2015 ACCP Global Conference on Clinical Pharmacy – Scientific Abstracts

ORIGINAL RESEARCH

ADR/Drug Interactions

1. Does concomitant administration of Piperacillin-Tazobactam with Vancomycin really increase the incidence of acute kidney injury? Lisa Katchan, Pharm.D. Candidate 2015[1], Taylor Seidel, Pharm.D. Candidate 2015[1], *Jennifer Bui, Pharm.D. Critical Care*[1], Faheem Younus, Chief Infectious Disease[2]; (1) Department of Pharmacy, University of Maryland – Upper Chesapeake Medical Center, Bel Air, MD (2) Department of Medicine, University of Maryland – Upper Chesapeake Medical Center, Bel Air, MD

PURPOSE: To validate whether patients concomitantly treated with intravenous vancomycin and Piperacillin-Tazobactam (PT) have a higher incidence of acute kidney injury (AKI) as compared to those receiving vancomycin alone or with other antibiotics.

METHODS: We performed a retrospective chart review of 182 adult patients, 91 patients each group, at a community hospital during a 4-month period. Patients who received vancomycin and PT for at least 48 hours (Group 1), was compared to those who received vancomycin alone or with other antibiotics (Group 2). AKI was defined according to the RIFLE criteria (a 50% increase in baseline serum creatinine developing within 7 days of drug exposure). Duration of vancomycin exposure, steady state trough vancomycin concentrations and other risk factors for AKI were also measured.

RESULTS: There were no statistically significant differences between groups 1 and group 2 regarding mean baseline serum creatinine (1 mg/dL $\pm$ 0.3 vs 0.9 mg/dL $\pm$ 0.3, p = 0.2), mean final serum creatinine (0.9 mg/dL $\pm$ 0.4 vs 0.9 mg/dL $\pm$ 0.3, p = 0.2, mean steady state trough vancomycin (14.9 μg/mL $\pm$ 6.0 vs 14.3 μg/mL $\pm$ 5.8, p = 0.54), mean duration of vancomycin (3.9 days $\pm$ 2.4 vs 4 days $\pm$ 2.4, p = 0.8), and mean number of risk factors for AKI (1.5 $\pm$ 0.9 vs 1.5 $\pm$ 1.1, p = 1.0), respectively. The incidences of AKI are exactly the same, 5.5% for each group.

CONCLUSIONS: Our study did not show an increased incidence of AKI in patients receiving concomitant vancomycin with Piperacillin-Tazobactam compared to those receiving vancomycin alone or with other antibiotics. Larger prospective trials are needed to prove this correlation.

2. Cytochrome P450 (CYP) enzymes interaction risk of brincidofovir (CMX001, BCV), a novel, broad-spectrum antiviral *Tim Tippin, Ph.D.*, Margaret Anderson, B.S., Laurie Keilholz, B.S., Marion Morrison, M.D., Greg Chittick, B.S., Herve Mommeja-Marin, M.D.; Chimerix, Inc., Durham, NC

PURPOSE: BCV is an orally-administered lipid conjugate nucleotide in Phase 3 clinical development for the prevention of cytomegalovirus infection in hematopoietic stem cell transplant recipients and for the treatment of adenovirus infection. In vitro, BCV showed weak (CYP1A2, 2C9, 2C19, 2D6; IC50 22 to 28 μM) to moderate (CYP3A4/5, IC50 12 to 17 μM; 2B6, IC50 11 μM; 2C8, IC50 5 μM) inhibition of CYP enzymes. The purpose of this study was to evaluate whether co-administration of BCV affects the pharmacokinetics of a sensitive CYP3A substrate, midazolam (MDZ), in healthy human subjects when MDZ is administered orally or intravenously.

METHODS: In this open-label, randomized, two-period, crossover study, healthy subjects were administered single oral (2.5 mg) and intravenous (1 mg) doses of MDZ alone and in combination with single oral doses of BCV (200 mg). Plasma was collected at 15 time points over a 24 hour period after dosing. MDZ concentrations were measured using liquid chromatography tandem mass spectrometry. MDZ exposure (AUC) was calculated after oral and intravenous administration alone and after co-administration of BCV, and compared using the exposure ratio [$(AUC_{MDZ\ +\ BCV})/(AUC_{MDZ\ -\ BCV})$].

RESULTS: Twenty subjects (17 male; 3 female; mean age, 38 years) were enrolled. MDZ AUC calculated after oral and intravenous administration alone and after co-administration of BCV resulted in mean oral and intravenous MDZ AUC ratio (90% confidence intervals) of 1.12 (1.08, 1.17) and 1.05 (1.03, 1.08), respectively.

CONCLUSION: In vivo effects of BCV on MDZ concentrations did not meet FDA weak inhibitor criteria (i.e., $\geq$1.25 AUC increase). Accordingly, no significant CYP3A-mediated interactions are expected between BCV and other CYP3A substrates. Interactions with medications eliminated by other CYP pathways are also not expected, because in vitro inhibition of these CYPs by BCV was comparable to, or less potent than inhibition of CYP3A.

Adult Medicine

5. Using in-hospital COPD inhaled-medication regimens as predictors for subsequent hospital admissions *Daniel Longyhore, Pharm.D., BCACP*[1], Yang Ling Ren, Pharm.D.[2], Robert Menak, Pharm.D., BCPS, CGP[2]; (1) Department of Pharmacy Practice, Wilkes University, Wilkes-Barre, PA (2) Department of Pharmacy, St. Luke's University Hospital, Bethlehem, PA

PURPOSE: Chronic obstructive pulmonary disease (COPD) is a leading cause for hospital readmission. The purpose of this investigation is to determine if certain COPD-related medications or medication combinations are associated with hospital readmission.

METHODS: We conducted a retrospective review of patients admitted to our hospital from August 2013 through September 2014 with a primary diagnosis of COPD. Patient demographics and in-hospital medications were recorded and evaluated for association with subsequent admission(s) for a COPD-related diagnosis over the 12-month period.

RESULTS: A total of 196 hospital records were evaluated for 155 patients over the study period. For maintenance medication (with or without short-acting beta/muscarinic antagonists (SAB/MA)), 4% of patients received either a long-acting beta agonist or inhaled corticosteroid (ICS) only, 11% received long-acting muscarinic antagonist (LAMA) only, 20% received ICS- long-acting beta agonist (LABA) combination, and 38% received LAMA with ICS-LABA combination. Sixteen percent of patients received only SAB/MA therapy. When evaluating medication use and risk of readmission for COPD, risk was not significantly different if patients were prescribed SAB/MA-only, LAMA-only, or ICS-LABA only (24, 35, 29%, respectively; p = NS). However, patients were more likely to be readmitted for COPD-related conditions if they received the combination LAMA with ICS-LABA (61%; p = 0.06 vs LAMA and p = 0.04 vs ICS-LABA). In addition, the quantity of medication classes used in hospital for COPD was moderately correlated with the number of subsequent readmissions (r = 0.321; p = 0.002)

CONCLUSION: Using in-hospital medication regimens may be helpful to identify hospitalized patients with COPD at high-risk for subsequent readmissions. While maintenance medication regimens consisting of a single agent were not associated with an increased risk, the use of LAMA with ICS-LABA was associated with significantly more patients returning to the hospital for readmission.

6. Evaluation of the safety and efficacy of a tobramycin nomogram in cystic fibrosis patients *Britta Staubes, Pharm.D.*[1], Nicole Metzger, Pharm.D.[2]; (1) Department of Pharmacy, Emory

University Hospital, Atlanta, GA (2) Department of Pharmacy Practice, Mercer University College of Pharmacy, Atlanta, GA
PURPOSE: Cystic fibrosis (CF) patients receiving tobramycin for an exacerbation are dosed by pharmacists using a nomogram and doses are adjusted based on levels. The primary objective is to evaluate the efficacy of the CF dosing nomogram in attaining therapeutic peaks based on the initial regimen. Secondary outcomes include the prevalence of attaining target troughs, attaining combined peak and trough targets, the incidence of nephrotoxicity, and identifying factors impacting levels.
METHODS: A retrospective medical record review was conducted for adult patients with CF who received tobramycin from January 1, 2010-December 16, 2014. Inclusion criteria were an intravenous tobramycin dose of at least 10 mg/kg and at least two serum tobramycin concentrations. Patients were excluded if dosing deviated from the nomogram. Descriptive statistics and the chi-square test were used for analysis.
RESULTS: Of the 322 patients screened, 190 met the inclusion criteria with a mean age of 26 years, 52% male, mean body mass index of 19.7, and mean baseline creatinine clearance of 110 mL/minute. With their initial dosing regimen, 41% of patients had a therapeutic tobramycin peak, 61% had a therapeutic tobramycin trough, and 22% had both a therapeutic peak and trough. About 10% of patients experienced nephrotoxicity within 7 days and 5.5% had AKI within forty-eight hours. Factors contributing to a supratherapeutic trough include female gender ($p = 0.01$), body mass index (BMI) ($p < 0.0001$), and baseline creatinine clearance ($p = 0.0013$). BMI is the only factor that increased the chance of attaining a therapeutic peak ($p = 0.045$).
CONCLUSION: Results indicate that the current dosing nomogram does not routinely achieve target peak concentrations with the initial regimen.

Ambulatory Care

7. LDL Reductions observed with rosuvastatin in a real-world multiracial population *Andrew Bzowyckyj, Pharm.D., BCPS, CDE*[1], Lara Kerwin, Pharm.D. Candidate 2015[2], Meryl Lanning, Pharm.D. Candidate 2015[2]; (1) Division of Pharmacy Practice and Administration, University of Missouri – Kansas City School of Pharmacy, Kansas City, MO (2) University of Missouri – Kansas City School of Pharmacy
PURPOSE: Percent LDL reductions for specific doses of statins are widely available from clinical trial data. These trials often exclude people with comorbidities; additionally, specific racial and ethnic groups (non-Hispanic whites) tend to be a majority of the patient populations studied. There are very few reports on real-world clinical application of statins in the literature. This retrospective chart review investigated the real-world clinical impact of rosuvastatin on LDL and non-HDL compared to reported findings in a 2014 Cochrane Review and the rosuvastatin package insert.
METHODS: Inclusion criteria consisted of patients with at least 3 months of adherent rosuvastatin refill history (80% or greater medication possession ratio) at the health system's medication assistance pharmacy between January 2007 and August 2014. Patients were excluded for lack of follow-up labs, and use of any statin within 3 months prior to starting rosuvastatin. 295 charts met inclusion/exclusion criteria. Data collected included age, race, gender, rosuvastatin dose, baseline fasting lipid panel (FLP) and first follow-up FLP. Percent reductions in LDL, total cholesterol, and non-HDL cholesterol at first follow-up were calculated and the between race and gender differences were analyzed using independent samples t-tests. The university IRB approved the protocol.
RESULTS: There was no statistically significant difference found between different ethnic or gender groups at any dose of rosuvastatin within the study population. However, our real-world findings did note some differences in overall percent reductions in each of the aforementioned parameters when compared to a recent Cochrane Review and the rosuvastatin package insert.
CONCLUSION: This retrospective study is the first to report real-world lipid-lowering data in a sizeable non-white population. Small sample size may be contributing to beta-error. Larger-scale studies are necessary to determine if there is a statistically significant difference in lipid lowering parameters among different racial/ethnic and gender groups with rosuvastatin.

8. Patient specific factors influencing INR monitoring adherence *Yardlee Kauffman, Pharm.D., MPH, BCACP, CPH*[1], Allison Schroeder, Pharm.D., BCPS[2], Daniel Witt, Pharm.D., FCCP, BCPS[3]; (1) Department of Pharmacy Practice and Administration, Philadelphia College of Pharmacy, Philadelphia, PA (2) Skaggs School of Pharmacy and Pharmaceutical Sciences – Clinical Pharmacy Research Team, University of Colorado – Kaiser Permanente Colorado, Aurora, CO (3) Department of Pharmacotherapy, University of Utah College of Pharmacy, Salt Lake City, UT
PURPOSE: The specific reasons underlying nonadherence to INR monitoring from the patient's perspective have not been formally studied. Understanding why patients adhere or do not adhere has the potential to reveal useful targets for improving adherence to INR monitoring or alternative treatment strategies. The objective of this study was to gain further insight into INR monitoring nonadherence from the patient's perspective.
METHODS: This qualitative study was conducted among members of Kaiser Permanente Colorado; patients were characterized as adherent or nonadherent and recruited from the Clinical Pharmacy Anticoagulation and Anemia Service to participate in an individual interview. Qualitative analysis was performed to identify emerging themes using an inductive approach. Demographic data was summarized using descriptive statistics.
RESULTS: Patients were primarily Caucasian and employed; the mean age of patients was 61.3 years. Perspectives and experiences were similar for all interviewed patients regardless of classification as adherent or nonadherent. The most common themes were the desire for INR monitoring to be inexpensive, convenient, and accessible; finding reassurance with INR monitoring; and preference for interacting with the same group of prescribers, pharmacists, and phlebotomists
CONCLUSION: The following strategies to improve adherence to INR testing are suggested: (1) assign anticoagulation providers to work with the same patients consistently, (2) provide formal INR reminders, (3) avoid harsh language or lecturing patients following missed INR tests, (4) reinforce patient specific impact of INR results, and (5) facilitate access to INR testing.

9. Burden of out-of-pocket medication cost in a primary care setting and development of a clinical service to assist patients with accessing medications *Robyn Teply, Pharm.D.*[1], Thomas Guck, Ph.D.[2], Mark Goodman, M.D.[2], Andrew Meyer, Pharm.D. Candidate[3]; (1) Department of Pharmacy Practice, Creighton University School of Pharmacy and Health Professions, Omaha, NE (2) Department of Family Medicine, Creighton University (3) Creighton University School of Pharmacy & Health Professions
PURPOSE: Medication costs can greatly impact a patient's well-being. Despite this burden, little discussion occurs between patients and physicians and there is a paucity in the literature regarding patients' awareness or ability to utilize appropriate cost savings options. The purpose of this study is to characterize the burden of costs, assess the knowledge and ability of patients to utilize cost-savings strategies and formulate a service to assist patients in finding a cost- and therapeutically-effective medication regimen.
METHODS: An anonymous survey was distributed to patients at a family medicine clinic. Information included demographics, burden of costs, response to burden, familiarity with cost-savings strategies, comfort discussing cost with physician and preferences for type of service they would utilize to lower their costs. "Burden of Cost" and "Familiarity with Cost-Savings Strategies" scales

were developed (Cronbach's alpha 0.911 and 0.666 respectively, no burden = 1 to extreme burden = 5 and no familiarity = 1 to extremely familiar = 5).
RESULTS: Fifty-two surveys were analyzed with average age 51.8, 48.1% male, 46.2% privately insured and 42.3% using government-based insurance. The mean perceived "Burden of Cost" was characterized as "slight burden" (2.11, SD 0.83). An increased "Burden of Cost" was significantly correlated with lower income ($p = 0.003$), diminishing health ($p = 0.049$) and greater number of medications ($p = 0.011$). The mean "Familiarity with Strategies" was only "slightly familiar" (2.23, SD 0.90). 44.2% were either likely or extremely likely to utilize a service provided by a pharmacist and pharmacy student to identify potential cost-savings strategies.
CONCLUSION: Due to the lack of familiarity with cost-savings strategies, the burden of medication costs and the willingness of patients to work with a pharmacist/pharmacy student team, it would be worthwhile to develop a program to assist patients in lowering the cost of their medications. Patients targeted for this service will be those with lower income, diminishing health and greater number of medications.

10. Evaluation of a collaborative care model with pharmacist-led medication reviews for adults on haemodialysis Xinyi Ashlyn Gwee, B.Sc.(Pharm) (Hons)[1], *Hua Heng Mcvin Cheen, B.Sc.(Pharm) (Hons)*[1], Mee Yin Melissa Chow, B.Pharm.[1], Giat Yeng Khee, Pharm.D., B.Sc.(Pharm) (Hons)[1], Yu Ling Cheryl Lim, B.Sc.(Pharm) (Hons)[1], Choon Nam Wan, B.Sc.(Pharm)[1], Wei Terk Chang, M.Clin.Pharm., B.Pharm. (Hons)[1], Hui Lin Lina Choong, MBBS, M.Med (Int Med), FAMS[2], Paik Shia Lim, B.Sc.(Pharm) (Hons)[1]; (1) Department of Pharmacy, Singapore General Hospital, Singapore, Singapore (2) Department of Renal Medicine, Singapore General Hospital, Singapore, Singapore
PURPOSE: This study aimed to determine the prevalence of drug-related problems (DRPs) in patients seen at the haemodialysis (HD) disease management clinic at an academic medical centre, and evaluate the effectiveness of a collaborative care (CC) model comprising of nephrologists and pharmacists in resolving DRPs and reducing pill burden. Secondary aims included identifying medication classes implicated in DRPs, evaluating the impact of CC on hospital admissions and exploring factors associated with DRPs.
METHODS: This retrospective observational study included all patients managed by CC between January 2013 and April 2014. Study data was obtained from the clinic's electronic database. Patient characteristics, prevalence and types of DRPs and pharmacist interventions were summarized using descriptive statistics. Changes in number of medications and pill burden were compared using paired t-test. Hospital admissions were analyzed using Poisson regression. Factors associated with DRPs were identified using multiple linear regression.
RESULTS: The study included 113 patients aged 61.5 ± 10.9 years. Twenty-six (23.0%) patients were newly initiated on HD within 3 months, and mean HD duration was 3.4 ± 4.1 years. A total of 390 DRPs (mean = 3.5 ± 2.3) were identified, with patients' failure to receive medication (42.8%), medication use without indication (15.9%) and untreated indication (11.5%) being the most common. Pharmacists resolved 75.6% of DRPs and reduced mean pill burden by 2.0 ± 3.6 ($p < 0.001$). Nephrologists accepted 69.8% of the 258 recommendations made by pharmacists. Medications for cardiovascular disease (23.5%), mineral and bone disorders control (15.9%) and anaemia control (15.4%) were commonly implicated in DRPs. A non-statistically significant reduction in hospital admissions was observed post-review (IRR 0.74; 95% CI: 0.49–1.10). Baseline number of medications ($b = 0.205$; 95% CI: 0.042–0.369) and Indian ethnicity ($b = 3.502$; 95% CI: 1.791–5.213) were positively associated with DRPs.
CONCLUSION: DRPs are highly prevalent in adults on HD. A CC model can resolve DRPs and reduce pill burden, translating to decreased health care utilization.

11. Evaluation of ambulatory care clinical pharmacists-provided discharge counseling service on hospital readmission rates *Amy M. Drew, Pharm.D., BCPS*, Brittany Albus, Pharm.D., Candidate, Jamie M. Pitlick, Pharm.D., BCPS, Megan Ziegler, Pharm.D.; St. Louis College of Pharmacy, St. Louis, MO
PURPOSE: Discharge medication counseling from a hospital setting can reduce discrepancies and potential adverse events. The purpose of this study is to determine the impact of ambulatory care clinical pharmacists-driven discharge counseling on hospital readmission rates to Mercy Hospital St. Louis (MHSL).
METHODS: Patients, over 18 years of age, were included if discharged from MHSL during a defined time period and received care from one of two ambulatory care clinics. Exclusion criteria included those admitted for obstetrics, elective surgery, behavioral health, and discharged to a nursing facility. The intervention was a medication review call to patients within 48 hours following discharge. The pre-implementation group was patients discharged before implementation of this service, and post-implementation group was patients discharged after implementation and received this service. The differences in groups were evaluated using chi-square tests.
RESULTS: There were 300 patients in the pre-implementation group and 217 patients in the post-implementation group. The primary outcome was difference in 30-day readmission rates after implementation of the service ($p = 0.296$). There were no differences in additional outcomes of readmission rates in 60 ($p = 0.605$) and 90 ($p = 0.408$) days, 30 day readmission rates in those with greater than seven medications ($p = 0.095$), and in those 60 years of age or older ($p = 0.342$).
CONCLUSION: Pharmacist-led discharge counseling by ambulatory care pharmacists had no statistical impact on readmission rates to MHSL. This study did not reach power ($n = 600$) for the primary outcome which is a limitation in the true interpretation of these findings. These clinics continue to implement this pharmacist- led discharge counseling service. Medication discharge counseling is an important component of patient care especially in improving the transition of a patient from one healthcare setting to another. Pharmacists have a unique opportunity to integrate into every aspect of patient care and make a positive impact on patient transitions of care.

