterobacter* spp. were collected from September 2013 - November 2015. Identification and meropenem MICs were determined with Vitek2. Fosfomycin MICs were determined via Etest and interpreted at 24 h using CLSI and EUCAST breakpoints. *E. coli* ATCC 25922 was used for susceptibility control. Genomic DNA underwent standard PCR with primers specific for carbapenemase genes (KPC, NDM, IMP, VIM, OXA-48) and plasmid-mediated fosfomycin resistance (fosA, fosA3, and fosC2). Amplification conditions were optimized via gradient PCR. Amplicons were analyzed by gel electrophoresis and sequenced for confirmation.

RESULTS: Fosfomycin MICs ranged from 0.38 mg/L to > 1024 mg/L, with an MIC50 of 32 mg/L and MIC90 of > 1024 mg/L. All isolates demonstrated meropenem MICs $\geq$ 16 mcg/mL and harbored *bla*KPC genes. Per CLSI and EUCAST criteria for fosfomycin, 74% and 58% of strains were susceptible, respectively. Eight strains were positive for *fosA*. *FosC2* nor *fosA3* were not detected in any isolates. Fosfomycin susceptibility was 50% by CLSI and 25% by EUCAST in fosA-positive strains. According to CLSI and EUCAST breakpoints, 91% and 82% of *fosA*-negative isolates, respectively, demonstrated susceptibility.

CONCLUSION: Our study provides the first report, to our knowledge, of prevalence of plasmid-mediated fosfomycin resistance genes among *blaKPC*-producing *Enterobacter* spp. in the United States. *fosA*-positive isolates demonstrated a broad range of MICs encompassing multiple breakpoint categories. Further work is needed to determine the implications of these enzymes on clinical breakpoint determinations.

521. Late antibody mediated rejection and acute mixed rejection are less responsive to proteasome inhibitor treatment. Alicia Lichvar, PharmD[1], Abbie Leino, PharmD[1], Adele Shields, PharmD[2], Rita Alloway, PharmD[1], E. Steve Woodle, MD[1]; (1) University of Cincinnati, Cincinnati, OH (2) The Christ Hospital, Cincinnati, OH

INTRODUCTION: The humoral components of early and late antibody mediated rejection (AMR) and mixed acute rejection (MAR) are fundamentally different. Late AMR and MAR represent mature immunologic responses, predominated by long-lived, niche-resident plasma cells. Proteasome Inhibitor (PI)-based therapy is utilized to treat both AMR and MAR.

RESEARCH QUESTION OR HYPOTHESIS: Both late AMR and MAR will be less responsive to PI-based therapy compared to early AMR and MAR, and this will result in worse death-censored graft survival (DCGS).

STUDY DESIGN: Retrospective observational study.

METHODS: RTx recipients with AMR or MAR from 1/2005 to 08/2015 treated with a PI-based regimen were assessed. The Banff Criteria was utilized to diagnose AMR and acute cellular rejection (ACR). MAR was defined as having both ACR and AMR. Early rejection occurred < 6 months post-RTx. Percent reduction in immunodominent donor-specific antibody (iDSA), histologic improvement, and serum creatinine (SCr) were compared. Kaplan Meier curves with logrank comparisons assessed DCGS.

RESULTS: 108 RTx recipients were included (early AMR [EAMR] = 40, early MAR [EMAR] = 9, late AMR [LAMR] = 20, late MAR [LMAR] = 39). Patients were 57.4% male, 31.5% African American, and 32.2% HLA-sensitized with a majority receiving living donor RTxs (70.4%). Percent decrease iDSA differed (EAMR −89.8% vs. EMAR −51.9% vs. LAMR −36.3% vs. LMAR −30.8%, p<0.001). Incidence of histologic improvement on biopsy was similar between groups (EAMR 50% vs. EMAR 66.7% vs. LMAR 64% vs. 73.6%, p=0.25). SCr was lower post-treatment for EAMR (p=0.001) and EMAR (p=0.002), but was unchanged for LAMR (p=0.64) and LMAR (p=0.46). Five-year DCGS differed between the groups (EAMR 88.4% vs. EMAR 77.8% vs. LAMR 19.3% vs. LMAR 35.5%, p=0.001).