12. Predictors of metformin prescribing in adult type II diabetes mellitus patients: a national cross sectional study *Mate Soric, Pharm.D., BCPS*[1], Jaclyn Boyle, M.S., Pharm.D., BCPS[2], John Moorman, Pharm.D., BCPS[3]; (1) Department of Pharmacy Practice, Northeast Ohio Medical University and University Hospitals Geauga Medical Center, Rootstown, OH (2) Department of Pharmacy Practice, Northeast Ohio Medical University, Rootstown, OH (3) Department of Pharmacy Practice, Northeast Ohio Medical University and Akron General Medical Center, Rootstown, OH
PURPOSE: Metformin remains the first-line oral type II diabetes treatment. Despite an abundance of evidence, it is routinely under-utilized. Our study evaluates the rates of metformin usage in an appropriate patient population and identifies predictors of metformin use so that providers may identify patients most likely to be affected by metformin under-prescribing.
METHODS: A national cross-sectional study was conducted utilizing data from the National Ambulatory Medical Care Survey from 2010. Patients were included if they had a diagnosis of type II diabetes mellitus and were between 18 and 79 years of age. Patients with a diagnosis of chronic renal failure or heart failure were excluded. The primary outcome was metformin prescribing rates, defined as any prescription for metformin or a metformin-containing combination. A multivariate logistic regression was conducted to identify variables significantly associated with metformin prescribing. All analyses were adjusted for number of medications prescribed and patient weighting.
RESULTS: A total of 1105 patient visits were eligible for inclusion, representing 41,386,703 office visits nationally. Metformin

was prescribed in 40.6% of these patients. After adjusting for number of medications and patient weight, the strongest independent predictors of metformin prescribing were rural location (odds ratio [OR] 1.76; 95% confidence interval [95% CI] 1.75–1.77 compared to urban location), age 18–24 (OR 0.46; 95% CI 0.44–0.47 compared to those aged 45–64), use of insulin (OR 0.59; 95% CI 0.58–0.59 compared to no insulin use) and presence of complications of diabetes (OR 0.64; 95% CI 0.64–0.64 compared to those without complications). Lower metformin prescribing rates were also independently associated with Medicare, Medicaid, higher poverty rates, black race and location in the Midwest.
CONCLUSION: Though widely accepted as the first-line oral antidiabetic agent, metformin prescribing remains low, particularly in younger diabetes patients, urban locations, in patients with diabetic complications and those receiving insulin. This represents an important opportunity to improve the quality of care for patients with diabetes.

Cardiovascular

14. Association of inflammatory gene polymorphisms with the prosthetic heart valve reoperation *Kyungeun Lee, Pharm.D.*[1], Elise Kim, Pharm.D.[2], Hyesun Gwak, Ph.D., Pharm.D.[3]; (1) Department of Pharmacy, Chungbuk National University, Chungbuk, South Korea (2) College of Pharmacy, Ewha Womans University, Seoul, South Korea (3) College of Pharmacy & Division of Life and Pharmaceutical Sciences, Ewha Womans University, Seoul, South Korea
PURPOSE: Prosthetic heart valve often require one or more reoperations. There are various reasons associated with prosthetic valve dysfunctions such as valve thrombosis, pannus development, paravalvular leakage, endocarditis, fibrous tissue ingrowth and calcification. It is known that inflammation is associated with the adverse complications in patients who underwent heart valve operations. Our study is designed to determine the risk factors correlated to reoperation in patients with prosthetic heart valves and also to investigate the relationship between genetic polymorphism of cytokines, considering their roles in inflammations in prosthetic valve dysfunction.
METHODS: This study included 228 patients with stable warfarin doses from the EAST Group of Warfarin. Blood samples of study patients used for genotyping were collected during their regular outpatient clinic visits. Patient charts and electronic medical records from June 1983 to May 2013 were reviewed. Single nucleotide polymorphisms (SNPs) of C-reactive protein (CRP), interferon-gamma (IFNG), interleukin-1beta (IL1B), interleukin-6 (IL6), interleukin-10 (IL10), transforming growth factor-beta1 (TGFB1), and tumor necrosis factor-alpha (TNFA) were genotyped with SnapShot or Taqman assays.
RESULTS: Forty five patients underwent more than one heart valve operation (19.7%). The time after first operation, gender, valve position and atrial fibrillation were statistically significant characteristics of patients for reoperation. We observed an increased risk of 2.2-fold for reoperation of the heart valve in homozygous variant-type (AA) carriers compared to wild-type carriers of CRP rs1205. The relative risk was calculated for IL10 rs1800896 and IFNG rs2430561 and showed 5.1-fold risk for reoperation in homo variant-type carriers of IL10 rs1800896 and 0.2-fold risk in variant-allele carriers of IFNG rs2430561. CRP genotype and time after first operation were found to affect the risk for reoperation from the logistic regression analysis.
CONCLUSION: Based on the results, it may be possible in future to use the knowledge of CRP gene variants as an indicator for reoperation.

15. Patients' perceived educational needs about oral anticoagulant therapy: a French survey based on the W4H (What, Who, Where, When, How) questionnaire *Diane de Terline, Pharm.D.*[1], Gilles Hejblum, Ph.D.[2], Christine Fernandez, Pharm.D., Ph.D.[3], Ariel Cohen, M.D., Ph.D.[4], Marie Antignac, Pharm.D., Ph.D.[1]; (1) Pharmacy Department, Hôpital Saint-Antoine, AP–HP, Paris, France (2) UMR_S 1136, Institut Pierre Louis d'Epidémiologie et de Santé Publique, INSERM, Paris, France (3) Pharmacy Faculty, Univ Paris-Sud, Chatenay-Malabry, France [4]Cardiology Department, Hôpital Saint Antoine, AP–HP, Paris, France
PURPOSE: Education programs for patients treated with anticoagulant therapies have progressively become an integrated component of patient management. Involving patients in the design of education programs is likely to provide useful guidance for tailoring more efficient programs, and more globally, to enhance health care systems oriented towards a patient-centered perspective. Therefore, we investigate the wishes of outpatients treated with oral anticoagulant therapies in terms of education programs: what do patients want to know, who should provide information, where, when and how.
METHODS: A nationwide study based on a self-reported questionnaire survey in a Cardiology Department and in community pharmacies was conducted. The questionnaire investigated patient information needs content and preferred modalities of information delivery.
RESULTS: The questionnaire was completed by 371 patients among which 184 (49.6%) were recruited in French community pharmacies, and 187 (50.4%) during an outpatient consultation in a Cardiology Department. Overall, patients judged that information about their treatment were important: 76% of the items on this topic that were proposed in the questionnaire were considered as important to indispensable. Treatment side effect was the top-ranked domain. The preferred modalities for information delivery were individual session with a doctor at the beginning of the treatment whereas pharmacists, nurses, and patient associations were poorly considered for delivering information. Group sessions and the Internet were judged as inconvenient modalities of information delivery, as well as patient's home.
CONCLUSION: The study results revealed important discrepancies between patients' preferences and current educational program practices, in terms of modalities for delivering information to the patient. Tailoring future education programs taking more into account the patients' preferences evidenced in this study might contribute to enhance the effectiveness of educational interventions.

16. Integrated home INR monitoring may improve outcomes in mechanical circulatory support recipients *Christina Doligalski, Pharm.D., BCPS*[1], Alex Lopilato, Pharm.D.[1], Lori Anderson, RN[2], Christiano Caldeira, M.D.[3]; (1) Department of Pharmacy, Tampa General Hospital, Tampa, FL (2) Tampa General Hospital, Tampa, FL (3) FACT Surgery, Tampa, FL
PURPOSE: Mechanical circulatory support (MCS) reduces mortality but is associated with frequent hospital readmissions, gastrointestinal bleeding (GIB) and pump thrombosis (PT). Integrated home INR monitoring (IHIM) is an emerging modality that may allow for improved anticoagulation control and improved patient outcomes.
METHODS: An IRB-approved retrospective review of first MCS implants between 10/1/2011 and 9/30/2013 at a single-center was conducted. Endpoints included difference in twelve-month incidence of hospital readmissions, PT, and GIB between IHIM vs traditional management (TM). Additionally, weekly INRs were collected and percentage of INRs less than 1.6 and greater than 3 were compared. Descriptive statistics were used for baseline characteristics, chi-square tests for categorical, and t-tests for continuous variables.
RESULTS: Sixty-four patients received continuous-flow MCS (4 IHIM, 60 TM) during the study period. Readmission rates were lower in IHIM, with an average of 0.75 vs 1.3 readmissions/patient ($p = 0.0498$). Twelve-month incidence of PT was 0% in IHIM vs 13.3% in TM ($p = 0.43$); GIB was 25% in IHIM vs 23.3% in TM ($p = 0.93$). The 1-, 3-, and 6-month rate of PT for the entire cohort was 1.6%, 6.25%, and 12.5%, respectively. All patients with PT underwent pump exchange. Mean time to first

GIB was 72.6 days (9–160). GIB was managed with temporary discontinuation of anticoagulation/antiplatelets and blood administration (3.23 units/event). Regarding anticoagulation control, INRs less than 1.6 was 11.3% (5.8–23%) for IHIM vs 24.6% (5–73.5%) for TM ($p = 0.034$); INRs greater than 3 were similar between IHIM and TM (10.75% [range 1.8–21.2%] vs 10.1% [0–26.7%], $p = 0.89$).
CONCLUSION: MCS is associated with early hemostatic-related morbidity. Despite a small sample size, IHIM appears to have an advantage over TM, as readmission rates were lower and fewer clinically significant low INRs occurred in the IHIM group. No PT occurred in the IHIM group compared with 13.3% in TM. Future work will focus on a larger population to explore identified trends.

17. Evaluating the potential effect of melatonin on the post cardiac surgery sleep disorder *Azita H. Talasaz, Pharm.D., BCPS*, Mehrnoush Dianatkhah, Pharm.D., Padideh Ghaeli, Pharm.D.; Department of Clinical Pharmacy, Tehran Heart Center, Tehran University of Medical Sciences
PURPOSE: Postoperative neurological injuries, including cognitive dysfunction, sleep disorder, delirium, and anxiety, are the important consequences of coronary artery bypass graft surgery (CABG). Evidence has shown that postoperative sleep disturbance is partly due to disturbed melatonin secretion in the perioperative period. The aim of this study was to evaluate the effect of melatonin on postoperative sleep disorder in patients undergoing CABG.
METHODS: One hundred forty-five elective CABG patients participated in a randomized double-blind study during the preoperative period. The patients were randomized to receive either 3 mg of melatonin or 10 mg of Oxazepam one hour before sleep time. Each group received the medication from 3 days before surgery until the time of discharge. Sleep quality was evaluated using the Groningen Sleep Quality Score (GSQS), and the incidence of delirium was evaluated by nursing records.
RESULTS: The analysis of the data showed that sleep was significantly disturbed after surgery in both groups. The patients in the Oxazepam group demonstrated significantly higher disturbance in their mean postoperative GSQS score than did their counterparts in the melatonin group ($p < 0.001$). A smaller proportion of the participants experienced delirium in the melatonin group (0.06%) than did those in the Oxazepam group (0.12%); however, this difference was not statistically significant.
CONCLUSION: The result of the present study revealed that 3 mg of melatonin taken one hour before bedtime can improve sleep in post-cardiac surgery patients more than what was observed with Oxazepam. Therefore, melatonin may be considered an effective alternative for Benzodiazepines in the management of postoperative sleep disorder.

18. Effects of carvedilol in patients after cocaine-induced chest pain *Shannon W. Finks, Pharm.D.*[1], Michael Brenner, Pharm.D., BCPS (AQ Cardiology)[2], Debra W. Kemp, Pharm.D., BCPS, BCACP[3], Lauren Odum, Pharm.D., BCPS[4], Mary H. Parker, Pharm.D., BCPS (AQ Cardiology)[5], Robert B. Parker, Pharm.D.[6], Kelly C. Rogers, Pharm.D.[1]; (1) Department of Clinical Pharmacy, University of Tennessee College of Pharmacy, Memphis, TN (2) VA Ann Arbor Healthcare System, Ann Arbor, MI (3) Department of Pharmacy, Durham VA Medical Center, Durham, NC (4) University of Missouri – Kansas City School of Pharmacy and Harry S. Truman VA, Columbia, MO (5) Durham VA Medical Center, Durham, NC (6) University of Tennessee Dept of Pharmacy, Memphis, TN
PURPOSE: Many patients presenting with cocaine-induced chest pain (CICP) have compelling indications for beta-blockade (BB), yet risk for recidivism impacts long-term therapy. Publications on the safety of BB in CICP focus on beta-blockers as a class. The purpose of this study is to report safety and efficacy outcomes in veterans receiving carvedilol, a unique agent with both alpha- and beta-blocking properties, after hospitalization for CICP.
METHODS: A multisite, retrospective analysis of medical records of veterans presenting with chest pain and positive urine drug screen for cocaine over 72 months was performed. Veterans were evaluated for a discharge prescription of carvedilol, concomitant diseases, 6-month all-cause emergency department (ED) and readmission rates, incidence of recurrent myocardial infarction (MI), new onset heart failure (HF), and mortality. Comparisons were made between patients receiving carvedilol and those given no BB.
RESULTS: Of 217 veterans (96% male) evaluated, 77 (35%) were given BB at discharge, with carvedilol prescribed in 47 (61%). Patients receiving carvedilol were significantly older and had more severe disease compared to no BB (age 57.3 ± 4.8 years vs 54.2 ± 7.7 years, $p = 0.003$; average ejection fraction (EF) $35.9 \pm 22\%$ vs $50.7 \pm 15.3\%$, $p = 0.0006$). Those receiving carvedilol had no increase in ED visits (1.65 ± 1.88 vs 1.97 ± 2.39, p = NS), 6-month incidence of MI (4.3% vs 3.6%, p = NS), 6-month HF occurrence (8.5% vs 8.6%, p = NS), or 1-year mortality (12.8% vs 10.0%, p = NS) compared to no BB.
CONCLUSIONS: Carvedilol at time of discharge for CICP did not worsen 6-month outcomes in veterans with strong indications for BB therapy, such as HF with reduced EF and MI. Despite being older and having more severe disease, those receiving carvedilol had no increase in death, MI, or HF; which suggests that administering carvedilol at discharge after CICP is safe and may potentially be protective.

19. Safety and efficacy of a bivalirudin based purge solution for a percutaneous ventricular assist device *Colleen Martin, Pharm.D.*[1], Craig Cocchio, Pharm.D., BCPS[2]; (1) Rutgers University, Piscataway, NJ (2) Ernest Mario School of Pharmacy at Rutgers, The State University of New Jersey, Piscataway, NJ
PURPOSE: The objective of this study is to compare safety and efficacy of a direct thrombin inhibitor (DTI) based purge solution to a heparin based purge solution in patients receiving a short-term ventricular assist device (LVAD). Patients with a history of heparin-induced thrombocytopenia (HIT), the manufacturer recommends to administer a DTI peripherally and to remove heparin from purge solution only. It is unknown whether substituting a DTI for heparin is effective or safe. At this institution, bivalirudin, a DTI is used as part of the purge solution in place of heparin. Therefore, the primary outcome was the incidence of LVAD related complications.
METHODS: Retrospective chart review of electronic charts of patients receiving a short-term LVAD who received either a bivalirudin-based purge solution or a heparin-based purge solution. For all data collected, continuous data will be analyzed using a Student's t-test and categorical data analyzed using a chi-square analysis.
RESULTS: A total of 24 patients received an LVAD during the study period, 8 of which received a purge solution containing bivalirudin. More patients who received a purge solution containing bivalirudin had a past medical history significant for COPD (4/8, 50%; 0/16, 0%; $p = 0.007$), otherwise there were no differences in baseline characteristics between patient groups and no difference in the indication for LVAD. For the primary outcome of incidence of device related complications, there was no difference between groups (5/8, 62.5%; 10/16, 62.5%; $p = 1.00$). There was no difference in the incidence of stroke within 30 days (0/8, 0%; 1/16, 6.25%, $p = 1.00$), myocardial infarction within 30 days (0/8, 0%; 1/16, 6.25%, $p = 1.00$), or acute major hemorrhage (1/8, 12.5%; 4/16, 25%, $p = 0.63$).
CONCLUSION: The results of this study suggest that the substituting bivalirudin for heparin in LVAD purge solution does not increase device complications.

20E. Comparison of amiodarone monitoring compliance: usual care, electronic template prescribing, and pharmacist-managed clinic *Michael Brenner, Pharm.D., BCPS (AQ Cardiology)*[1], Jeannie Poon, Pharm.D.[2], Allison Brenner, Pharm.D.[1]; (1) VA Ann Arbor Healthcare System, Ann Arbor, MI (2) Novant Health Presbyterian Medical Center, Charlotte, NC
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21. Adherence and persistence to antihypertensive medications in uncomplicated treatment naïve patients: effects of initial therapeutic classes *Young-Mi Ah, Ph.D. Candidate*[1], Yun-Jung Choi, Ph.D. Candidate[1], Baek-eum Kim, Pharm.D.[2], Ju Yeun Lee,[3], Kyung Hee Choi, Ph.D. Candidate[4], Jung-Mi Oh, Pharm.D.[5], Whan Gyun Shin, Pharm.D.[6], Hae-Young Lee, M.D.[7]; (1) College of Pharmacy, Institute of Pharmaceutical Science and Technology, Hanyang University, Ansan Gyeonggi-do, South Korea (2) College of Pharmacy,, Institute of Pharmaceutical Science and Technology, Hanyang University, Ansan Gyeonggi-do, South Korea (3) College of Pharmacy, Institute of Pharmaceutical Science and Technology,Hanyang University, Ansan Gyeonggi-do, South Korea (4) College of Pharmacy, Sunchon National University, South Korea (5) College of Pharmacy, Seoul National University, Seoul, South Korea (6) Department of Pharmacy, Seoul National University, South Korea (7) Department of internal medicine, Seoul National University Hospital, South Korea
PURPOSE: Despite the fact that antihypertensive medication (AHT) use is associated with a major reduction in cardiovascular events, adherence and persistence to AHT were reported to be relatively poor in several studies. We aimed to assess 1 year persistence and adherence to AHT among newly treated uncomplicated hypertensive patients in Korea and to evaluate the effect of initial therapeutic classes.
METHODS: We retrospectively analyzed 20% random sample of whole newly treated uncomplicated hypertensive patient population (45,787 patients) in 2012 from National Health Insurance claim database. The cohorts were classified into six groups according to initial AHT class. Medication possession ratio (MPR) was used to assess 1 year adherence to AHT. Class and treatment persistence was measured. Prescription gap of 60 days was allowed for persistence.
RESULTS: Dihydropyridine calcium channel blockers (D-CCB) and angiotensin receptor blockers (ARB) were mainly chosen class as initial AHT (43.71% and 40.33%, respectively). Only 64% were adherent to AHT (MPR $\geq$ 0.8) in total cohort and ARB group (0.79) and thiazide diuretics group (0.55) showed the highest and the lowest mean MPR, respectively. Mean treatment duration of total cohort was 276.45123.12 days and approximately two thirds (62.07%) were persistent to any AHT over 1 year: ARB group (67.39%), D-CCB group (63.78%), angiotensin converting enzyme inhibitors (ACEI) group (62.41%), beta blockers (BB) group (45.62%), and thiazide diuretics group (30.76%). However, class persistence was the highest in D-CCB group (44.42%) followed by ARB group (43.55%) but class duration was not significantly different (232.7 130.7 days vs 230.3 131.0 days). In addition to initial AHT class, age, sex, insurance type, Charlson comorbidity index, depression, dyslipidemia, and number of co-medications were significantly related with persistence to AHT.
CONCLUSION: In real world, adherence and persistence to AHT were suboptimal. Meaningful differences in adherence and persistence between initial AHT classes were observed.

22. Nuisance bleeding assessment in community dwelling patients taking clopidogrel *Kathryn M. Momary, Pharm.D., BCPS*[1], Laura P. Kimble, Ph.D., RN, FNP-C[2]; (1) Department of Pharmacy Practice, Mercer University College of Pharmacy, Atlanta, GA (2) Georgia Baptist College of Nursing of Mercer University, Atlanta, GA
PURPOSE: Nuisance bleeding is a common problem in patients taking antiplatelet therapy, however this adverse event is rarely assessed in clinical trials or traditional patient care. The purpose of this study was to characterize nuisance bleeding utilizing a novel scoring system in community based patients taking clopidogrel therapy.
METHODS: This was a cross-sectional study of community dwelling cardiovascular patients with a self-reported prescription for clopidogrel recruited via newspaper advertising. Self-report mailed questionnaires assessed demographic characteristics and nuisance bleeding. The nuisance bleeding scale, was developed by the authors, and assessed both the presence and severity of nine specific types or areas of bleeding. Evidence for validity of the scale was obtained via expert review. For each type of nuisance bleeding, subjects also rated the severity on a 5-point Likert scale. Two scores were generated from the nuisance bleeding scale: total number of sites/areas where subjects reported bleeding and the mean severity rating provided by the subject. Nuisance bleeding was characterized using descriptive statistics.
RESULTS: A total of 102 subjects were enrolled with a mean (SD) age of 72 years (10), 58% were male, 91% were European Caucasian and the most common indication for clopidogrel was coronary stenting. Nuisance bleeding was reported in 88.3% of subjects. Subjects reported nuisance bleeding in a mean (SD) of 3.4 (2.1) sites, with the most commonly reported types being easy bruising (72.8%) and bruising on hands and arms (64.1%). The mean (SD) severity score was 1.1 (1.0).
CONCLUSIONS: Data from this cross-sectional study suggest that community dwelling patients taking clopidogrel are experiencing nuisance bleeding and this tool could help clinicians assess and monitor this important problem.

Community Pharmacy Practice

23E. Medication adherence and activity patterns measured by sensor technologies guided hypertension management in the community pharmacy Kevin Noble, B.S.[1], Pin Xiang, Pharm.D. Candidate[2], *Yoona Kim, Pharm.D., Ph.D.*[3], Sarah Leadley, B.S.[3], Lorenzo DiCarlo, M.D.[3]; (1) Pinnacle Health Partnership LLP, East Cowes (2) University of California: San Francisco, San Francisco, CA (3) Proteus Digital Health, Redwood City, CA
Presented at Submitted to The Clinical Pharmacy Congress 2015 poster session in London April 24–25.

Critical Care

25. Impact of a method of sedation and analgesia control on average ventilator days and length of stay in the intensive care unit *Efrain Marrero, Pharm.D., BCPS*[1], Robert McEachern, M.D.[2], Geoffrey Patrissi, M.A. Psychology[3], Jeri Pike, B.S. Chemistry, AD Nursing[4]; (1) Saint Francis Hospital, Memphis, TN (2) Baptist Memorial Hospital-North Mississippi (3) Navy Personnel Research, Studies, and Technology (4) St. Francis Hospital, Memphis, TN
PURPOSE: Inadequate analgesia and excess sedation in the mechanically ventilated patient can lead to suppression of the respiratory drive or delirium, which can prolong ventilation time and hospital length of stay (LOS). Every intensive care unit is challenged with designing and implementing a protocol which can consistently guide the bedside provider on the provision of safe and effective sedation and analgesia. This study evaluates a novel method of sedation and analgesia for mechanical ventilation in the intensive care unit (ICU) from the perspectives of protocol content, education, and implementation; and the impact on days requiring mechanical ventilation, ICU LOS, and net hospital LOS.
METHODS: This is a single-centered retrospective analysis of the implementation of a protocol for sedation and analgesia control in a 35 bed ICU. Baseline data was compared from among patients assessed before and after the education and

implementation of the new process (42 vs 43 patients). There was no significant difference among the groups with respect to age, gender, or ethnicity. All mechanically ventilated patients on the plan were included in the study with the exception of patients whose condition required off-protocol sedatives, were neurologically impaired, or who were chronically ventilated. ICU staff was educated on the new protocol utilizing differentiated teaching methods including group and individual orientation to the protocol, the role of analgesics, and overall sedation management.
RESULTS: Our initiative resulted in a 40.8% decrease in average days requiring mechanical ventilation ($p < 0.003$); a 37.6% reduced ICU length of stay ($p < 0.04$), and a 34.5% decrease in net hospital length of stay ($p < 0.01$).
CONCLUSIONS: This study describes a method of sedation and analgesia for the mechanically ventilated ICU patient and its implementation, demonstrating a clinically and statistically significant decrease in average days requiring mechanical ventilation and length of stay.

26. Nimodipine 14 versus 21 days in aneurysmal subarachnoid hemorrhage *Susan Cho, Pharm.D.*[1], Kim Tran, Pharm.D., BCPS[2], Gina Korab, Pharm.D., BCPS[2], James Bales, M.D., Ph.D.[2], Nita Khandelwal, M.D.[2], Aaron Joffe, D.O.[2]; (1) University of Washington Medical Center, Seattle, WA (2) Harborview Medical Center, Seattle, WA
PURPOSE: Nimodipine therapy is the standard of care for patients who experience aneurysmal subarachnoid hemorrhage (aSAH). Due to a national drug shortage, the duration of nimodipine therapy was shortened from the standard 21 days to 14 days of therapy starting May 2013 at an academic medical center. It is unknown whether a shortened duration of nimodipine therapy will affect neurologic outcomes.
METHODS: We analyzed medical records of all patients who received nimodipine between January 2012 and August 2013. Patients who received a shortened duration of therapy were compared to historical controls for neurologic outcome at hospital discharge based on two different neurologic assessment scores.
RESULTS: There were a total of 199 aSAH patients who were included in the analysis for the given study period, including 164 patients in the standard duration group (21 days) and 35 patients in the shortened duration (14 days) group. Baseline patient severity of illness and bleeding scores did not differ between the treatment groups. A shortened duration of 14 days was not associated with a higher risk of a poor neurologic outcome using the Modified Rankin Scale, OR 1.85, 95% CI 0.54–6.32, $p = 0.32$ or using the Extended Glasgow Outcome Scale, OR 2.47, 95% CI 0.93–6.57, $p = 0.06$. Mortality rates were the same in each group.
CONCLUSION: The duration of nimodipine therapy was not associated with worse neurologic outcomes in aSAH patients at one institution. More studies are needed prior to recommending a shortened duration of nimodipine therapy in all aSAH patients.

27. Does the type of your parenteral lipids matter? a clinical answer in critical illness Jean-Christophe Devaud, Pharm.D.[1], Mette M. Berger, M.D.[2], Andre Pannatier, Ph.D.[1], Farshid Sadeghipour, Ph.D.[1], *Pierre Voirol, Ph.D.*[1]; (1) Service of Pharmacy, Lausanne University Hospital (CHUV), Lausanne, Switzerland (2) Service of Adult Intensive Care and Burns, Lausanne University Hospital (CHUV), Lausanne, Switzerland
PURPOSE: Disturbance of lipid profile is common among intensive care unit (ICU) patients, but evidence regarding the impact of the different fatty acid (FA) emulsions in patients requiring parenteral nutrition (PN) is scarce. The present study aims to compare the plasma lipid response to 2 types of lipid emulsions (mix of long chain triglycerides (LCT) and medium chain triglycerides (MCT)) or a LCT with n-9FA in patients requiring prolonged ICU treatment.
METHODS: Retrospective observational study in a multidisciplinary university ICU: 2 periods were defined by the type of industrial lipid emulsion and a lower energy targets in the 2nd period. Inclusion criteria: consecutive patients on PN staying between ≥4 and <18 days. Recorded variables were: energy intake, amount and type of nutritional lipids, propofol dose, glucose and protein intake, laboratory parameters, and all drugs received. Triglyceride (TG) levels were assessed 2–3 times weekly. Hypertriglyceridemia (hyperTG) was defined as TG >2 mmol/L. Statistics: two-way analysis of variance (ANOVA) and linear regression.
RESULTS: A total of 187 patients were included (112 LCT/MCT and 77 LCT n-9FA respectively): demographic variables, severity indices and diagnostic categories were similar. Outcomes did not differ. Seventy seven patients (41%) presented hyperTG. The LCT/MCT n group received significantly more daily energy (kcal/day), lipids (g/day), and glucose (g/day), ($p < 0.05$). Despite the higher lipid load, the increase in TG on LCT/MCT emulsion was significantly lower than in the LCT n-9FA group (0.2 and 0.4 mmol/L respectively, $p < 0.05$).
CONCLUSION: The frequent HyperTG during PN, is not associated with adverse outcome. The use of LCT/MCT emulsions is associated with lesser alterations of plasma triglycerides than LCT n-9FA emulsions.

29. Protocolized, weight-based administration of 3-factor prothrombin complex concentrate and incidence of thrombosis *Kirstin Kooda, Pharm.D., BCSP*[1], Philip Kuper, Pharm.D., BCSP[1], Lance Oyen, Pharm.D.[2]; (1) Department of Pharmacy Services, Mayo Clinic Hospital – Rochester, Rochester, MN (2) Department of Pharmacy Services; College of Medicine Mayo Clinic, Mayo Clinic Hospital – Rochester, Rochester, MN
PURPOSE: Characterize (1) indication for 3-factor prothrombin complex concentrate (PCC) administration, (2) effect of institutional guideline based dosing strategy (ranging from approximately 500 units to 50 units/kg dosed based on INR at baseline and indication), and (3) incidence of venous thromboembolism (VTE) with real-world utilization of PCC.
METHODS: Retrospective chart review of all 3-factor PCC doses administered to research authorized patients for non-hemophilia related indications from January 1, 2013 to March 31, 2014. Analysis of the use was compared to institutional guidelines and categorized as on or off guideline. Listed indication for and dose of PCC, pre and post dose INR, coadministration of plasma and vitamin K, incidence of thromboembolism within 7 days, and in-hospital mortality were recorded.
RESULTS: Two hundred nineteen doses were administered to 185 patients, most commonly for reversal of warfarin for neurologic or other bleeding emergency (n doses = 121, 55.3%) to reverse a median INR of 2.5 (range 1.5–11.4) in the guideline group and 2 (range 0.8–10) in the non-guideline group ($p = 0.0016$). Guideline criteria were met by 116 patients (62.7%) with 105 (53%) administered doses matching dose recommendations. Within 12 hours of PCC administration, the percentage decrease in INR was 43.6% in the guideline group and 25.8% in the non-guideline group ($p < 0.001$). Vitamin K was coadministered in 138 patients (74.6%) and plasma in 105 patients (56.8%). Of the 185 patients, 46 patients (24.9%) died in-hospital and 22 patients (11.9%) experienced VTE within 7 days of dose, most commonly DVT.
CONCLUSION: Indication and INR adjusted weight-based dosing of 3-factor PCC may be effective for INR reversal. Use of PCC in real-world care was associated with an 11.9% incidence of VTE as compared to a range of 0–7% in previously reported clinical trials. Further analysis of thrombosis and other safety risks is warranted.

Drug Information

30. Comparison of the time interval between entry in PubMed and indexing with Medical Subject Headings between biomedical journals *Adriane Irwin, Pharm.D.*[1], Daniel Rackham, Pharm.D.[2]; (1) College of Pharmacy, Oregon State University, Corvallis, OR (2) Lebanon Community Hospital, Lebanon, OR

PURPOSE: Compare the time interval between entry into PubMed and indexing with Medical Subject Headings (MeSH) between biomedical journals.
METHODS: This was a cross-sectional study of articles entered into PubMed between January 1 and December 31, 2012. Three sets of journals were identified: (1) those with impact factors of 2.0–2.5, 4.5–6.5, and >10, (2) those classified as internal medicine versus specialty area journals, and (3) those representing the healthcare disciplines of medicine, nursing, and pharmacy practice. Primary study endpoint was the time between entry into PubMed and MeSH term indexing
RESULTS: A total of 7906 articles were reviewed across 18 journals. In the first comparison, a total of 2,222 articles were reviewed with a time to indexing of 177 ± 100 days, 111 ± 69 days, and 23 ± 40 days for articles published in journals with impact factors of 2.0–2.5 (n = 663), 4.5–6.5 (n = 757), and >10 (n = 802), respectively. In the second comparison, a total of 2130 were reviewed with a time to indexing of 111 ± 69 days for internal medicine (n = 757) versus 170 ± 74 days for specialty journals (n = 1373). In the third comparison, a total of 1893 articles were reviewed with a time to indexing of 177 ± 100 days, 234 ± 107 days, and 163 ± 58 days for medicine (n = 663), nursing (n = 458), and pharmacy practice (n = 772) journals, respectively.
CONCLUSIONS: Study results identified a variable delay between entry of articles into PubMed and the time to indexing with MeSH terms. This suggests that factors may exist that influence the priority by which articles are indexed. Future research should focus on determining those factors and the impact of this delay on clinical practice.

31. A national survey of drug information resource use among pharmacists *Conor Hanrahan, Pharm.D., BCPS*[1], Kelli Garrison, Pharm.D., BCPS[2], Sabrina Cole, Pharm.D., BCPS[1]; (1) Intermountain Healthcare, Murray, UT (2) Medical University of South Carolina, Charleston, SC
PURPOSE: The primary objective was to assess the preferences of pharmacists toward available online and mobile drug information (DI) resources and identify trends in resource utilization.
METHODS: An anonymous, self-administered electronic survey was distributed to pharmacists in the United States through online listservs from two national organizations: the American Society of Health-System Pharmacists and the American College of Clinical Pharmacy. The survey instrument consisted of 25 questions assessing demographic information; access to and use of DI resources; and preferences toward DI resources in electronic health record systems.
RESULTS: A total of 621 pharmacists responded to the survey. Most (80%, 488/621) reported working in the hospital setting, followed by 13% (81/621) in the ambulatory, primary care, or community environment. Ninety-two percent (574/621) reported using a desktop/laptop computer to access DI resources. The most commonly reported desktop/laptop resources made available by institutions included UpToDate (70%, 432/621), Micromedex 2.0 (65%, 405/621), Lexicomp Online (57%, 355/621), and Facts and Comparisons eAnswers (35%, 215/621). When asked which DI resource for a laptop/desktop computer respondents preferred to use or used the most, the majority selected Lexicomp Online (35%, 203/572), followed by Micromedex 2.0 (28%, 160/572) and UpToDate (16%, 91/572). Drug dosing was the most frequently used component of laptop/desktop DI resources, with 38% (213/557) reporting use greater than once per day. Approximately 70% (389/562) of participants reported accessing DI resources via a mobile device. Lexicomp was the most commonly provided mobile resource by institutions (48%, 187/389), followed by Micromedex (35%, 135/389), and UpToDate (18%, 70/389). When asked which mobile drug resource participants preferred to use or used most often, the majority selected Lexicomp (54%, 208/385), followed by Micromedex (19%, 72/385), and Epocrates (10%, 37/385).
CONCLUSIONS: Pharmacists frequently access DI resources online and via mobile devices, with most respondents from all settings appearing to prefer Lexicomp Online.

Education/Training

32. Evaluation of a mock interview session on residency interviewing skills *Kelsey Buckley, Pharm.D., BCACP*[1], Samantha Karr, Pharm.D., FCCP, BCPS, BCACP, BC-ADM[1], Kristi Kelley, Pharm.D., FCCP, BCPS, CDE, BC-ADM[2], Sarah A. Nisly, Pharm.D., BCPS[3]; (1) Midwestern University College of Pharmacy-Glendale, Glendale, AZ (2) Auburn University, Harrison School of Pharmacy, Birmingham, AL (3) Butler University College of Pharmacy and Health Sciences & Indiana University Health, Indianapolis, IN
PURPOSE: Each year, at the ACCP Annual Meeting, the Education and Training Practice and Research Network (PRN) holds a Mock Interview Session. The purpose of the Mock Interview Session is to provide current pharmacy students, residents, and fellows an opportunity to participate in a mock interview with an ACCP member who may be a clinical pharmacist, educator, preceptor, or residency director. The purpose of this research is to determine the impact of final year pharmacy student participation in the Mock Interview Session on confidence level regarding residency interviewing skills.
METHODS: A pre-session survey assessing confidence level (on a 5 point Likert scale) for residency interviews was administered to eligible final year pharmacy students seeking residency program placement. Participants were randomly assigned to an interviewer. Sessions then commenced with each student participating in up to three mock interviews, designed to simulate post-graduate program interviews. Students were given immediate feedback on interviewing skills. Participants were then asked to complete a post-session survey evaluating their confidence level. Descriptive statistics were used to analyze nominal data. Paired t-tests were used to determine the change in interview confidence level.
RESULTS: There were 59 final year pharmacy students eligible to participate in the Mock Interviews Session; all 59 (100%) submitted the pre-session survey. A total of 51 (86%) participants submitted post-session surveys and were matched to pre-session surveys. The Mock Interview Session demonstrated an average pre-session confidence score of 2.52, an average post-session confidence score of 3.69, and an average change of 1.16 in confidence post-session (CI 0.93–1.39; $p < 0.001$).
CONCLUSION: Although limited by a small sample, post-session results indicate that students' confidence level increased after the Mock Interview Session, supporting the continued efforts of our PRN in providing this session.

33. Facetime faceoff: evaluation of video conferencing as a novel pre-interview screen for a PGY-1 pharmacy residency Mary Staicu, Pharm.D., *Christine A. Hamby, Pharm.D.*, Maura Wychowski, Pharm.D., BCPS, Bob Reiss, Pharm.D., MPA; Department of Pharmacy, Rochester General Hospital, Rochester, NY
PURPOSE: To describe the utility of video conferencing as a pre-onsite interview screen for PGY-1 residency program applicants.
METHODS: We report our experience utilizing video conferencing as a supplemental approach to conventional interview processes for applicants of the 2015 PGY-1 pharmacy residency match. All applicants were eligible for inclusion. An interview team, consisting of the residency director, coordinator, and a preceptor, reviewed application materials using an internally developed scoring tool. High scoring applicants were invited for a 15-minutes video conference conducted by the interview team. The video conference utilized a standard format which included five behavioral-based interview questions and allowed the opportunity for the applicant to ask questions in return.

RESULTS: A total of 34 applications were received of which 23 (68%) were invited for a video conference. All applicants had access to Skype or FaceTime. Unsuccessful video conference connections were observed in 5 interviews (22%) but were replaced by a telephone interview with the same questions during the same time slot. The average time spent conducting the pre-screen was 13.5 minutes (±SD of 2.64). Of the 23 applicants that participated, 13 (57%) were further invited for an on-site interview. One applicant well-known to the department bypassed video conferencing and was directly invited for an on-site interview.
CONCLUSION: Video conferencing is an innovative and efficient method to screen residency applicants prior to scheduling an on-site interview. This process requires minimal time investment and allows the interview team to gauge factors that cannot be evaluated from a written application. Additionally, video conferencing excluded over 40% of high scoring applicants which reduces both applicant and institutional loss of productivity and applicant travel expenses, while improving the selection of candidates best matched for the residency program.

34. Impact of physicians education on prescribing errors within an inpatient setting *Hassan Mitwally, B.Sc.Pharm., BCPS*[1], Tarek Ibrahim, B.Pharm., M.Clin.Pharm.[1], Asmaa Fayez, B.Sc.Pharm.[2]; (1) Clinical Pharmacy, Al-Wakra Hospital: Hamad Medical Corporation, Al-Wakra, Qatar (2) Inpatient Pharmacy, Al-Wakra Hospital: Hamad Medical Corporation, Al-Wakra, Qatar
PURPOSE: Medication errors are known to increase morbidity, mortality and both hospital cost and stay within the inpatient settings. Prescribing errors are the most important source of medication errors. Prescribing error rates vary widely ranging from 0.3% to 39% of medication orders. In our study, we investigate whether physician education had an impact on reducing prescribing errors within our inpatient setting.
METHODS: The clinical pharmacy team prepared educational sessions discussing prescribing errors. The educational material included real case scenarios as well as Hamad Medical Corporation (HMC) prescribing policies. The sessions were conducted during the weekly meeting for each department. Physicians who were unable to attend were provided with one to one education. Random prescriptions were collected for 1 week both prior and after the educational phase for prescribing errors. A prescribing error was considered if the dose, route of administration or frequency was incorrect. The use of unapproved abbreviations, trade names and the absence/incorrect patient label was also considered as a prescribing error. The Chi-square test was used to check for association between prescribing errors, inpatient wards and physician hierarchy.
RESULTS: A total of 1822 prescriptions were involved in the study, with 948 in the pre sample and 874 in the post sample. The total number of errors within the pre sample was 197 (20.8%) in comparison to 87 (9.954%) errors for the post sample, an overall reduction of 52% in prescribing errors ($p < 0.001$). The overall physician attendance was 92 from a total of 102 (90.196%).
CONCLUSION: The structured educational program conducted by the clinical pharmacy team was effective and statistically significant in reducing prescribing errors within our inpatient setting.

35. Pharmacy student perceptions of Socratic questioning in a women's health elective *Erin Raney, Pharm.D.*; Department of Pharmacy Practice, Midwestern University College of Pharmacy-Glendale, Glendale, AZ
PURPOSE: The Socratic Method incorporates sequential, purposeful questioning to enhance critical thinking skills in various educational settings. This study evaluated pharmacy students' perceptions of its use in a women's health elective.
METHODS: Instructor-led Socratic questioning was utilized during each large group discussion session in a postmenopausal women's health elective. At the completion of the 2014 offering, all enrolled students were asked to voluntarily participate in an anonymous written survey. A four-point Likert scale assessed students' perceptions of the benefits of the technique on their learning, their level of comfort and confidence with the technique, and whether it should be incorporated into other coursework. Additional open-response questions assessed what was liked most and least about the technique. The results were analyzed in aggregate using descriptive statistics.
RESULTS: The response rate was 73.8% (31/42 enrolled students). All respondents either "agreed" or "strongly agreed" that the technique was valuable and helped them maintain attention in class, improved clinical reasoning skills, and developed skills for future clinical rotations. The majority agreed that the technique should be used in additional core and elective courses (61.3% and 83.9%, respectively). More students "agreed" or "strongly agreed" that they were confident in participating in Socratic questioning at the completion of the course compared to prior to the course (96.8% and 51.7%, respectively). The most common element liked "least" about the method (9/15 responses) was anxiety regarding answering questions in front of peers. However, the majority (90.3%) indicated they were comfortable participating in the process.
CONCLUSION: Student participants in Socratic questioning in a women's health elective perceived that it was beneficial to their learning. These results offer insight for faculty considering the use of this teaching technique.