CONCLUSION: Late AMR and MAR were less responsive to PI-based therapy in regards to iDSA reduction and SCr improvement, resulting in higher rates of graft loss. Effective treatments for late AMR and MAR continue to represent an unmet clinical need and warrants additional studies.

522. Effect of etomidate on pneumonia development in critically ill, non-trauma patients. Drayton Hammond, PharmD, MBA, BCPS, BCCCP[1], Claire Vines, PharmD[2], Ashley McPhee, BS[3], Naleen Raj Bhandari, MS[4], Kendrea Jones, PharmD, BCPS[1], Nikhil Meena, MD[5], Jacob Painter, PharmD, PhD, MBA[6]; (1) Department of Pharmacy Practice, University of Arkansas for Medical Sciences, Little Rock, AR (2) University of Mississippi Medical Center (3) University of Arkansas for Medical Sciences Medical Center, Little Rock, AR (4) University of Arkansas for Medical Sciences College of Pharmacy, Little Rock, AR (5) University of Arkansas for Medical Sciences, Little Rock, AR (6) Division of Pharmaceutical Evaluation and Policy, University of Arkansas for Medical Sciences, Little Rock, AR

INTRODUCTION: Patients who require intubation are at an increased risk for the development of hospital-acquired pneumonia (HAP). In patients who experienced a trauma, etomidate administration was associated with HAP development by day 28 of follow-up but has not been investigated in critically ill, non-trauma patients.

RESEARCH QUESTION OR HYPOTHESIS: Is pre-intubation etomidate associated with increased HAP in critically ill, non-trauma patients?

STUDY DESIGN: A single-center, cohort study of critically ill, non-trauma patients admitted to the medical intensive care unit (ICU) from 2012 to 2014 and intubated with or without etomidate was conducted.

METHODS: Demographics, comorbidities, primary diagnosis, critical illness scores, concomitant medications, and outcomes were obtained from medical records. Student t, Chi-square, and Fisher's exact tests were performed, as appropriate. Relevant characteristics were modeled using logistic regression techniques to determine if any predicted HAP independently.

RESULTS: Of the 174 patients, 94 (54%) received etomidate and 80 (46%) did not. There was no difference in HAP between etomidate and no etomidate groups (13.8 vs. 23.7%, p=0.092). Duration of mechanical ventilation (4.4 vs. 4.6 days, p=0.845), ICU length-of-stay (7.4 vs. 6.9 days, p=0.547), ICU mortality (14.9 vs. 12.5%, p=0.648) and hospital mortality (17 vs. 16.2%, p=0.892) were similar between groups. For each one-day increase in mechanical ventilation duration, likelihood of HAP development increased by 21%. Patients who received etomidate but no neuromuscular-blocking agent were 80% less likely to develop HAP than those who received neither agent (OR 0.202, 95% CI 0.045–0.908).

CONCLUSION: Etomidate use was not associated with a difference in HAP development in critically ill, non-trauma patients.

523. Valganciclovir followed by CMV hyperimmune globulin compared to valganciclovir for 200 days in abdominal organ transplant recipients at high risk for CMV infection. James Fleming, PharmD, Dave Taber, PharmD, MS, Nicole Pilch, PharmD, MS, Satish Nadig, MD, John McGillicuddy, MD, Charles Bratton, MD, Prabhakar Baliga, MD, Kenneth D. Chavin, MD, PhD; Medical University of South Carolina, Charleston, SC

INTRODUCTION: With the advent of effective antivirals against cytomegalovirus (CMV), use of CMV hyperimmune globulin has decreased. Although antiviral prophylaxis in patients at high risk for CMV is effective, many patients still have late infection, never developing antibodies sufficient to achieve immunity. Utilizing a combination of antiviral and CMV IgG may allow patients to achieve immunity and decrease late CMV infections.