36. Impact of research mentors' publication record on resident research publication *Scott Vouri, Pharm.D., BCPS, CGP*[1], Paul Stranges, Pharm.D., BCPS, BCACP[2]; (1) Department of Pharmacy Practice, St. Louis College of Pharmacy, St. Louis, MO (2) University of Illinois at Chicago
PURPOSE: To further explore influences that impact the publication of a pharmacy residency project
METHODS: Previously, we identified that the publication rate after presentation at the Great Lakes Pharmacy Residency Conference (GLPRC) in 2003, 2005, and 2007 was 11.4% (n = 76). University-affiliated residencies strongly predicted publication of a residency project. To further explore other associations, we analyzed published and unpublished research identified in our previous research, matched 1:1, based on state and abstract year. We identified the H-Index, a measure of productivity and impact of published work, and degree (e.g, PharmD, MD, PhD) for each co-investigator on the GLPRC abstract using Scopus®. We used chi-square analysis and Mann-Whitney U tests to describe baseline characteristics. Next, we performed univariate and multivariate analyses to identify variables associated with resident publication. H-Index was investigated as continuous and dichotomous (0 or 1 or more), as well as with and without physician contribution.
RESULTS: Based on the univariate analyses, university-affiliated programs ($p = 0.015$), highest H-Index of non-physician co-investigators ($p = 0.002$), and positive H-Index (1 or more) of non-physician co-investigators ($p = 0.017$) were significant. There were no differences in projects with physician co-investigators ($p = 1.00$) or the number of co-investigators ($p = 0.051$) between published and unpublished projects. Variables with p values <0.2 were entered into the multivariate analysis. University affiliation and number of co-investigators were not significant. The highest H-index of non-physician co-investigator remained significant [OR 1.09 (1.01–1.17)], while an H-Index of 1 or more [OR 1.74 (0.74–4.07)] was no longer significant.
CONCLUSION: Based on our findings, we discovered that an increasing H-Index of non-physician co-investigators is associated with the publication of residency projects while simply being published (H-Index of 1 or more) is not associated. More emphasis should be placed on research metrics from the standpoints of both residency program directors and residents.

37. The impact of resident research publication on early-career publication success *Paul Stranges, Pharm.D., BCPS, BCACP*[1], Scott Vouri, Pharm,D., BCPS, CGP[2]; (1) University of Illinois at Chicago (2) Department of Pharmacy Practice, St. Louis College of Pharmacy, St. Louis, MO

PURPOSE: To assess the influence of publishing a resident research project on subsequent publications.

METHODS: Previously, we identified that resident research publication rate after presentation at the Great Lakes Pharmacy Residency Conference in 2003, 2005, and 2007 was 11.4% (n = 76). To assess whether publication experience during residency increases publication rate post-residency, we analyzed published and unpublished research identified in our previous analysis, matched 1:1, based on state and abstract year. Our primary outcome was subsequent publication by the resident within 5 years of abstract presentation. Subsequent publications were identified using Scopus®. For each abstract, we identified number of co-investigators, H-Index (a measure of productivity and impact of published work) and degrees (e.g, PharmD, MD, PhD) of co-investigators, and university-affiliated residencies as potential predictors for subsequent publication. We performed univariate and multivariate analyses to identify predictors of resident publication.

RESULTS: Of the residents who published research projects, 50% (n = 38) had a subsequent publication compared to 22.4% (n = 17) who did not publish resident research projects. Univariate analyses revealed that published residency research projects ($p < 0.001$), university-affiliated residencies ($p = 0.001$), highest H-Index of non-physician co-investigators ($p = 0.035$), and positive H-Index (1 or more) of non-physician co-investigators ($p = 0.001$) were significant. No differences were found with physician co-investigators ($p = 0.316$) or increasing number of co-investigators ($p = 0.442$) on subsequent publications. Variables with p-values <0.2 were entered into the multivariate analysis, which found published residency research projects [OR 2.86 (1.31–6.25)] and completing a university-affiliated residency [OR 6.72 (2.93–15.42)] remained predictors of subsequent publications. In a sensitivity analysis of residents with subsequent publications, 74.5% were published with post-residency academic affiliations.

CONCLUSION: Publishing a resident research project and having a university-affiliated residency is associated with subsequent publications. A majority of pharmacy residents with subsequent publications work in an academic setting, which may confound these individuals towards publication regardless of publishing resident research.

38. Documentation of clinical interventions during APPEs by students who accept residencies after graduation *Miranda R. Andrus, Pharm.D., BCPS, FCCP*, Lea Eiland, Pharm.D., BCPS, FASHP, T. Lynn Stevenson, Pharm.D., BCPS; Department of Pharmacy Practice, Auburn University Harrison School of Pharmacy, Auburn, AL

PURPOSE: All fourth year student pharmacists (P4s) are required to document patient care interventions during their advance pharmacy practice experiences (APPEs) in a single, commercially-available, web-based documentation system. The purpose of this study was to determine (1) if students who committed to residencies after graduation documented more clinical interventions during APPEs than those who did not enter residency programs, (2) if graduates who complete residencies are using clinical documentation systems in their current places of employment, and 3) if residency trained graduates consider the educational experience of documenting interventions during APPEs valuable.

METHODS: Reports of clinical interventions documented by P4s for May 2011-April 2014 were analyzed, and the number of interventions documented by students who entered a residency after graduation was compared to those who did not enter a residency. Graduates from the classes of 2012 to 2014 were surveyed about their use of clinical intervention systems within their current place of employment.

RESULTS: Interventions from 422 students were analyzed. Students who committed to a residency after graduation (n = 90) documented more interventions than other students (mean number of interventions = 520 vs 400, $p = 0.003$). Of the 95 graduates who completed the survey, 37 were completing or had completed a residency (41%). Of the graduates that were residency trained, 78% (n = 29) were currently using a clinical intervention documentation system at their place of employment, and 78% (n = 29) felt that their experiences documenting clinical interventions during APPEs were valuable for their future careers. All residency trained graduates (100%) stated that documentation of interventions is "somewhat important" or "very important" for pharmacists.

CONCLUSION: Students entering residencies after graduation document more clinical interventions than other students during APPEs. Intervention documentation is an important part of the educational experience for students entering residencies, as the majority will use clinical documentation systems in their future places of employment.

39. Combination of a flipped classroom and a virtual patient case to enhance active learning in the classroom *Alicia Lichvar, Pharm.D.*[1], Ashley Hedges, Pharm.D.[2], Neal Benedict, Pharm.D.[3], Amy C. Donihi, Pharm.D.[3]; (1) Department of Pharmacy and Therapeutics, University of Pittsburgh Medical Center, Pittsburgh, PA (2) VA Pittsburgh Healthcare System, US Department of Veterans Affairs, Pittsburgh, PA (3) Department of Pharmacy and Therapeutics, University of Pittsburgh School of Pharmacy, Pittsburgh, PA

PURPOSE: The goal of this combined pedagogical strategy was to promote active, self-directed learning and to enhance learning of course objectives within the complications of liver diseases module of Gastroenterology and Nutrition, a required course in the second professional year of the PharmD curriculum.

METHODS: A branched-narrative virtual patient case was incorporated into an advanced therapeutics course already utilizing a flipped classroom with pre-class video lectures and in-class case-based activities. Pre- and post-tests flanking the in-class virtual patient case were administered to students. These assessments were not identical, but similar in content and difficulty level. Examination scores were compared to a historic control from the previous year. Questions in both assessments were compared across low-level (knowledge, comprehension) and high-level (application, analysis, synthesis) Bloom's Taxonomy domains. After the examination, students also completed a quantitative survey to assess the effectiveness of the virtual patient case and learning preferences.

RESULTS: A total of 109 students completed the combined learning strategy in 2014. Students' median post-test scores were higher compared to pre-test questions after completing the virtual patient case (33% vs 50%, $p = 0.01$). Median examination scores were significantly higher compared to the historical control (70% vs 80%, $p = 0.025$). Students answered significantly more high-level learning questions correctly in the examination compared to students in the historic control (66.67% vs 83.33% $p = 0.003$). A majority of students (67.5%) agreed that the virtual patient helped them understand and apply the topics covered in the video lecture. Thirty-three percent of students preferred this strategy to usual in-class activities, while 37% indicated both approaches were equally effective.

CONCLUSION: The combination of a pre-class video lecture with an in-class virtual patient case effectively promoted active, self-directed learning. Additionally, learners were receptive to this combined instructional design.

40. Pharmacy residency school-wide match rates and modifiable predictors *Katherine Smith, Pharm.D., BCPS*[1], Alana Whittaker, Pharm.D., BCPS[2], Heather Reddemann, Pharm.D. Candidate[3]; (1) Roseman University of Health Sciences College of Pharmacy, South Jordan, UT (2) College of Pharmacy, Roseman University of Health Sciences, Henderson, NV (3) College of Pharmacy, Roseman University of Health Sciences, South Jordan, UT

PURPOSE: Previous research has been published on correlations between school-wide residency match rates and non-modifiable factors. The objective of this research was to assess additional school characteristics as predictors of school-wide match rates.
METHODS: School characteristics and match rate data were collected from pharmacy associations, accrediting bodies, regulatory organizations and college of pharmacy websites for the years 2013 and 2014. A multiple regression model was developed to predict the residency match rate using several variables: licensing exam pass rates, history of Accreditation Council for Pharmacy Education (ACPE) probation, availability of clinical or post-graduate training tracks, availability of dual degrees, student-driven research projects, affiliations with residency programs, program length, length of accreditation, National Institutes of Health funding, academic health center affiliation, and institution type.
RESULTS: The fit of the model was good and was able to explain 58.3% of the variance using these factors. The regression results demonstrated that the significant predictors of residency match rates were North American Pharmacist Licensure Exam (NAPLEX) averages, ACPE probationary status, and program length. The average score on the NAPLEX positively predicted the school's match rate (ß = 0.35, p = 0.001) while probation history was a negative predictor (ß = −0.238, p = 0.006). A 3-year program length predicted a lower match rate (ß = −0.204, p = 0.02) compared to longer programs. The Pearson's correlation between the NAPLEX averages and the matching rate was also statistically significant at 0.512 (p = 0.000).
CONCLUSIONS: Factors which would seem to help prepare students for residency such as research and availability of focused clinical pharmacy training did not correlate with school-wide match rates. Alternatively, residency match rates were influenced by publicly available measures of composite student success. Doctor of pharmacy programs may wish to consider the impact of these factors on future student residency opportunities.

41. Assessment of burnout among pharmacy practice faculty *Shareen El-Ibiary, Pharm.D., FCCP, BCPS*[1], Lily Yam, Pharm.D. Candidate 2015[2], Kelly Lee, Pharm.D., MAS, BCPP, FCCP[3]; (1) Pharmacy Practice, Midwestern University College of Pharmacy-Glendale, Glendale, AZ (2) Midwestern University College of Pharmacy-Glendale, Glendale, AZ (3) Skaggs School of Pharmacy and Pharmaceutical Sciences, University of California San Diego, La Jolla, CA
PURPOSE: Burnout is a syndrome of emotional depletion and maladaptive detachment that develops in response to prolonged occupational stress. The Maslach Burnout Inventory-Educators Survey (MBI-ES) measures three dimensions of burnout: emotional exhaustion, depersonalization, and feelings of inefficacy or personal accomplishment. Studies have measured burnout in healthcare professionals and educators; however, no study has evaluated burnout within pharmacy practice faculty. This study aimed to measure the level of burnout, if any, among pharmacy practice faculty within U.S. Colleges/Schools of Pharmacy and to identify any possible factors associated with burnout.
METHODS: Using a cross-sectional-anonymous survey design, we measured burnout in faculty from U.S. Colleges/Schools of Pharmacy using the MBI-ES, distributed by Mindgarden, Inc. Subjects were recruited using the current AACP roster of Pharmacy Practice Faculty. Subjects (n = 2318) were emailed a link to the MBI-ES with supplemental demographic questions. Completion of the survey served as consent. De-identified data was collected via Qualtrics® software and analyzed with IBM SPSS software®. The study was approved by the Midwestern University Institutional Review Board.
RESULTS: Response rate was 32.8% (n = 760). A high level of emotional exhaustion was identified in 40% of participants. Faculty with clinical practice sites or who worked more than 40 hours per week had higher levels of emotional exhaustion. Faculty working in newer Colleges/Schools of Pharmacy were found to have higher levels of emotional exhaustion and depersonalization. In comparison groups, emotional exhaustion was found to be higher in women ($p < 0.001$), in assistant professors ($p = 0.009$), and in those with a mentor ($p = 0.006$). Having children ages 1–12 years and a hobby were associated with higher levels of personal accomplishment ($p < 0.001$, $p = 0.002$, respectively).
CONCLUSIONS: Pharmacy practice faculty within U.S Colleges/Schools of Pharmacy are suffering from burnout, exhibited mainly through emotional exhaustion. Programs and resources are needed to reduce or prevent burnout among faculty, especially in high-risk groups.

42. Implementation and outcomes from an interprofessional simulated patient care experience on end-of-life care and attitudes toward death *Drayton Hammond, Pharm.D., MBA, BCPS*[1], Catherine Renna, Pharm.D. Candidate[2], Ashley Wilson, Pharm.D., BCPS[1], Jacob Painter, Pharm.D., Ph.D., MBA[3], Kendrea Jones, Pharm.D., BCPS[1]; (1) Department of Pharmacy Practice, University of Arkansas for Medical Sciences, Little Rock, AR (2) University of Arkansas for Medical Sciences, Little Rock, AR (3) Division of Pharmaceutical Evaluation and Policy, University of Arkansas for Medical Sciences, Little Rock, AR
PURPOSE: The Accreditation Council on Pharmaceutical Education requires that interprofessional (IP) educational opportunities that allow for collaboration between healthcare disciplines be incorporated into didactic curricula. Simulated patient care experiences (SPCEs) provide an avenue for encouraging problem-solving and critical-thinking on an IP team. This study describes the implementation of an IP SPCE on end-of-life (EOL) care and students' attitudes toward death (ATD).
METHODS: Third-year pharmacy students enrolled in a critical care elective received a lecture on EOL care topics by members of palliative care and ethics teams the week before completing a two-part EOL SPCE in a high-fidelity simulation center. Pharmacy, medical and respiratory care students completed the validated, 12-item ATD survey before and after SPCE participation. Pharmacy students completed written reflection papers after SPCE participation. Quantitative data were analyzed with descriptive statistics, Wilcoxon signed-rank test and McNemar's test. Two investigators independently used the cutting and sorting technique to analyze the reflection papers qualitatively. The institutional review board determined this research to be exempt.
RESULTS: Fifteen students completed pre- and post-ATD surveys. After the EOL SPCE, pharmacy students demonstrated a significant change in attitudes for 3 out of 10 statements related to EOL care ($p < 0.05$). Eight themes were identified regarding EOL care, including a change in the students' views on EOL care and the need to involve the family in the decision-making process as much as possible. There was an increase in the perception that "communication with family" is one of the top three most important problems in caring for a dying patient ($p = 0.07$).
CONCLUSION: Lectures on EOL care topics by content experts and implementation of a high-fidelity IP SPCE led to a change in students' views on EOL care. After the SPCE, students felt more comfortable talking to families about death and involving the family in the decision-making process.

43. Team-based chronic disease management: An interprofessional experience in diabetes for pharmacy and medicine students *Michele Pisano, Pharm.D., CGP*[1], Nissa Mazzola, Pharm.D., CDE[1], Lauren Block, M.D., MPH[2], Danielle Ezzo, Pharm.D., BCPS[1], Celia Lu, Pharm.D., BCACP[1]; (1) Department of Clinical Health Professions, St. John's University College of Pharmacy and Health Sciences, Queens, NY (2) Hofstra North Shore-LIJ School of Medicine, Hempstead, NY
PURPOSE: The 2016 draft standards of the Accreditation Council for Pharmacy Education state that the curriculum must include opportunities for interprofessional education (IPE). An existing course at a medical school was modified to include inter-

professional activities with pharmacy and medicine students to improve the ability to work collaboratively.
METHODS: The chronic disease management course was identified as the course to include IPE. One class session was designed to highlight the advantages of team-based care in diabetes management and recognize the roles of various members of the interprofessional healthcare team. The session started with a panel discussion consisting of diabetic educators, nutritionists, and a patient. Students were then divided into groups for case discussion and diabetic device counseling. All students present were surveyed pre- and post- the IPE experience to examine their attitudes towards interprofessional learning, utilizing the validated Readiness for Interprofessional Learning Scale (RIPLS) Questionnaire.
RESULTS: Of 125 students surveyed (100 medicine, 25 pharmacy), 90 surveys (71 medicine, 19 pharmacy) were completed (response rate 72%). Twenty one percent of students reported having previous experience with interprofessional learning. Post-experience, 89% of students agreed or strongly agreed that their "ability to understand clinical problems will increase with shared learning," compared to 47% pre-experience. Results post-experience also showed more students disagreeing with the statement "I don't want to waste my time learning with other health care students" (91% vs 61%). The percentage of students' undecided pre-experience about the impact of shared learning in improving patient care greatly decreased post-experience (20% vs 0.04%).
CONCLUSION: Overall, results showed this IPE experience had a positive impact on student perceptions of the value of the interdisciplinary team and its role in patient care.

44. A renal replacement therapy simulation to strengthen essential pharmacist skills *Aimon C. Miranda, Pharm.D., BCPS*[1], Erini Serag-Bolos, Pharm.D.[1], Shyam R. Gelot, Pharm.D., BCPS[2]; (1) Pharmacotherapeutics and Clinical Research, University of South Florida College of Pharmacy, Tampa, FL (2) Doctors Hospital of Sarasota, Sarasota, FL
PURPOSE: The purpose of this simulation activity was to strengthen students' professional communication, informatics skills, ability to provide care for special populations, and drug information and literature evaluation skills, all of which are essential components deemed by the Accreditation Council for Pharmacy Education (ACPE). This renal replacement therapy (RRT) simulation allowed for application and augmentation of didactic material learned during their Pharmacotherapeutics I and Clinical Pharmacokinetics and Pharmacodynamics course. The objectives were to utilize an electronic medical record (EMR) to develop a SBAR (Situation, Background, Assessment, Recommendation) note, utilize appropriate resources to verify medication orders for a chronic kidney disease (CKD) patient, and verbally respond to drug information questions.
METHODS: The activity consisted of a didactic component discussing RRT modalities, a pre- and post-assessment, a simulation, and a debrief session. Fifty third-year pharmacy students worked in groups of five and rotated through four stations. The first station included a drug information question, verification of an electronic peritoneal dialysis (PD) order, and verification of the bag. The second station involved students conducting a literature search to renally adjust three medications for continuous renal replacement therapy (CRRT). The last station entailed a verbal presentation of a complex patient case newly initiated hemodialysis utilizing an EMR to locate pertinent information. The pre- and post-assessment consisted of five clinical questions related to RRT.
RESULTS: Forty-seven students completed the pre-assessment and fifty students completed the post-assessment. Average time to complete the assessment, respectively, was 7 versus 5 minutes. Mean score was 4.64 (±SD 1.6) versus 7.65 (±SD 1.32) out of 10. The average number of questions correct was 1.69 versus 3.61.
CONCLUSION: The simulation increased students' knowledge about RRT modalities and exposed students to various pharmacist roles and considerations in caring for patients with CKD. Future modifications to this activity include an addition of an interprofessional component.

45. Evaluation of an interprofessional workshop on medication error prevention: building teamwork in healthcare *Nirav Haribhakti, Pharm.D. Candidate*, Rolee Pathak, Pharm.D., BCPS, Mary Bridgeman, Pharm.D., BCPS, CGP, Marc Sturgill, Pharm.D.; Ernest Mario School of Pharmacy, Rutgers, The State University of New Jersey, Piscataway, NJ
PURPOSE: To foster team-based patient care, student pharmacists, physicians, and physician assistants participated in an interprofessional medication error prevention workshop. Participants' perceptions of the role of teams in preventing errors were evaluated before and after program participation.
METHODS: A three-hour workshop was developed to address medication error contributing factors and analysis methods. Interprofessional teams were tasked with evaluation of medication error cases resulting in patient harm. Fourth professional year pharmacy, third year medical, and physician assistants students participated. Pre- and post-activity surveys were developed utilizing the validated Attitudes Towards Health Care Teams Scale and distributed through a secure electronic platform. Institutional Review Board approval was obtained prior to survey distribution.
RESULTS: Two hundred twelve pharmacy, 151 medical, and 47 physician assistant students participated in the program. Forty-nine students (12%) completed both pre- and post-surveys, with no significant differences seen in median responses to each of the seventeen survey items. Although statistically significant changes were not observed, attitudinal changes were identified on several items, including whether patients would be treated as whole persons with team-based care and whether the give-and-take among team members helps make better patient care decisions, where the median response changed from "agree" to "strongly agree" after program participation. Similarly, in the item regarding the physician having ultimate legal responsibility for decisions made by the team, the median response changed from "neutral" prior to the program to "disagree" afterwards.
CONCLUSION: This survey failed to demonstrate a significant overall impact of workshop participation on student attitudes towards working in health care teams to prevent medication errors. Changes in median responses were seen, demonstrating the potential for this activity to impact the perceptions of students of various disciplines. The low response rate of surveys returned may have limited the ability to capture significance in attitudinal change attributed to this activity.

46. Provider perceptions regarding the impact of hypoglycemia on insulin therapy: a field medical team based survey *Diana Noller, RN, CDE*, Bethany Fedutes Henderson, Pharm.D., Rita Lakamp, Pharm.D., BCPS, Knikki Pendleton, Pharm.D., Henry Anhalt, D.O., Mahmood Kazemi, M.D., Sharon Levesque, MBA; US Medical Affairs, Sanofi US, Bridgewater, NJ
PURPOSE: Despite improvements in insulin therapy, patients are reluctant to inject themselves at least in part due to fear of hypoglycemia. Providers cite this as a reason to delay initiation or intensify therapy. A proactive, educational survey for Healthcare providers (HCPs) to assess their understanding of patient behavior and their own perceptions was derived from the Global Attitudes of Physicians and Patients (GAPP™) study. The GAPP study was designed to evaluate patient and physician opinions regarding insulin therapy.[1] The HCP responses to the survey were compared to the results in the GAPP study.
METHODS: Surveys were conducted by a Sanofi Diabetes Regional Medical Liaison (RML) during face-to-face interactions with HCPs utilizing Survey Monkey® via an iPAD.
RESULTS: A total of 855 surveys were conducted over a 1 year period (2014). When asked how frequently their patients missed

or omitted an insulin dose monthly, only 30% of HCPs provided an answer consistent with the GAPP study (3 days) whereas 45% thought 5–7 days was the appropriate response. Frequency of SMBG (36%) was the most common response for non-adherence and was not consistent with the GAPP study which was fear of hypoglycemia (31%). When asked what percentage of physicians are less aggressive therapeutically because of hypoglycemia, they answered 30%; however, the GAPP study reported as many as 70%. The majority of HCPs surveyed correctly identified that up to 80% of patients wish insulin regimens would be more flexible to accommodate changes in their daily lives.
CONCLUSION: For the HCPs that were surveyed, understanding the impact hypoglycemia has on patient and physician behavior was discordant from the findings of the GAPP study. These data demonstrate knowledge gaps exist among HCPs and provide an opportunity for education by the field medical team. Discussion of this survey provides a novel field medical approach to increase HCP awareness of patient and provider perceptions of hypoglycemia and the challenges patients confront on current insulin therapies.[1]Peyrot M, et al. Diab Obes Metab.2012:14:1081–87.

47. The perceived importance of clinical research skills: A needs assessment to inform the development of a clinical research methods elective for PharmD students *Heather Anderson, Ph.D.*[1], Joseph Saseen, Pharm.D.[2]; (1) Department of Clinical Pharmacy, University of Colorado Denver Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO (2) Department of Clinical Pharmacy, University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO
PURPOSE: Assess the perceptions of clinical research skills according to PharmD students, PGY1 residents, and residency directors.
METHODS: Online surveys were administered in the spring of 2014 to 4th year PharmD students at the University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences (SSPPS), PGY1 residents (including those in Colorado and 2013 SSPPS graduates), and all PGY1 and PGY2 residency directors from accredited programs. Due to increasing competition for residency positions, surveys were framed around obtaining and/or completing a residency. Respondents ranked clinical research experience compared to other characteristics (e.g., communication, leadership), and ranked specific research skills compared to each other.
RESULTS: Respondents included 255 PGY1 residency directors, 155 PGY2 residency directors, 35 PGY1 residents, and 87 P4 students. Response rates ranged from 26% (directors) to 58% (residents). Directors and residents ranked research experience lowest among other characteristics (communication was ranked highest); P4 students ranked research experience higher (mean rank = 7 out of 10). Writing a research question, analyzing data, and interpreting results were ranked as most important. All respondents indicated a lack of education in writing a research paper.
CONCLUSION: Despite recognition of the importance of research in clinical pharmacy by professional pharmacy organizations, the overall perceived importance in the context of residency training is low. Educational opportunities that emphasize data analysis and interpreting and presenting results were perceived as needed and should therefore be offered in PharmD programs for students planning to pursue a research-related career. A clinical research methods elective is now offered to P2 PharmD students at SSPPS.

Emergency Medicine

48. A national survey of emergency pharmacy practice *Michael C. Thomas, Pharm.D.*[1], Nicole M. Acquisto, Pharm.D., BCPS[2], Mary Beth Shirk, Pharm.D.[3], Asad E. Patanwala, Pharm.D.[4]; (1) College of Pharmacy, Western New England University, Springfield, MA (2) Department of Pharmacy, University of Rochester Medicine, Rochester, NY (3) Wexner Medical Center, The Ohio State University, Columbus, OH (4) Pharmacy Practice and Science, The University of Arizona College of Pharmacy, Tucson, AZ
PURPOSE: An increasing number of pharmacists are practicing in emergency departments (EDs). However, pharmacist activities and staffing models in EDs have not been described for several years. The objective of this study was to characterize pharmacy practice in EDs in the United States.
METHODS: An electronic survey was developed through consensus-based process by four investigators with experience in emergency pharmacy practice. The survey was disseminated using the ACCP Emergency Medicine Practice and Research Network and the ASHP Emergency Medicine Connect group. It was available for 30 days. We estimate 356 unique emergency pharmacists were surveyed. Duplicate responses from the same institution were eliminated. Descriptive analyses were used for all variables.
RESULTS: Two hundred thirty three surveys were partially or completely filled out (response rate 65%). After removing duplicate responses and null records, 187 surveys were included. The majority of respondents were from community (60.4%) or academic EDs (35.4%). The median number of full time equivalent pharmacists per ED was 2 (IQR 1 to 2.5). On weekdays the duration of pharmacist coverage was 1 to 8 hours (31.6%), 9 to 16 hours (44.6%), and 17 to 24 hours (23.8%). Approximately a third of institutions (35.2%) did not provide any weekend staffing. The most frequent time period of pharmacist coverage was 1 pm to midnight. The median (IQR) percentage of pharmacist time spent in various activities was clinical 25% (15–40%), emergency response 15% (10–20%), order processing 15% (5–25%), medication reconciliation 10% (5–25%), teaching 10% (5–15%), administrative 5% (0–10%), and scholarly endeavors 0% (0–5%). Ninety-two percent of positions were fully funded by the pharmacy department and 3% were fully funded by colleges of pharmacy.
CONCLUSION: Institutions with emergency pharmacy programs have multiple pharmacists practicing in the ED and most have daily coverage that exceeds 8 hours. Activities of the pharmacist vary greatly between institutions.

49. Management of acute abdominal pain in the emergency department *James Priano, Pharm.D.*[1], Brian Faley, Pharm.D.[1], Gabrielle Procopio, Pharm.D.[1], Joseph Feldman, M.D.[2], Kevin Hewitt, M.D.[2]; (1) Ernest Mario School of Pharmacy, Rutgers, The State University of New Jersey, Piscataway, NJ (2) Department of Emergency Medicine, Hackensack University Medical Center, Hackensack, NJ
PURPOSE: Acute abdominal pain is one of the most common reasons for patients to visit the emergency department (ED). The utility of providing multimodal analgesia for acute abdominal pain in the ED is not well understood. The primary objective is to analyze ED provider ordering habits for adjunct non-opioid pain medication for opioid-naïve patients who require intravenous (IV) morphine or hydromorphone for acute abdominal pain. Secondary objectives are to assess pain scores, time to opioid rescue dose, total opioid consumption in morphine equivalent units (MEUs), and ED length of stay (LOS) between groups.
METHODS: A retrospective chart review of opioid-naïve adult patients who presented to the emergency department at a large academic medical center with a chief complaint of abdominal pain and received IV morphine or hydromorphone for acute pain was conducted.
RESULTS: Adjunctive non-opioid analgesics were ordered on 19% and 38% of patients who initially received IV hydromorphone or IV morphine, respectively. Patients who initially received IV hydromorphone received more opioid compared to patients who initially received IV morphine (7.56 vs 4.15 MEUs, $p < 0.0001$). Patients who received an adjunct non-opioid analgesic received a smaller initial opioid dose than those who did not receive an adjunct non-opioid analgesic (4.69 vs 6.52 MEUs, $p = 0.006$). Initial pain score reduction on the Numeric Rating Scale (NRS) did not differ between patients who initially received IV hydromorphone vs IV morphine (3.86 vs 3.29, $p = 0.645$).

CONCLUSION: A small proportion of patients with acute abdominal pain receive a non-opioid analgesic in conjunction to IV opioids. The available data suggests that the use of non-opioid analgesics may allow for the use of lower initial opioid doses whilst maintaining efficacy. Further studies are warranted to assess the potential impact of adjunct medications of patients with acute abdominal pain in the emergency department.

50. Using a cloud-based platform to identify discrepancies during medication reconciliation in a community hospital emergency department *Eric La, Pharm.D.*, Sanu Koshy-Varghese, Pharm.D., Agnieszka Pasternak, Pharm.D., MBA, CNSC, BCPS; Department of Pharmacy, Huntington Hospital, Huntington, NY

PURPOSE: MedHx (version ACMEDHX TOUA 1.0; DrFirst®, Rockville, MD) is a cloud-based platform that delivers access to comprehensive, patient-specific medication history information, including medication claims and pharmacy fill data. This study looked at the number of discrepancies identified during admission medication reconciliation while using the MedHx database. The results of this study will be used to provide direction for potential areas of emphasis and improvement during medication reconciliation.

METHODS: Admission medication reconciliation was performed on a total of 264 patients in the emergency department between September 8 and October 6, 2014. Patient interviews at the bedside were initially conducted with available resources, such as a medication list from an existing electronic medical record or a patient's personal medication list. Medication claims and pharmacy fill data produced by MedHx's database were used at the conclusion of the interview in order to identify discrepancies specifically captured by MedHx.

RESULTS: Out of 203 patients that were included in our final data analysis, a total of 449 medication-related discrepancies were identified among 148 patients (73%) while using MedHx. The discrepancies identified fell into five different categories, including: medication not listed on MedHx database (33.9%), patient forgot to mention medication (29.6%), patient could not recall medication dose or provided an inaccurate dose (24.5%), patient could not remember the name of medication (10.7%), and patient could not remember the frequency of medication administration (1.3%). Out of all 449 medication-related discrepancies, 34 (7.6%) discrepancies involved high alert medications, which included opioids, anticoagulants, and insulin.

CONCLUSION: MedHx is a valuable medication history tool and addition to the admission medication reconciliation process. One limitation of the cloud-based platform was that certain pharmacies were not captured by MedHx's database. However, its ability to provide available patient-specific pharmacy fill data improved the accuracy and quality of medication reconciliation at our institution.

Endocrinology

51. Glycemic outcome in patients with Type 2 diabetes mellitus receiving insulin via pens versus vials and syringes in an integrated health care delivery system Rita Hui, Pharm.D., M.S.[1], Yunwen Chiu, Pharm.D.[2], *Iris Young, Pharm.D.*[3]; (1) Pharmacy Outcomes Research Group, Kaiser Permanente, Oakland, CA (2) PriMed Management Consulting Services, Hill Physicians Medical Group, San Ramon, CA (3) Pharmacy Drug Use Management, Kaiser Permanente, Northern California, Oakland, CA

BACKGROUND: Published trials comparing insulin pen versus vials have largely focused on adherence, cost and hypoglycemia rate using selected insulin regimens.

PURPOSE: This study compares the rate of attaining therapeutic goal with insulin pen versus vial in a real world setting.

METHODS: We performed an observational non-inferiority study to compare the outcomes of adult Type 2 diabetic subjects who initiated on basal insulin using either a vial or pen within an integrated healthcare delivery system. Subjects remained on the same insulin delivery device and regimen throughout the twelve-month observation period. The primary outcome was the odds of achieving a hemoglobin A1c (HbA1c) at therapeutic goal (<7% for age <65 and <8% for age ≥ 65). Secondary outcomes included changes in HbA1c, and rates of hypoglycemia resulting in hospital admission or emergency room (ER) visits. This study received IRB approval.

RESULTS: We identified 20,533 subjects initiated on basal insulin by pen or vial, of whom 614 were pen users. The reduction in HbA1c was higher for vial users ($-0.20 \pm 0.06\%$, $p = 0.001$), although there was no significant difference in the odds of achieving therapeutic level of HbA1c (adjusted odds ratio, OR = 1.20, 95% confidence interval, CI = 0.99–1.45 $p = 0.060$). No significant differences in the rate of hypoglycemia requiring hospitalization or ER visit were seen between the 2 groups.

CONCLUSIONS: The type of insulin delivery device does not appear to be associated with any differences in measured quality outcomes after 1 year when individuals with Type 2 diabetes initiate basal insulin in an integrated healthcare delivery system.

52. Emotional distress in relation to treatment satisfaction and glycemic control among patients with uncontrolled Type 2 diabetes Melanie Siaw, B.Sc.(Pharm), *Joyce Lee, Pharm.D., BCPS, BCACP*; Department of Pharmacy, Faculty of Science, National University of Singapore, Singapore

PURPOSE: Efforts to attain glycemic control can be challenging and demanding, leading to increased emotional distress. Although various factors have been examined in relation to diabetes distress, evidence linking emotional distress with diabetes treatment satisfaction is limited. In this study, we aimed to examine the association of emotional distress with treatment satisfaction and glycemic control.

METHODS: This was a cross-sectional study conducted in four primary care institutions. Patients ≥21 years old with HbA1c >7% and polypharmacy were included while those with limited language proficiency were excluded from this study. A 20-item Problem Areas in Diabetes Questionnaire (PAID), and an 8-item Diabetes Treatment Satisfaction Questionnaire (DTSQ) were administered by trained interviewers. PAID was measured using a five-point Likert scale (0 to 4) with higher score indicating more emotional distress. DTSQ was measured using a seven-point Likert scale (0 to 6) with higher score indicating more satisfaction.

RESULTS: Of 356 patients approached, 281 patients were eligible for the administration of the questionnaire. The mean age was 59.2 ± 8.2 years with 43.1% female and 56.9% male. The average HbA1c was $8.4 \pm 1.2\%$. Overall, the PAID and DTSQ scores were 23.2 ± 16.5 and 25.6 ± 6.0, respectively. Using general linear model adjusted for age, gender, ethnicity, education level, type of residence, duration of diabetes, and marital and employment status, our study showed that PAID score decreased by 0.8 point with every 1 point increase in DTSQ score (95% CI -1.079 to -0.432; $p < 0.0001$). In addition, PAID score increased by 1.6 points for every 1% increase in HbA1c (95% CI 0.144 to 3.067; $p < 0.05$).

CONCLUSION: Emotional distress was associated with low treatment satisfaction and poor glycemic control. Improvements in patient satisfaction towards diabetes management and glycemic control may positively affect diabetes-related emotional distress.

53E. Incidence of genital mycotic infections decreases over time in older patients with type 2 diabetes mellitus treated with canagliflozin *Michael Davies, Ph.D.*[1], Pamela Kushner, M.D.[2], Ujjwala Vijapurkar, Ph.D.[3], Gary Meininger, M.D.[3]; (1) Diabetes – Medical Affairs, Janssen Scientific Affairs, LLC., Raritan, NJ (2) University of California, Irvine Medical Center (3) Janssen Research & Development, LLC

Presented at 23rd Annual Women's Health Conference, Washington, DC, April 16–19, 2015.

Family Medicine

54. Scholarly contributions of pharmacist educators in family medicine in North America: A five-year review *Jennie Jarrett, Pharm.D., BCPS*[1], Sarah Rindfuss, Pharm.D., BCPS[2], Jody Lounsbery, Pharm.D.[3]; (1) UPMC St. Margaret Family Medicine Residency Program, UPMC St. Margaret, Pittsburgh, PA (2) Department of Medical Education, UPMC St. Margaret Family Medicine Residency Program, Pittsburgh, PA (3) Department of Pharmaceutical Care and Health Systems, University of Minnesota College of Pharmacy, Minneapolis, MN

PURPOSE: Pharmacists' roles in family medicine training programs are well established. Little data is known regarding their scholarly contributions. This project evaluates the scholarly contributions pharmacists in family medicine are making in North American literature and conferences and the impact on physician resident assessment via The Accreditation Council for Graduate Medical Education (ACGME) family medicine core competencies.

METHODS: A retrospective review of scholarly contributions by pharmacists was evaluated via publications in nine of the highest impact family medicine journals and presentations at four major family medicine conferences from July 1, 2009 to June 30, 2014. Data collected included geographic location, affiliation, credentials, type of collaboration and topic of each submission.

RESULTS: There were 414 unique pharmacists which produced 648 unique scholarly works during the study period. Each pharmacist averaged 1.6 scholarly works with an average of 1.5 pharmacists per work. Publications have gradually increased from 2.3 to 4.6%, while presentations have remained stagnant, fluctuating between 3.0 and 4.0% over the study period. The most common ACGME core competencies supported were medical knowledge (30.5%), patient care (23.3%) and systems-based practice (20.2%).

CONCLUSIONS: Pharmacist involvement in scholarly works has increased overall, yet is a small subset of the scholarly works in family medicine. This work was limited by differences in reporting by publications and conference programs. Uniquely, this data identifies pharmacists as educators of systems-based practice as well as medical knowledge and patient care. Pharmacists have an active and growing role in family medicine scholarship with a broader focus than pharmacotherapy knowledge.

Gastroenterology

55. Eluxadoline for the treatment of irritable bowel syndrome with diarrhea (IBS-D): results of two randomized, double-blind, placebo-controlled Phase 3 clinical trials *Paul Covington, M.D.*; Furiex Pharmaceuticals, A Subsidiary of Actavis Plc, NJ

PURPOSE: To evaluate the efficacy and safety of eluxadoline, a locally active, mu-opioid receptor agonist and delta-opioid receptor antagonist, in patients with IBS-D.

METHODS: Patients meeting Rome III criteria for IBS-D were randomized to twice-daily eluxadoline (75 or 100 mg) or placebo for 26 weeks in two double-blind, Phase 3 studies (IBS-3001, IBS-3002). The primary endpoint was a composite response based on simultaneous improvement of ≥30% in daily worst abdominal pain (WAP) score and daily stool consistency <5 (Bristol Stool Scale [BSS]) for ≥50% of days over Weeks 1–12 and 1–26. Additional efficacy measures included other bowel symptoms (bowel movements, urgency, incontinence) and global endpoints (adequate relief, global symptoms, quality of life).

RESULTS: A total of 2427 patients were randomized. Significantly more patients receiving 100 mg eluxadoline were composite responders in both studies and over both intervals assessed ($p < 0.005$; see Table); improvement was noted within first few doses. Significantly more patients receiving 75 mg eluxadoline were composite responders for Weeks 1–12 in both studies and Weeks 1–26 in IBS-3002. Significantly more patients receiving eluxadoline had adequate relief. Responder rates for the BSS component for both eluxadoline doses were significantly higher than placebo. Responder rates for the WAP component of ≥30% improvement were numerically higher. Both doses of eluxadoline showed greater improvements in bowel movement frequency and urgent episodes, daily global symptom scores, and IBS-Quality of Life questionnaire scores ($p < 0.05$). Pooled data for 100 mg eluxadoline demonstrated significance for ≥40% and ≥50% improvement in WAP ($p < 0.025$). The most common adverse events were constipation (7.4% and 8.3% vs 2.4%) and nausea (7.8% and 7.3% vs 4.8%) for 75 mg, 100 mg, and placebo, respectively.

CONCLUSIONS: Eluxadoline simultaneously improved pain and diarrhea in patients with IBS-D, with sustained effects over 26 weeks. Efficacy was rapid in onset and supported by improvements in other global measures.

ITT Analysis Set	Study IBS-3001 Responder n/N (%)	Study IBS-3002 Responder n/N (%)
Composite Responder[#]		
Weeks 1–12		
Eluxadoline 75 mg BID	102/427 (23.9)**	110/381 (28.9)****
Eluxadoline 100 mg BID	107/426 (25.1)***	113/382 (29.5)****
Placebo BID	73/427 (17.1)	62/382 (16.2)
Weeks 1–26		
Eluxadoline 75 mg BID	100/427 (23.4)ns	116/381 (30.4)****
Eluxadoline 100 mg BID	125/426 (29.3)****	125/382 (32.6)****
Placebo BID	81/427 (19.0)	77/382 (20.2)
Adequate Relief Responder[†]		
Weeks 1–12		
Eluxadoline 75 mg BID	226/427 (52.9)***	229/381 (60.1)***
Eluxadoline 100 mg BID	231/426 (54.2)***	223/382 (58.2)**
Placebo BID	187/427 (43.8)	188/382 (49.2)
Weeks 1–26		
Eluxadoline 75 mg BID	195/427 (45.7)ns	201/381 (52.8)**
Eluxadoline 100 mg BID	211/426 (49.5)***	205/382 (53.5)***
Placebo BID	171/427 (40.0)	167/382 (43.7)

#Composite Responder: A patient who reported both an improvement in daily WAP score ≥30% compared to baseline and a daily stool consistency of <5 on the BSS or absence of bowel movement for at least 50% of days (FDA Responder, Weeks 1–12; EMA Responder, Weeks 1–26); †Adequate Relief Responder: A patient who reports adequate relief for ≥50% of weeks; **$p < 0.025$; ***$p < 0.01$; ****$p \leq 0.001$; nsNot significant. BID, twice daily; EMA, European Medicines Agency; FDA, Food and Drug Administration; ITT, intention to treat.