RESEARCH QUESTION OR HYPOTHESIS: Will using an abbreviated valganciclovir regimen followed by CMV hyperimmune globulin be a feasible regimen compared to valganciclovir alone for 200 days in abdominal transplant recipients at high risk for CMV?

STUDY DESIGN: Prospective randomized, open-label pilot study.

METHODS: This was a prospective randomized, open-label, pilot study comparing valganciclovir prophylaxis for 200 days versus valganciclovir for 100 days followed by CMV HIG in abdominal transplant recipients at high risk for CMV. The primary outcome was a comparison of late CMV infection.

RESULTS: Forty patients were randomized to valganciclovir for 200 days (n=20) or valganciclovir for 100 days followed by 3 doses of monthly CMV HIG (n=20). Numerically there were more overall CMV infections in the CMV HIG group (45 vs. 20%, p=0.09). There were no differences in overall or late clinically significant CMV infections between groups (20 vs. 15%, p=1.00 and 0 vs. 0, p=1.00). All clinically significant CMV infections occurred within 200 days, with 63% occurring while on valganciclovir. There were no differences in toxicities, graft function, or rejection between groups. Patients with CMV infection at any time were heavier than those that did not have an infection (82 vs. 95 kg, p=0.049).

CONCLUSION: Use of CMV HIG sequentially with prophylaxis may be an effective and affordable prophylactic regimen in abdominal transplant recipients at high risk for CMV. Increased monitoring for patients with obesity may be warranted.

524. Virtual Care Center: impact on 30-day readmission rates involving pharmacist-provided medication management in the setting of a transitional care service. Leigh Ann Reid, PharmD, Linda Thomas, PharmD, BCPS, Michael Cohen, PharmD, Curtis Haas, PharmD, FCCP, BCPS, Marc Berliant, MD; Department of Pharmacy, University of Rochester Medical Center, Rochester, NY

INTRODUCTION: Efforts to decrease 30-day hospital readmissions remain an ongoing challenge for many institutions to date. Studies have shown that the inclusion of clinical pharmacists in care transition programs is an integral component to improve patient outcomes. As such the Virtual Care Center (VCC), a transitional care pilot program which involves a clinical pharmacist, a social worker and a transition health coach at Strong Memorial Hospital was funded through the Greater Rochester Health Foundation in an effort to reduce 30-day hospital readmissions.

RESEARCH QUESTION OR HYPOTHESIS: This study aimed to evaluate pharmacist-provided medication management in the setting of a transitional care service and its impact on 30-day hospital readmissions.

STUDY DESIGN: Single-center retrospective cohort study.

METHODS: We dichotomized patients who met inclusion criteria into those enrolled in the VCC and received pharmacist-provided medication management during index hospital admission against a comparator group (no pharmacy services) from January 1st, 2015-December 1st, 2015 on 2 adult general medicine units. The primary outcome was 30-day hospital readmission from index discharge. Total number of pharmacist-identified medication reconciliation interventions in the VCC group was also assessed.

RESULTS: Of 1040 unique patients identified, 492 (47.3%) patients were in the intervention group (VCC) with the remainder in the control group (n=548). Mean age (years) in the VCC and control group was 65 and 66 respectively and 47.4% were male for the overall group. Total of 202 (19.4%) patients were readmitted within 30 days of discharge; 85 (17.3%) patients in the VCC group and 117 (21.4%) patients in the control group (p=0.09). A total of 527 medication discrepancies were identified by the pharmacist in the VCC group.

CONCLUSION: Our study suggests pharmacist involvement in care transition programs is vital in reducing medication discrepancies and potentially beneficial in reducing 30-day hospital readmissions however further research evaluating this outcome is warranted.

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