56. Impact of vitamin K administration on INR changes and bleeding events among patients with cirrhosis *Eli N. Deal, Pharm.D., BCPS*[1], Melissa Green, Pharm.D. Candidate[2], Heather Pautler, Pharm.D., BCPS[1], Adam Meyer, M.D.[3], Kevin Korenblat, M.D.[4], Mark Thoelke, M.D.[3]; (1) Department of Pharmacy, Barnes-Jewish Hospital (2) St. Louis College of Pharmacy, St. Louis, MO (3) Division of Hospital Medicine, Washington University in St. Louis School of Medicine (4) Division of Gastroenterology, Washington University in St. Louis School of Medicine

PURPOSE: Vitamin K is frequently provided to patients with cirrhosis to correct coagulopathy despite poor evidence to support this practice. The purpose of this investigation was to determine the impact of vitamin K in this population.

METHODS: This is a retrospective investigation of patients hospitalized at a single, academic institution from 2010 to 2012. Adults with an ICD9 code supporting cirrhosis were segregated into cohorts based on provision of vitamin K and matched according to age, ICU care, INR, and renal function. The primary objective of this study was to determine factors associated with a decrease in INR during the first 7 days of hospitalization. Bleeding events were defined as any event requiring >2 units of packed red blood cells or surgical correction, an event causing a decrease in hemoglobin concentration >2 grams/L, or any clinically evident bleeding. Multivariable binary logistic regression of factors associated with INR decrease and bleeding events was completed.
RESULTS: The final matched cohort (n = 276) contained 130 patients who received vitamin K (median dose 15 mg over 4 days; 36% oral only, 30% parenteral only, and 34% combination) and 146 who did not receive this therapy. INR decreases of 0.5 and 1.0 were experienced in 19% and 10%, respectively, in the vitamin K group. ICU care (Adjusted odds ratio [AOR] 2.91, 95% Confidence Interval [CI] 1.54–5.49; p = 0.01), receipt of a blood product (AOR 2.40, 95% CI 1.35–4.24; p = 0.03), baseline INR > 1.6 (AOR 1.72, 95% CI 1.00–2.95; p = 0.05), but not vitamin K administration (AOR 1.17, 95% CI 0.66–2.08; p = 0.59) was associated with INR decrease. Bleeding events occurred more frequently among patients with a history of esophageal varices (AOR 6.35, 95% CI 1.21–33.4; p = 0.03), but vitamin K administration did not impact these events (AOR 4.90, 95% CI 0.56–43.0; p = 0.15).
CONCLUSION: Administration of vitamin K did not positively impact INR changes or bleeding events in this cohort of hospitalized patients with cirrhosis.

Geriatrics

57. Factors influencing medication non-adherence: A focus on socioeconomically vulnerable seniors in Singapore *Nicholas Loh, B.Sc.(Pharm) (Hons) Candidate*, Christine Teng, M.Sc.(Clinical Pharmacy), Kai Zhen Yap, Ph.D., B.Sc.(Pharm) (Hons); Department of Pharmacy, National University of Singapore, Singapore
PURPOSE: Medication non-adherence among older persons can compromise management of chronic diseases. This cross-sectional study aims to determine the prevalence of non-adherence to chronic medications and identify associated factors among socioeconomically vulnerable seniors staying in clusters served by volunteer-run senior activity centres (SAC) in Singapore. Findings from this study can improve support services provided by SAC.
METHODS: Participants aged 55 years and above who are taking chronic medications were surveyed using an interviewer-administered questionnaire over two periods (September–December in 2013 and 2014). Self-reported medication non-adherence was measured with the 8-item Morisky Medication Adherence Scale (MMAS-8). Demographics, psychosocial well-being, health literacy and medication-related factors were evaluated using bivariate analyses. Factors with p < 0.10 were included into the multivariate logistic regression.
RESULTS: About 51.9% of 212 participants from 6 SAC were non-adherent to their medications, with majority indicating that they forgot to take medicines sometimes (25.9%) and had difficulty remembering to take all medicines (23.6%). Individuals who were (1) dissatisfied with their life (adjusted OR 3.411; 95% CI 1.160–10.036), (2) had inadequate health literacy (adjusted OR 2.097; 95% CI 1.162–3.787) and (3) received full government subsidy on their medications (adjusted OR 2.120; 95% CI 1.054–4.265) were more likely to be non-adherent. The presence of depressive symptoms (15-item Geriatric Depression Scale) was significant (p < 0.05) in the bivariate analysis but not in the multivariate model.
CONCLUSION: Medication non-adherence was high among the study population. There is a need to integrate the social support services provided by SAC with pharmacist-led interventions to improve adherence to medication, especially for seniors who are receiving financial aids. Reminder services may be useful for improving the unintentional non-adherent behaviors identified. Interventions should also focus on improving health literacy, which may improve medication adherence and empower them to make better healthcare-related decisions.

58. Limitations to antimuscarinic use in nursing home residents with overactive bladder and/or urinary incontinence *Barbara Zarowitz, Pharm.D.*[1], Carrie Allen, Pharm.D.[2], Terrence O'Shea, Pharm.D.[3], Todd Berner, M.D.[4], Eric Tangalos, M.D.[5], Joseph Ouslander, M.D.[6]; (1) Omnicare, Inc., Livonia, MI (2) West Division, Omnicare, Inc., San Antonio, TX (3) Division of Clinical Services, Omnicare, Inc., Englewood, OH (4) Astellas Scientific and Medical Affairs, Northbrook, IL (5) Mayo Clinic, Rochester, MN (6) Florida Atlantic University
PURPOSE: This study characterized differences in drug regimens, severe mobility impairment (SMI) and moderate to severe cognitive impairment (MSCI) in nursing home residents (NHR) with overactive bladder (OAB) and/or urinary incontinence (UI) in order to determine the proportion with: (1) relative contraindications to antimuscarinic treatment due to concomitant anticholinergic medications or acetylcholinesterase inhibitors (AChEI), and (2) non-pharmacologic limitations to treatment.
METHODS: A cross-sectional retrospective database analysis of NHR ≥65 years of age with a diagnosis of OAB and/or UI was conducted. Data were derived from linked and de-identified pharmacy claims and Minimum Data Set data (MDS) 3.0 records from 842 U.S. skilled nursing facilities serviced by Omnicare from 10-1-2010 to 9-30-2012.
RESULTS: Of the 56,153 NHR with OAB and/or UI, 71.3% received at least 1 medication with moderate to severe anticholinergic properties[1], and many were commonly prescribed medications that can worsen incontinence: opioids (55.8%), sedative-hypnotics (38.6%), diuretics (36.0%), antipsychotics (25.5%), alpha antagonists (11.5%), verapamil or diltiazem (7.9%) and digoxin (7.8%). We found that 9.7% (n = 5419) were treated with antimuscarinics. When compared with an age- and gender-matched cohort who were not prescribed antimuscarinics, by categories of potential contraindication to treatment, only 6.6% (n = 356; p = 0.066) were possible candidates for treatment (see Table 1). However, 20.4% (n = 1103; p < 0.001) were treatment eligible when AChEI and anticholinergic medication use were removed as relative contraindications.

Table 1. Assessment of Potential Antimuscarinic Treatment Candidates:

Residents with OAB and/or UI (n = 5419)	Antimuscarinic use, n (%)	No Antimuscarinic use, n (%)	p-Value
Moderate to severe cognitive impairment (MSCI) (contraindication)	3357 (61.9)	3683 (68.0)	0.001
Severe mobility impairment (SMI) (contraindication)	2288 (42.2)	2778 (51.3)	0.001
Anticholinergic use (contraindication)	4189 (77.3)	3810 (70.3)	0.001
AChEI inhibitor use (contraindication)	1296 (23.9)	1118 (20.6)	0.001
None of the above contraindications were present	310 (5.7)	**356 (6.6)***	0.066

*These were the potential candidates for antimuscarinic treatment.

CONCLUSIONS: Most elderly NHR with OAB and/or UI studied had potential pharmacodynamic contraindications to

safe and effective treatment with antimuscarinic agents. Concern exists that many with potential contraindications who were treated risk an increased rate of cognitive and functional decline. Improvement of risk assessment and pharmacotherapeutic options to treat OAB and/or UI in this frail population is needed. [1]West T, et al. Evaluation of anticholinergic burden of medications in older adults. JAPhA 2013; 53(5): 496–504 and Appendix 1.

Health Services Research

59. Association between discharge pharmacist counseling techniques and hospital readmission rate *Rayf Abulezz, IV, B.S., Pharm.D., BCPS*[1], Thamer Alaifan, III, MBBS[2], Aeshah Al-Azmi, III, B.S., Pharm.D.[3], Ahmed Attar, IV, MBBS, FRCPC, ABPN, FAN[4]; (1) Pharmacy Department, Prince Mohamed bin Abdulaziz Hospital-NGHA, Madinah, Saudi Arabia (2) Internal Medicine, Schulich School of Medicine & Dentistry Western University, London, ON, Canada (3) Pharmaceutical care, King Abdulaziz Medical City-Jeddah-NGHA, Jeddah, Saudi Arabia (4) School of Medicine, McMaster University, Hamilton, ON, Canada

PURPOSE: We evaluated the impact of a new discharge counseling technique on patients' readmission rate and on identifying medication discrepancies during discharge.

METHODS: A retrospective investigational study was conducted to compare the 30-day readmission rate among patients subjected to the new counseling method with those of the standard methods (primary objective). The secondary objective was to evaluate the frequency and types of drug-related problems detected at the time of discharge among both groups. Inclusion criteria were patients who were counseled using the new counseling technique and all patients who were counseled using the standard techniques over a period of 2 months.

RESULTS: We identified 191 patients counseled using the standard technique and 233 patients counseled using the new technique. The readmission rate was lower by approximately 28% for the new counseling technique (21.5%) compared with those subjected to the standard one (29.8%; $p < 0.05$; OR: 1.56; 95% confidence interval [CI], 1.002–2.418). The discrepancies were more frequently detected among patients who were subjected to the new technique (20.6%) compared with those who were counseled using the standard technique (5.2%; $p < 0.05$). There were statistically significant differences regarding the type of diagnosis and sex between the two groups. The adjusted odds ratio for readmission within 30 days is 1.876 (95% CI, 1.162–3.028; $p = 0.01$) after adjusting for sex, and diagnosis, number of identified discrepancies, and number of medications.

CONCLUSION: Our study showed that the new discharge counseling technique was associated with a lower readmission rate and improved detection of identified discrepancies 4 times more than the standard technique for identified high-risk adult and pediatric patients. Larger-scale prospective studies are needed to confirm this finding.

60. Impact of pharmacist-involved collaborative care model on metabolic control and psychological health of patients with uncontrolled Type 2 diabetes: a prospective, multicenter, randomized, controlled study Melanie Siaw, B.Sc.(Pharmacy), Porlin Ng, B.Sc.(Pharmacy), *Joyce Lee, Pharm.D., BCPS, BCACP*; Department of Pharmacy, Faculty of Science, National University of Singapore, Singapore

PURPOSE: Pharmacist-managed diabetes clinics are known to be effective. However, a robust study design that evaluates both the clinical and humanistic outcomes of patients with uncontrolled diabetes is lacking especially in Asia. This study aimed to compare the care outcomes of pharmacist-involved collaborative care model to the usual care in Singapore.

METHODS: This was a 6-month prospective, randomized, controlled study supported by Ministry of Health in Singapore. All patients ≥21-years-old with HbA1c >7% and polypharmacy from four health institutions were randomized into control (usual care without pharmacist-involvement) or intervention where four BCACP pharmacists worked closely with physicians, nurses and dietitians in providing dose titration and diabetes counseling. Patients who required any form of assistance from caregivers were excluded from this study. Clinical data were extracted from institution database, and psychological health, measured using a 20-item Problem Areas in Diabetes Scale (PAID), was administered at baseline and at 6-month.

RESULTS: Of 436 eligible patients approached, 356 were randomized (181 intervention and 175 control) with 22.5% dropout rate. The mean age (I: 58.8 years, C: 59.9 years), HbA1c (I: 8.4%, C: 8.5%), SBP (I: 130.2 mmHg, C: 129.9 mmHg), LDL (I: 92.8 mg/dL, C: 96.7 mg/dL) and TG (I: 141.7 mg/dL, C: 150.6 mg/dL) were comparable at baseline ($p > 0.05$). At 6-month, the change in HbA1c and SBP between the two arms were −0.7% ($p = 0.016$) and −6.2 mmHg ($p = 0.002$), respectively. Compared to the intervention, trends of worsening in LDL and TG were observed in the control throughout the study. Finally, a greater improvement in PAID scores was observed in the intervention as compared to the control (I: 29.4 to 16.6, C: 29.0 to 23.3; $p < 0.0001$).

CONCLUSION: Improvements in metabolic control and psychological health of patients with uncontrolled diabetes favored the pharmacist-involved collaborative care model.

61E. Barriers to sustainable medication supply chain in a public hospital in Roatan, Honduras *Navaneeth Narayanan, Pharm.D.*[1], Sylvia Stoffella, Pharm.D.[2], Tina Brock, B.Sc.(Pharm), Ed.D.[3]; (1) Department of Pharmacy Practice and Administration, Ernest Mario School of Pharmacy, Rutgers University, Piscataway, NJ (2) UCSF Medical Center (3) Department of Clinical Pharmacy, UCSF School of Pharmacy

Presented at 74th FIP World Congress of Pharmacy and Pharmaceutical Sciences 2014 of the International Pharmaceutical Federation, Bangkok, Thailand, August 31–September 4, 2014.

Hematology/Anticoagulation

62E. Consequences of treating false positive heparin-induced thrombocytopenia *Carrie S. Oliphant, Pharm.D., BCPS (AQ Cardiology)*[1], Jacob Marler, Pharm.D.[2], Jessica Unzaga, Pharm.D., BCPS[3], Sundae Stelts, Pharm.D., BCOP[4]; (1) Department of Pharmacy, Methodist University Hospital, Memphis, TN (2) Methodist University Hospital, Memphis, TN (3) Memorial Cancer Institute, Hollywood, FL (4) Roper St. Francis Health System

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63. Evaluation of clinical outcomes at pharmacist versus physician-based anticoagulation outpatient clinic in Qatar Fatemeh Jalali, B.Pharm.[1], Nada Khudair, B.Pharm.[1], Noha Hassaballah, B.Pharm.[1], Shaban Mohammed, M.Sc.[2], Osama Abdelsamad, M.S.[3], *Hazem Elewa, R.Ph., Ph.D., BCPS*[4]; (1) Qatar University, College of Pharmacy, Doha, Qatar (2) Heart Hospital, Pharmacy Department, Hamad Medical Corporation, Doha, Qatar (3) Pharmacy Department, Alwakra hospital, Hamad Medical Corporation, Alwakra, Qatar (4) Clinical Pharmacy and Practice Section, Qatar University, College of Pharmacy, Doha, QatarOptimal anticoagulation necessitates dedication and continuous patient education. This requires time which is a resource that majority of the physicians lack due to their other responsibilities. Thus, managing anticoagulation by pharmacists benefits both the patients (by providing them with the necessary care) and the physicians (by freeing their time for more skilled tasks).

PURPOSE: To evaluate the impact of pharmacist versus physician-based anticoagulation management on the percentage time under therapeutic INR (TTR) and on the extreme out of the range INRs.
METHODS: A retrospective, observational cohort study was conducted to assess outcomes of patients receiving warfarin therapy managed either by pharmacist or physician. The primary end point of the study was the percentage of TTR (calculated by Rosendaal method) and extreme INR values, as defined by an INR $\leq$1.5 or $\geq$4.5.
RESULTS: A total of 278 patients taking warfarin (200 managed at physician versus 78 at pharmacist-based clinic) were evaluated. Subjects followed at pharmacist-based clinic had higher TTR when compared to those managed at physician-based clinic ($82 \pm 16\%$ vs $70 \pm 15\%$, $p < 0.0001$). Additionally, the mean percentage of visits within the therapeutic range were significantly higher in pharmacist group compared to physician's group (76.5 vs 71.2, $p = 0.011$). At the same time, mean percentage of visits with extremely subtherapeutic INR was lower in the pharmacist-managed clinic (5.17% vs 7.05%, $p = 0.007$). Subgroup analysis for the TTR and the percentage visits with extreme out of range INR was also performed to exclude potential confounders.
CONCLUSION: Our study shows that pharmacist-based anticoagulation has more positive clinical outcomes when compared to the traditional anticoagulation management. Pharmacist-managed anticoagulation clinics should be considered and supported in more hospitals in Qatar. This implementation will improve patient care and lower the overall cost through enhancement of anticoagulation management and providing physicians with longer contact time with their patients.

64. Evaluation of venous thromboembolism risk stratification for periprocedural warfarin management *Edward Saito, Pharm.D., BCACP*[1], Nathan Clark, Pharm.D., FCCP, BCPS[2], Daniel Witt, Pharm.D., FCCP, BCPS[3], Loren Davies, Pharm.D., BCACP[4], Kathleen H. McCool, Pharm.D.[5], James Douketis, M.D.[6], Kelli Metz, Pharm.D.[7], Thomas Delate, Ph.D., M.S.[5]; (1) School of Pharmacy, Pacific University, Hillsboro, OR (2) Anticoagulation and Anemia Management Services, Kaiser Permanente Colorado, Aurora, CO (3) Department of Pharmacotherapy, University of Utah College of Pharmacy, Salt Lake City, UT (4) Denver Health, Denver, CO (5) Kaiser Permanente Colorado, Aurora, CO (6) Department of Medicine, Division of Hematology and Thromboembolism, McMaster University (7) Department of Health Care Policy and Financing, State of Colorado
PURPOSE: The periprocedural management of warfarin for venous thromboembolism (VTE) presents a dilemma for clinicians due to the lack of validated risk stratifications to guide preferred practices. The purpose of this study was to compare "real world" rates of clinically-relevant hemorrhage and recurrent VTE among patients with VTE who interrupted warfarin for an invasive procedure and did or did not receive bridge therapy with low-molecular-weight heparin in order to assess the utility of consensus panel risk stratification recommendations.
METHODS: This retrospective cohort study included patients who were receiving warfarin for VTE and interrupted therapy for an invasive procedure between January 1, 2006 and March 31, 2012. Data were collected via queries of administrative datasets and outcomes verified via manual chart review. Thirty-day outcomes of clinically-relevant hemorrhage, recurrent VTE, and all-cause mortality (ACM) were compared between treatment groups and across VTE risk strata.
RESULTS: There were 2018 procedures in 1313 patients included. When stratified according to consensus panel definitions, bridge therapy was employed in 29.7%, 33.8%, and 62.1% of procedures in low, moderate, and high-risk patients, respectively. Thirty-day rates of hemorrhage among low and moderate-risk patients in the bridged group were 2.1% and 4.2% compared with 0.1% and 0.0% in the unbridged group, respectively ($p < 0.01$). Among high-risk patients, hemorrhage rates were similar between groups. The 30-day rates of recurrent VTE and ACM were low and equivalent between and across all groups and risk strata ($p > 0.05$).
CONCLUSION: Despite consensus panel recommendations, there were a substantial number of low and moderate-risk patients who received bridge therapy, which was associated with an increased risk of hemorrhage without significantly reducing the risk of recurrent VTE or ACM. These results suggest that most patients with VTE likely do not require bridge therapy and that consensus panel recommendations could condense risk stratification into low and high-risk categories.

65. A retrospective comparative evaluation of antithrombotic therapy after total hip arthroplasty or total knee arthroplasty at University of Colorado Health *Toby Trujillo, Pharm.D.*[1], Patrick Klem, Pharm.D.[2], Larry GoLightly, Pharm.D.[3], Megan Wong, Pharm.D.[2]; (1) Clinical Pharmacy, University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO (2) Pharmacy, University of Colorado Hospital, Aurora, CO (3) University of Colorado Hospital, Aurora, CO
PURPOSE: Patients undergoing total hip and total knee arthroplasty (THA or TKA) are at high risk of venous thromboembolism (VTE). The relative merits of aspirin compared to anticoagulants for these patients is debatable among clinicians. Recently standardized practices for VTE prevention in THA/TKA patients at the University of Colorado Hospital (UCH) changed from low molecular weight heparin (LMWH) to ASA providing two cohorts of patients to assess comparative effects. The goals of the study were to (1) assess the relative efficacy and safety of ASA compared to LMWH and (2) to identify additional patient characteristics which may help predict bleeding or thrombotic events.
METHODS: Patients undergoing elective THA and TKA at UCH from January 1 to April 1, 2013 (cohort #1), and from January 1 to April 1, 2014 (cohort #2) were included. Cohort #1 received a LMWH for VTE prevention, and cohort #2 received an ASA. Patient characteristics and clinical data were collected up to 6 weeks post surgery. The primary endpoint was the percentage of patients who developed a clinical VTE event. Secondary endpoints included the incidence of major bleeding (ISTH definition) and transfusion between groups.
RESULTS: A total of 138 TKA or THA patients received LMWH, and 90 received ASA for VTE prevention. The primary outcome occurred in 2.9% of patients receiving LMWH, and 8.9% of patients receiving ASA ($p = 0.047$). The rates of bleeding did not differ between the LMWH and ASA groups (2.9% vs 3.3%), but the rates of transfusion was significantly higher in the LMWH group (15.3% vs 2.2%, $p = 0.0012$)
CONCLUSION: In our study comparing a pre and post cohort of patients receiving different VTE prevention strategies, patients on ASA had a higher rate of clinical VTE but lower rates of transfusions. Full results will be presented.

66. Evaluation of the safety and tolerability of target specific ORAL anticoagulants at a large university setting *Toby Trujillo, Pharm.D.*[1], Gina Woodhouse, Pharm.D.[2], Renjbar Zebari, Pharm.D. Candidate[3], Kathy Hassell, M.D.[2], Patrick Klem, Pharm.D.[4]; (1) Clinical Pharmacy, University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO (2) University of Colorado Hospital, Aurora, CO (3) University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO (4) Pharmacy, University of Colorado Hospital, Aurora, CO
PURPOSE: Multiple clinical trials have documented the safety and efficacy of target specific oral anticoagulants (TSOAC) in various patient populations. The goal of thisstudy was to determine the appropriateness of prescribing patterns for the TSOACs and document the long term safety and tolerability in a real world setting.
METHODS: A retrospective data analysis of our electronic health record system was conducted to obtain data for

patients taking rivaroxaban (RIVA) or dabigatran (DABI) between March 2011 and July 2013. Appropriateness of prescribing was determined from prescriptions written by providers at University of Colorado Health based on FDA approved dosing and institutional guidelines. Clinically significant hemorrhage (major bleeding or bleeding which required medication to be discontinued), major thrombosis (TIA/CVA or VTE), and other adverse drug events (ADE) were collected for all patients who had RIVA or DABI as a documented active medication during the study period and with at least 1 month of follow up. Discontinuation of medication was assessed for patient tolerability

RESULTS: During the study period a total 563 patients were evaluated for RIVA (n = 204) or DABI (n = 360) use for atrial fibrillation or treatment of VTE. A total of 261 patients received new prescriptions for RIVA (n = 99) or DABI (n = 162), of which 25 (9.6%) had inappropriate dosing. Of these, 23/25 were due to under dosing of the individual agent. Clinical outcomes include:

	DABI (n = 360), %	RIVA (n = 204), %
Clinically significant hemorrhage	4.2	6.4
Major Thrombosis	1.4	1.5
Other ADE	0.5	1.0
Total Discontinuation Rate	29.2	41.2

Of patients who discontinued therapy, 38% in the DABI group and 25% in the RIVA group resumed a different oral anticoagulant

CONCLUSION: Our real world analysis highlights the importance of the continual need for provider education to optimize-outcomes. WHile the rates of ADEs, bleeding, and thrombotic events appears consistent with reported clinical trials, therates of drug discontinuation are higher and merit further analysis.

67. Retrospective evaluation to determine the use of unfractionated heparin for the treatment of venous thromboembolism in patients otherwise considered candidates for low molecular weight heparin *Morgan Trepte, Pharm.D.*[1], Lori Hornsby, Pharm.D.[2]; (1) Department of Pharmacy, University of North Carolina Hospitals, Chapel Hill, NC (2) Department of Pharmacy Practice, Auburn University Harrison School of Pharmacy/ Midtown Medical Center, Auburn, AL

PURPOSE: The purpose of this study was to determine the percentage of patients treated with unfractionated heparin (UFH) for venous thromboembolism (VTE) that were otherwise candidates for low molecular weight heparin (LMWH) and for those considered LMWH candidates, the average time required to achieve a therapeutic aPTT, number of aPTT values obtained and UFH dose adjustments required. Time utilized by pharmacists for the management of UFH in these individuals was also estimated.

METHODS: A retrospective chart review of 70 patients receiving UFH for the treatment of VTE was conducted. Patients not considered candidates for LMWH included those on hemodialysis, in acute renal failure or scheduled for a surgical procedure. Data collection included date and time of UFH initiation, aPTT time and values, UFH dose adjustments and anticoagulation status at discharge. Pharmacists' time required to manage therapy was estimated using a range of 10–25 minutes per aPTT value.

RESULTS: Thirty-two patients (45.7%) receiving UFH were determined to be candidates for LMWH. For these 32 patients the average time to first therapeutic aPTT was 30 hours, 28% required >24 hours to achieve a therapeutic aPTT, a total of 323 aPTTs were obtained and 155 dose adjustments were required. Seventy aPTTs were above goal, 100 were below goal, and UFH infusions were required to be held 32 times. Fifty-six % of the 32 patients were converted to LMWH prior to or at discharge. Pharmacists were estimated to spend 1.7–4.2 hours managing each UFH patient that was otherwise a candidate for LMWH therapy.

CONCLUSIONS: This study highlights the underuse of LMWH at our institution along with potential disadvantages of UFH in patients who are otherwise candidates for treatment with LMWH. These include a prolonged time to achieve therapeutic anticoagulation along with significant laboratory monitoring, dose adjustments and ultimately pharmacist time.

68. Predictors of extreme INR values in patients with left ventricular assist devices anticoagulated with warfarin *Lydia Newsom, Pharm.D., BCPS*[1], Kathryn M. Momary, Pharm.D., BCPS[1], Michael Moranville, Pharm.D., BCPS (AQ Cardiology)[2], Christopher Paciullo, Pharm.D., BCPS, FCCM[3]; (1) Department of Pharmacy Practice, Mercer University College of Pharmacy, Atlanta, GA (2) The Johns Hopkins Hospital, Baltimore, MD (3) Emory University Hospital, Atlanta, GA

PURPOSE: Anticoagulation in patients with left ventricular assist devices (LVAD) is complex. Prevention of device thrombosis must be balanced with the risks of device-induced coagulopathy and bleeding. This study characterizes risk factors associated with extreme INR values in patients with an LVAD anticoagulated with warfarin.

METHODS: A retrospective chart review was conducted for patients implanted with a Heartmate II or Heartware LVAD at Emory University Hospital and The Johns Hopkins Hospital between 1/1/2007 and 6/31/2012. Baseline demographics, clinical characteristics, and outpatient INR values for 3 months post discharge were collected in addition to bleeding and thrombotic events that occurred during the follow up period. Patients with at least one significantly supratherapeutic INR (INR > 4) were compared to those without a supratherapeutic INR. This analysis was repeated for patients with at least one subtherapeutic INR (INR < 1.5).

RESULTS: Of 116 study patients, 20.7% had at least one INR >4 with 66.4% having an INR < 1.5. Patients with a supratherapeutic INR were more likely to have a thrombotic event (29.2% versus 10.9%, $p = 0.046$) and receive a transplant following LVAD implantation (12.5% versus 1.1% patients, $p = 0.027$). These patients required less blood transfusions associated with a bleeding event, were less likely to have a history of atrial fibrillation, and had a lower serum creatinine at baseline ($p < 0.05$ for all comparisons). Conversely, patients with at least one subtherapeutic INR had increased hospitalizations associated with thrombosis (0.143 ± 0.42 versus 0.026 ± 0.16, $p = 0.033$) and were less likely to receive statin therapy inhibiting warfarin metabolism ($p = 0.036$).

CONCLUSION: Factors such as past medical history and concomitant medications may impact anticoagulation in LVAD patients. While subtherapeutic INR values were more common, both extremes in INR values were associated with adverse events following LVAD implantation.

HIV/AIDS

69E. Tenofovir alafenamide (TAF) in a single tablet regimen in initial HIV-1 therapy *Jason Flamm, M.D.*[1], David A. Wohl, M.D.[2], Anton Pozniak, M.D.[3], Melanie Thompson, M.D.[4], Edwin DeJesus, M.D.[5], Daniel Podzamczer, M.D.[6], Christian Callebaut, Ph.D.[7], Hal Martin, M.D., Ph.D.[7], Jean Lee, Pharm.D.[7], Scott McCallister, M.D.[8]; (1) Kaiser Permanente, Sacramento, CA (2) University of NC at Chapel Hill School of Medicine, Division of Infectious Disease, Chapel Hill, NC (3) Chelsea and Westminster Hospital, London, United Kingdom (4) AIDS Research Consortium of Atlanta, Atlanta, GA (5) Orlando Immunology Center, Orlando, FL (6) Hospital Universitario de Bellvitge, Barcelona, Spain (7) Gilead Sciences, Foster City, CA (8) Clinical Research, Gilead Sciences, Inc., Foster City, CA

Presented at the Conference of Retroviruses and Opportunistic Infections, Seattle, WA, February 23–26, 2015

70E. Safety of tenofovir alafenamide in renal impairment *Kenneth Lichtenstein, M.D.*[1], Brad Hare, M.D.[2], Anton Pozniak, M.D.[3], Jose Arribas, M.D.[4], Samir Gupta, M.D.[5], Frank Post, M.D.[6], Gordon Crofoot, M.D.[7], Moti Ramgopal, M.D.[8], Jean Lee, Pharm.D.[9], Marshall Fordyce, M.D.[10]; (1) National Jewish Health, Denver,

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Presented at the Conference of Retroviruses and Opportunistic Infections, Seattle, WA, February 23–26, 2015

71E. Renal and bone safety of tenofovir alafenamide vs tenofovir disoproxil fumarate *Daniel Klein, M.D.*[1], Paul Sax, M.D.[2], Michael Yin, M.D.[3], Frank Post, M.D.[4], Ellen Koenig, M.D.[5], Benoit Trottier, M.D.[6], Jaime Andrade, M.D.[7], Huyen Cao, M.D.[8], Betty Kritikos, Pharm.D.[8], Marshall Fordyce, M.D.[9]; (1) Kaiser Hospital, San Leandro, CA (2) Brigham amd Women's, Boston, MA (3) Columbia University Medical Center/ New York Presbyterian, New York, NY (4) King's College Hospital NHS Foundation Trust, London, United Kingdom (5) Instituto Dominicano de Estudio Virologicos, Santo Domingo, Dominican Republic (6) Clinique medicale l'Actuel, Montreal, QC, Canada (7) Hospital Civil de Guadalajara, Guadalajara, Jalisco, Mexico (8) Gilead Sciences, Foster City, CA (9)Clinical Research, Gilead Sciences, Inc., Foster City, CA
Presented at Citation: Sax P, et al. Conference on Retroviruses and Opportunistic Infections. February 23–26, 2015. Oral Session O-11 (#113LB). Seattle, Washington.

72E. Integrated analysis of emergent drug resistance through 48 weeks from clinical studies of HIV-1 treatment-naïve subjects receiving elvitegravir/cobicistat/emtricitabine/tenofovir alafenamide *Christian Callebaut, Ph.D.*[1], Nicolas A. Margot, B.S., M.A.[1], Kathryn M. Kitrinos, Ph.D.[1], Marshall W. Fordyce, M.D.[2], Scott McCallister, M.D.[2], Michael D. Miller, Ph.D.[1]; (1) Clinical Virology, Gilead Sciences, Inc., Foster City, CA (2) Clinical Research, Gilead Sciences, Inc., Foster City, CA
Presented at Drug Resistance Workshop, Seattle, WA, February 21–22, 2015.

74. Adherence assessment techniques in adolescents receiving a protease inhibitor based antiretroviral therapy treatment regimen in a resource limited setting *Tinashe Mudzviti, B.Pharm. (Hons), M.Phil. (M.D.)*[1], Tafadzwa Mandizvidza, B.Pharm. (Hons)[1], Cleophas Chimbetete, MBChB, MPH[2], Charles Maponga, Pharm.D., MHPE[1], Gene Morse, Pharm.D.[3]; (1) School of Pharmacy, University of Zimbabwe, Harare, Zimbabwe (2) Newlands Clinic, Zimbabwe Aids Care Foundation, Harare, Zimbabwe (3) Translational Pharmacology Core, Center of Excellence in Bioinformatics and Life Sciences, School of Pharmacy, University at Buffalo, Buffalo, NY
PURPOSE: In adolescents several psychosocial factors contribute to non-adherence. This study was undertaken to ascertain overall adherence of HIV infected adolescents to either boosted atazanavir (ATV/rtv) or lopinavir (LPV/rtv). The study was also conducted to compare self-report / pill counting adherence measurement techniques against the MEMS cap device technique.
METHODS: This was a prospective cohort study in adolescents (aged 12–23) receiving either boosted atazanavir (ATV/rtv) or lopinavir (LPV/rtv) as part of an antiretroviral regimen. This study was conducted at Newlands Clinic, Harare, Zimbabwe. Participants received a MEMS cap to assess adherence to the protease inhibitor (PI). During subsequent clinic visits, MEMS caps would have data downloaded before medicine was refilled. Participants were blinded to the results of the MEMS cap result. At each subsequent visit, a pill count and a self-report was also conducted to measure adherence. Viral load measurements were also recorded against the adherence data.
RESULTS: Twenty-six participants with a median age of 18 (range 12–23) years participated in the study with 65% being female. Utilizing a pill count to assess adherence, 22 participants had a greater than 95% adherence to their PI regimen. However using the MEMS cap only, 9 participants had a greater than 95% adherence. Eleven of the 26 participants had a viral load greater than 50 (median = 63,525 cells/mL; range = 52–707,060) with a median adherence level of 100% (range = 94–100%) as determined by a pill count and a median adherence level of 83.3% (range = 0–100%) as determined by the MEMS cap.
CONCLUSION: Pill counts and self-reported adherence overestimated adherence in adolescent patients on PIs as part of an antiretroviral regimen. Newer adherence assessment techniques need to be developed which can more accurately assess adherence in populations with adherence challenges.

75E. Levonorgestrel implant + efavirenz-based antiretroviral therapy: unintended pregnancies and associated pharmacokinetic data *Kimberly K. Scarsi, Pharm.D., M.Sc.*[1], Kristin M. Darin, Pharm.D.[2], Shadia Nakalema, MBChB[3], David J. Back, Ph.D.[4], Pauline Byakika-Kibwika, MBChB, Ph.D.[3], Laura Else, Ph.D.[4], Sujan Dilly Penchala, B.Sc.[4], Susan E. Cohn, M.D., MPH[5], Concepta Merry, M.D., Ph.D.[3], Mohammed Lamorde, MBChB, Ph.D.[3]; (1) Department of Pharmacy Practice, University of Nebraska Medical Center, Omaha, NE (2) Division of Infectious Diseases and Center for Global Health, Northwestern University Feinberg School of Medicine, Chicago, IL (3) Infectious Diseases Institute, Makerere University, Kampala, Uganda (4) Department of Molecular and Clinical Pharmacology, University of Liverpool, Liverpool, United Kingdom (5) Division of Infectious Diseases, Northwestern University Feinberg School of Medicine, Chicago, IL
Presented at the Conference on Retroviruses and Opportunistic Infections, Seattle, WA, February 25, 2015.

Infectious Diseases

76. Safety and efficacy of fixed-dose combination compared to separate tablets regimen in the initial treatment phase of pulmonary tuberculosis in Qatar *Mohammad Al-Shaer, Pharm.D., BCPS*[1], Hanine Mansour, Pharm.D., BCPS[2], Fatima Iqbal, Pharm.D.[3]; (1) Clinical Pharmacy, Al-Wakra Hospital: Hamad Medical Corporation, Qatar (2) School of Pharmacy, Lebanese American University, Lebanon (3) Department of pharmacy, Rumailah Hospital: Hamad Medical Corporation, Qatar
PURPOSE: To compare fixed-dose combination (FDC) and separate tablets (ST) regimens regarding safety and efficacy in treating pulmonary tuberculosis (PTB).
METHODS: This was a retrospective observational study in a new hospital, in which patients diagnosed with PTB received rifampin, isoniazid, pyrazinamide, and ethambutol (either as FDC or ST) administered by the nurse, and sputum acid-fast bacilli (AFB) tested weekly. We included patients admitted between December 2012 and November 2014, ≥18 years old, and diagnosed with PTB with positive sputum AFB. Patients with first-line-resistant PTB were excluded. Patients' demographics, comorbidities (e.g. hypertension and diabetes), vitamin D levels, anti-tuberculosis regimens and adverse events (cutaneous, gastric, musculoskeletal, hepatic, visual, and hyperuricemia), and time to negative sputum AFB were recorded. Safety and efficacy were assessed by comparing incidence of adverse events and time to negative sputum AFB between regimens, respectively.
RESULTS: We included 148 patients in this study. The mean (±SD) for age and body mass index were 33.9 ± 10.1 years and 20.4 ± 3.1 kg/m^2, respectively. The percentage of male gender was 85.8%. Nine patients had vitamin D level <10 ng/mL, and 94 patients between 10 and 29 ng/mL. Ninety (60.8%) patients received the FDC. There was an insignificant difference between

FDC and ST regimens regarding mean time to negative AFB results (29.9 vs 35.6 days, respectively) and incidence of adverse events. Among the 33 diabetic patients, 19 (57.6%) received the FDC, who had faster conversion to negative sputum AFB compared to those who received ST (31 vs 49.4 days, respectively, $p = 0.05$). Diabetic patients needed longer time for sputum AFB conversion (38.8 vs 30.2 days, $p = 0.03$) and had more hepatotoxic and gastric adverse events compared to non-diabetics (18.2% vs 5.2% [$p = 0.016$] and 54.5% vs 16.5% [$p < 0.001$], respectively).

CONCLUSIONS: FDC and ST regimens have similar efficacy and safety in general population. FDC seems to be more effective in diabetic patients and warrants further investigations.

77. Relationship of sulfamethoxazole therapeutic drug monitoring to clinical efficacy and toxicity: a retrospective cohort study *Lauren Ice, Pharm.D.*[1], Jason Barreto, Pharm.D.[1], Bao Dao, Pharm.D., MBA[2], Robert Wolf, Pharm.D.[1], Ross Dierkhising, M.S.[3], Paul Jannetto, Ph.D.[4], Loralie Langman, Ph.D.[4], Pritish Tosh, M.D.[5]; (1) Department of Pharmacy, Mayo Clinic, Rochester, MN (2) Department of Clinical Pharmacy, University of California San Francisco Medical Center, San Francisco, CA (3) Division of Biomedical Statistics and Informatics, Mayo Clinic, Rochester, MN (4) Division of Laboratory Medicine and Pathology, Mayo Clinic, Rochester, MN (5) Division of Infectious Diseases, Mayo Clinic, Rochester, MN

PURPOSE: Trimethoprim/sulfamethoxazole (TMP/SMX) is the treatment of choice for infections caused by *Pneumocystis jiroveci*, *Stenotrophomonas maltophilia*, and *Nocardia species*, but the utility of therapeutic drug monitoring (TDM) is unclear. The objective of this study was to evaluate the association of SMX serum levels with clinical outcomes.

METHODS: This study was conducted in patients receiving treatment with TMP/SMX for culture-positive infection who underwent TDM from 2003 to 2013. Peak SMX levels were classified as below target (<100 μg/mL), within target (100–150 μg/mL), or above target (>150 μg/mL). The effect of initial SMX levels on clinical outcomes was compared using propensity score adjusted multivariable Cox models.

RESULTS: A total of 279 patients had SMX monitoring performed. The primary infecting organisms were *P. jiroveci* (47%) and *S. maltophilia*(38%). A majority of patients (74%) had a SMX peak level outside of the target range. Using direct regression propensity score adjustment, there was no significant difference between rates of clinical failure and initial peak SMX level (<100 μg/mL vs 100–150 μg/mL: HR 0.92, 95% CI, 0.28–3.07 and >150 μg/mL vs 100–150 μg/mL: HR 1.92, 95% CI, 0.72–5.09). Similarly, there was no relationship between SMX level and incidence of toxicity ($p = 0.42$).

CONCLUSION: Sulfamethoxazole serum levels outside the target range were not associated with increased rates of clinical failure in patients treated with TMP/SMX. There was also no association found between peak SMX levels and rates of adverse events. The utility of SMX therapeutic drug monitoring may be limited to a subset of patients and requires further, prospective investigation.

78. Evidence of the relief of upper respiratory symptoms with flurbiprofen 8.75 mg lozenge Bernard Schachtel, M.D.[1], Adrian Shephard, B.Sc.(Hons)[2], Sue Aspley, Ph.D.[2], Gary Smith, M.Sc.[2], *Tim Shea, B.S.*[3], Kathleen Sanner, RN[4], Laurie Savino, RN[4], Emily Schachtel, M.D.[4]; (1) Department of Epidemiology and Public Health, Yale University School of Medicine, New Haven, CT (2) Reckitt Benckiser, Slough, United Kingdom (3) Reckitt Benckiser, Parsippany, NJ (4) Schachtel Research Company, Jupiter, FL

PURPOSE: Symptoms of upper respiratory tract infection (URTI) are due to inflammatory mediators triggered by viruses or bacteria. Therefore, it seems logical to treat URTI symptoms with an anti-inflammatory agent. A lozenge containing the non-steroidal anti-inflammatory drug (NSAID) flurbiprofen was developed to treat sore throat, a prominent symptom of pharyngeal inflammation (Schachtel, Pain 2014;155:422–8). Because patients with URTI experience more than one symptom, we investigated the effects of flurbiprofen 8.75 mg lozenge on these symptoms of URTI.

METHODS: Adults with recent-onset sore throat were examined for evidence of pharyngitis (with objective indicators of pharyngeal inflammation confirmed on the Tonsillo-Pharyngitis Assessment, or TPA). For entry all patients were required to have at least one symptom of URTI in addition to sore throat (documented on the URTI Questionnaire). To assure double-blinding some patients were randomly assigned (1:5) to suck one placebo lozenge or one flurbiprofen lozenge. Patients remained under observation at the research center for 3 hours and assessed URTI symptoms on the URTI Questionnaire at baseline and 3 hours post-dosing.

RESULTS: 122 patients were randomized to flurbiprofen ($n = 101$) or placebo ($n = 21$). Mean age was 19.5 years, 58% were female, mean TPA score was 9.9. All patients had symptoms and findings of URTI. Flurbiprofen-treated patients reported a significant reduction in URTI symptoms (eg, achiness, coughing, pressure around the eyes, neck gland tenderness, headache, sinus pressure, sinus pain, all $p < 0.05$ compared with baseline). There were no serious AEs and no patients discontinued due to an AE.

CONCLUSION: This study suggests that, in addition to sore throat, flurbiprofen 8.75 mg lozenge relieves other symptoms of URTI, effects that are possibly due in part to the local (and systemic) anti-inflammatory action of flurbiprofen. Further research is planned to investigate these observations.

79E. Use of fluconazole as prophylaxis for invasive Candida infections in preterm infants: a retrospective chart review *Eric Hoie, Pharm.D.*[1], Stephanie Le, Pharm.D.[2], Chris Destache, Pharm.D.[3]; (1) Pharmacy Practice, Creighton University SPAHP, Omaha, NE (2) Nebraska Medicine, Bellevue Medical Center, Bellevue, NE (3) Creighton University School of Pharmacy and Health Professions, Omaha, NE

Presented at the 40th Annual Midwest Pharmacy Residents Conference, Omaha, NE, May 8, 2014

80. Risk of relapse of urinary tract infections due to extended-spectrum beta-lactamase producing organisms *Adriane Irwin, M.S., Pharm.D.*[1], Sumit Patel, Pharm.D.[2], Jessina C. McGregor, Ph.D.[3], David T. Bearden, Pharm.D.[4], Thomas Delate, Ph.D.[5]; (1) College of Pharmacy, Oregon State University/Oregon Health Science University, Corvallis, OR (2) Pharmacy Department, Indiana University Health (3) Oregon State University/Oregon Health & Science University College of Pharmacy, Portland, OR (4) College of Pharmacy, Oregon State University/Oregon Health Science University, Portland, OR (5) Pharmacy Department, Kaiser Permanente Colorado, Aurora, CO

PURPOSE: This study evaluated risk of infection relapse in patients with a urinary tract infection (UTI) due to an extra-spectrum beta-lactamase (ESBL) producing organism treated with an oral antibiotic (ciprofloxacin, nitrofurantoin, or trimethoprim/sulfamethoxazole [TMP/SMX]) or ertapenem with in vitro susceptibilities to the prescribed agent.

METHODS: This was a retrospective cohort study of adult patients diagnosed between December 6, 2009 and December 5, 2011 with an ESBL producing *Escherichia coli* or *Klebsiella pneumonia* with in vitro susceptibilities to a fluoroquinolone, nitrofurantoin, and/or TMP/SMX. The primary study endpoint was infection relapse, defined as a urine culture positive for the same microorganism during the 6 months following initial culture date. Frequency of relapse was compared across treatment groups using a multivariable logistic regression with nitrofurantoin as the referent.

RESULTS: A total of 182 patients were included – 20 (11%), 34 (19%), 37 (20%), and 91 (50%) in the ertapenem, ciprofloxacin,

TMP/SMX, and nitrofurantoin groups, respectively. Patients were primarily female (94%) with a mean age of 57.8 ± 18.9 years. Unadjusted relapse rates were as follows – 6 (30%), 4 (12%), 5 (14%), and 28 (31%) in the ertapenem, ciprofloxacin, TMP/SMX and nitrofurantoin groups, respectively. After adjusting for baseline differences, patients treated with ciprofloxacin (odds ratio [OR] = 0.16; 95% confidence interval [CI] 0.04–0.63) or TMP/SMX (OR = 0.23; 95% CI 0.06–0.87) were significantly less likely to experience an infection relapse compared to patients treated with nitrofurantoin. There was no difference in relapse when compared to ertapenem (OR = 0.40; 95% CI 0.09–1.67).
CONCLUSIONS: Patients treated with a fluoroquinolone or TMP/SMX had a lower risk of infection relapse than patients treated with nitrofurantoin. Confounding may influence results so future research should be conducted to determine the appropriateness of oral antibiotic therapy for UTIs due to ESBL producing organisms.

81. Comparison of $AUC_{0–24}$ predicted for published vancomycin dosing protocols designed for obese patients *Brittany McGalliard, Pharm.D. Candidate*[1], Kendra Radtke, Pharm.D. Candidate[1], Kit Wun Kathy Cheung, Pharm.D. Candidate[1], Nancy Wong, Pharm.D. Candidate[1], Tuba Nemati, Pharm.D. Candidate[1], Tina Denetclaw, Pharm.D., BCPS[2]; (1) School of Pharmacy, University of California, San Francisco, San Francisco, CA (2) Department of Clinical Pharmacy, School of Pharmacy, University of California, San Francisco, San Francisco, CA
PURPOSE: To evaluate whether $AUC_{0–24}$ predicted for published vancomycin dosing protocols as applied to obese patients meet AUC_{24} and safety targets recommended by current authoritative guidelines.
METHODS: Data was collected regarding gender, height, weight, age and serum creatinine to calculate the expected $AUC_{0–24}$ for obese patients according to the vancomycin dosing methods set forth by the Denetclaw, Reynolds, Wesner and traditional protocols. Obesity was defined as a total body weight greater than 130% of ideal body weight. Mean $AUC_{0–24}$ and proportion of patients achieving an $AUC_{0–24}$ ≥400 mg*h/L were assessed.
RESULTS: Ninety-eight consecutive obese patients were evaluated. The mean predicted $AUC_{0–24}$ for the Denetclaw obese protocol (763 ± 230 mg h/L) was higher than the Traditional protocol with or without load, the Reynolds protocol without load, and the Wesner protocol with target trough 10–15 mg/L ($p < 0.001$ to 0.0239); and not different than the Reynolds protocol with loading dose and the Wesner protocol with target trough 15–20 mg/L ($p = 0.1548$ and 0.2268). The proportion of patients achieving predicted $AUC_{0–24} \geq 400$ mg h/L was higher for the Denetclaw protocol than the traditional protocol without a loading dose and Reynolds protocol without a loading dose ($p < 0.0001$ and 0.0313); and not different than the Traditional protocol with load, the Reynolds protocol with load, the Wesner protocol with target trough 10–15 mg/L, and the Wesner protocol with target trough 15–20 mg/L ($p = 0.1512$ to 0.9642).
CONCLUSION: Obese patients receiving vancomycin 750 mg or 1000 mg every 6 hours according to the Denetclaw obese protocol, compared to higher, less frequent doses in other protocols, exhibited predicted $AUC_{0–24}$ values larger or not different than other protocols applied to obese patients. The Denetclaw protocol may be preferred in obese patients due to a potential decreased nephrotoxicity risk without a loss of efficacy.

82. Evaluating the appropriateness of empiric and targeted therapy in the treatment of Klebsiella pneumoniae bacteremia *Eric La, Pharm.D.*[1], Thien-Ly Doan, Pharm.D., BCPS (AQ-ID)[2]; (1) Department of Pharmacy, Huntington Hospital, Huntington, NY (2) Department of Pharmacy, Long Island Jewish Medical Center, New Hyde Park, NY
PURPOSE: Antimicrobial resistance has been associated with increased hospital length of stay (LOS), healthcare costs, and mortality. *Klebsiella pneumoniae* is capable of producing extended-spectrum beta-lactamases (ESBL) and carbapenemases (KPC). As a result, prescribers may select inappropriate empiric agents for the treatment of bacteremia.
METHODS: A retrospective chart review of all positive blood cultures for *K. pneumoniae* from June 2012 to June 2013 was performed to assess the appropriateness of prescribing for the treatment of *K. pneumoniae* bacteremia. The secondary objective was to determine whether an association exists between inappropriate therapy and patient outcomes (LOS, critical care stay, mortality). Subjects were excluded if: age was less than 18, expired within 24 hours of admission, failed to receive antibiotics, or lost to follow-up. Descriptive statistical analysis was performed along with the Mann-Whitney and Kruskal-Wallis tests to assess for association.
RESULTS: Of the 86 patients that were included in the study, 18 (21%) received inappropriate empiric therapy due to bug-drug mismatches or inadequate coverage. Once culture susceptibilities were available, targeted antimicrobial therapy remained inappropriate in 12 (14%) patients due to: bug-drug mismatches, inadequate coverage, inadequate dosing, and further opportunities for de-escalation in therapy. We identified 19 (22%) ESBL or KPC-producing isolates that shared several common denominators, including: comorbid diabetes (53%), hospitalization within past 6 months (84%), antibiotic use within past 3 months (58%), and coming from long-term care facility (47%). No association was found between inappropriate empiric therapy and LOS or critical care admission. Statistical analysis on mortality was unable to be performed due to small sample size. Admission to a critical care unit was associated with increased LOS ($p = 0.005$).
CONCLUSION: Bug-drug mismatches and resistance were the primary reasons for inappropriate empiric therapy in treating *K. pneumoniae* bacteremia. There are opportunities to improve prescribing patterns in both empiric and targeted therapy at our institution.

83. Antibiotic use in San Jose del Negrito, Honduras *Anna Bondar, B.S.*, Lauren J. Jonkman, Pharm.D., MPH, BCPS, Sharon E. Connor, Pharm.D.; School of Pharmacy, University of Pittsburgh, Pittsburgh, PA
PURPOSE: Self-medication with antibiotics is a common phenomenon in other countries. The purpose of this research is to understand the extent to which patients seeking care at a primary care clinic in rural Honduras self-medicate with antibiotics. Furthermore, this research seeks to understand the perceptions of community leaders, community members, and local health care providers in the village.
METHODS: This mixed-methods research project included surveys of patients at the clinic and key informant interviews with community members and clinic staff. All adult patients coming to the medical clinic over the two-week medical brigade were invited to complete the survey, a previously developed and validated tool (Preguntas Para el Uso de Antibioticos (PUAS) or Questions for the Use of Antibiotics). Key informants were interviewed to assess their perceptions of antibiotic use and self-medication with antibiotics in the community.
RESULTS: Eighty patient surveys and 5 key informant interviews were conducted. The majority of participants believed that antibiotics could be used for both bacterial and viral infections. Participants tended to seek antibiotics from the clinic more often than from the local convenience stores (63 out of 80 patients). The majority of participants reported keeping an extra supply of antibiotics for future use (72 out of 80 patients). Parents were much less likely to report self-medication used for their children (12 out of 80 patients). The key informants described a decrease in self-medication with antibiotics in the last few years. They described a need for further public education about the proper uses of antibiotics.
CONCLUSION: There is a gradual decrease in the amount of self-medication with antibiotics since the clinic has opened in San Jose. Having access to a physician in the community has allowed

for greater community education and awareness about the proper use of antibiotics.

Medication Safety

84. Institution, EHR vendor, and drug database provider collaboration combats sources of alert fatigue *Jennifer Gatsos-Walter, Pharm.D.*[1], Kayann Burke, Pharm.D.[1], Howard Venable, R.Ph., MBA[2], Jeff Thompson, R.Ph.[3], Chris Hansen,[4]; (1) Wolters Kluwer Clinical Drug Information (WKCDI), Indianapolis, IN (2) Loyola University Health System, Maywood, IL (3) Stormont-Vail HealthCare, Topeka, KS (4) Epic, Verona, WI
PURPOSE: Determine the effect of a collaborative approach to reduce commonly overridden alerts in institutional EHR systems.
METHODS: Override data from two institutions from a 7-day period (March 2014) were collected and analyzed with regard to drug dosing, drug interactions, pregnancy, and lactation alerts. The following activities were performed: (1) WKCDI clinicians evaluated the most common overridden alerts; (2) Epic worked with WKCDI and the institutions to understand the effect of implementation settings; (3) The institutions evaluated and applied WKCDI/Epic recommendations. The data from a 7-day period approximately 1 year later (February 2015) was collected and re-analyzed.
RESULTS:

	Drug Interactions	Dosing	Pregnancy/ Lactation*
Baseline (March, 2014)			
Alerts (all data lines)	19,434	12,096	2232
Followup after all interventions (February, 2015)			
Alerts (all data lines)	14,896	9988	1643
Alert reductions (%)	23	17	26

Total of 133272 (baseline)/ 127891 (post) drug orders were processed in each 7 day period. *Data from Loyola University Health System only Effective strategies for alert optimization, as demonstrated in our results, were determined to include the following. The institution should re-examine implementation settings, utilize customizations provided by the EHR vendor to an optimal degree (e.g., exclude alerts arising from drugs within pre-vetted order sets); and align route tables with that of the drug data provider. Drug database providers should re-evaluate and update the attributes associated with commonly overridden alerts and align the data utilizing the newest published treatment standards and primary literature. The EHR vendor role should be to assist the institution with enhancing implementation and optimization options
CONCLUSION: A large reduction of total alerts in our study was the collaboration between, and inherent understanding of, the various roles and interdependencies involving the drug database provider, EHR vendor and the institutions' implementation of the data.

85. Reduce medication errors by doing early medication reconciliation in the emergency department *Josephine Quach, Pharm.D.*, San Hua, Pharm.D., Brittany Traylor, Pharm.D., Julianna Burton, Pharm.D.; Pharmacy, University of California Davis Medical Center, Sacramento, CA
PURPOSE: To determine the impact of an early medication reconciliation (MR) in patients evaluated in the emergency department (ED) and identify barriers to reconciling medication in the ED.
METHODS: Between January 6 to January 23, 2014 patients evaluated at the University of California Davis Medical Center (UCDMC) in Sacramento, CA were randomly selected to participate in a single center pilot study. Patients were offered to receive MR if they were: ≥65 years old, taking a high alert medication (i.e. anticoagulants, opioids, insulin), or if the patient's physician deemed it necessary. Patients agreeing to receive MR were randomly assigned to receive MR either according to standard of care (control), or have their MR completed prior to admission (treatment). Patients' in the treatment group had their medications reviewed, checked for discrepancies and compared against the admission orders for potential errors. All unintentional discrepancies were regarded as errors and were then given to a panel of experts for severity ranking (1 = severe error 4 = non-significant error).
RESULTS: A total of 307 patients were enrolled in the study (treatment = 134 and control = 173). More discrepancies were discovered when MR was completed in the ED (383 vs 275, $p = 0.0023$). The treatment group had an average severity ranking that was lower than the control group (3.28 vs 3.52, $p < 0.0001$), meaning the errors discovered in the treatment group had a greater potential to cause patient harm or discomfort. Barriers to MR included: constant movement of patients on the floor, frequent room changes, patients unable to give history due to acuity, inability to reach family or caregiver, and patients discharge before MR can be completed.
CONCLUSION: Conducting MR earlier will minimize the number of unintentional medication errors per patient compared to the current standard of care at UCDMC. Early MR in the ED may prevent severe medication errors from occurring and optimize patient care during hospitalization.

89E. Implementation of electronic health record (EHR)-based medication management functionalities associated with decreased 30-day acute myocardial infarction (AMI) readmission rates *Mark E. Patterson, Ph.D., MPH*[1], Stephen Andrews, Pharm.D. Candidate[2]; (1) University of Missouri-Kansas City School of Pharmacy, Kansas City, MO (2) School of Pharmacy, University of Missouri-Kansas City School of Pharmacy, Kansas City, MO
Presented at 9th Annual Conference of the Center for Patient Safety, Bridgeton, Missouri 63044, March 13, 2015.

Nephrology

90E. Evaluation of antibiotic dosing in patients receiving sustained low-efficiency dialysis Leigh Anne Keough, Pharm.D.[1], *Joanna Q. Hudson, Pharm.D., BCPS, FASN, FCCP, FNKF*[2], Beth Segars, Pharm.D.[1], Amy Krauss, Pharm.D., BCPS[1]; (1) Department of Pharmacy, Methodist University Hospital, Memphis, TN (2) Department of Clinical Pharmacy, The University of Tennessee College of Pharmacy, Memphis, TN
Published in J Am Soc Nephrol 2014;25:339A.

91E. Incidence of thromboembolism and use of antithrombotic primary prophylaxis in nephrotic syndrome patients *Leslie N. Smith, Pharm.D.*[1], Joanna Q. Hudson, Pharm.D., BCPS, FASN, FCCP, FNKF[2], Jennifer Twilla, Pharm.D., BCPS[1]; (1) Methodist University Hospital, Memphis, TN (2) Department of Clinical Pharmacy, The University of Tennessee College of Pharmacy, Memphis, TN
Presented at Smith LN, Hudson JQ, Twilla JD. Incidence of Thromboembolism and Use of Antithrombotic Primary Prophylaxis in Nephrotic Syndrome Patients. J Am Soc Nephrol 2014;25:749A. American Society of Nephrology Meeting, Philadelphia, PA. November 15, 2014.

Neurology

93. Systematic literature review of abobotulinumtoxinA in clinical trials for lower limb spasticity *Jack J. Chen, Pharm.D.*[1], Khashayar Dashtipour, M.D., Ph.D.[2], Heather Walker, M.D.[3], Michael Y. Lee, M.D.[3]; (1) College of Pharmacy, Marshall B. Kethcum University, Fullerton, CA (2) Loma Linda University, Loma Linda, CA (3) University of North Carolina, NC
PURPOSE: Adult lower limb spasticity (LLS) due to stroke, spinal cord injury, or other neurological disorders can signifi-

cantly impair stride, gait and balance. To systematically assess the clinical trial efficacy, safety and dosing methodology of abobotulinumtoxinA (ABO) for treatment of LLS.
METHODS: A Cochrane-quality, systematic, PRISMA-guided, protocol-defined, literature review was designed and conducted to identify randomized controlled trials of ABO in adult lower limb spasticity.
RESULTS: Of the 295 records identified, 6 unique publications met inclusion criteria. The etiology of LLS was stroke (4 studies, total n = 288 patients) and multiple sclerosis (MS; 2 studies, total n = 180 patients). Three of the post-stroke LLS studies were small (<25 patients each). Total ABO doses ranged between 500 to 2000U depending on the muscles injected. All studies utilized EMG-guided injections and adjunctive electrical stimulation was studied in 2 stroke-LLS studies. Concomitant standard of care physiotherapy and adjunctive oral medications were allowed. At 8 to 12 weeks post-injection, ABO was associated with statistically significant reductions in muscle tone (Ashworth or Modified Ashworth Score) in the stroke-LLS studies. In MS-LLS studies, ABO did not improve functional outcomes or Ashworth tonicity scores, compared to placebo. Across all 6 studies, improvements in walking distance and functional endpoints were inconsistent. ABO was well tolerated with a few reports of weakness and dysphagia.
CONCLUSION: ABO improves muscle hypertonicity in adults with post-stroke LLS receiving concomitant rehabilitative therapy. Clinical trials pre-specify muscles for injection; this protocol-restricted approach may have affected the outcome of some studies. Our results illustrate that the effect of ABO in post-stroke LLS is not generalizable to LLS due to other neurologic conditions (e.g., multiple sclerosis). We also identified the need for conducting larger clinical trials of ABO in LLS due to other etiologies.

94. Dose conversion between abobotulinumtoxinA and onabotulinumtoxinA: a systematic literature review *Jack J. Chen, Pharm.D.*[1], Khashayar Dashtipour, M.D., Ph.D.[2], Alberto J. Espay, M.D.[3], Zoltan Mari, M.D.[4], William Ondo, M.D.[5]; (1) College of Pharmacy, Marshall B. Kethcum University, Fullerton, CA (2) Loma Linda University, Loma Linda, CA (3) University of Cincinnati Academic Health Center (4) Johns Hopkins University, Baltimore, MD (5) University of Texas Health Science Center-Houston
PURPOSE: The unit doses of botulinum toxin type-A products are not interchangeable; however, situations may arise that require estimation of approximate unit dose equivalences. In particular, unit dose conversion between onabotulinumtoxinA (ONA) and abobotulinumtoxinA (ABO) remains unresolved. We aimed to identify an appropriate unit dose conversion between ONA and ABO. An appropriate unit dose conversion is defined as one which results in similar (.ie., no statistical difference) in both efficacy and safety.
METHODS: A Cochrane-quality, systematic, PRISMA-guided, protocol-defined, literature review of 3 medical literature databases (PubMed, Cochrane Library, and EMBASE) was performed to identify randomized clinical studies, systematic reviews, and meta-analyses that directly compared ONA and ABO dose conversion ratios and published in English language between January 1991 and November 27, 2013. Targeted clinical applications included neurological and dermatological disorders and aesthetics. Studies that met predefined inclusion criteria were selected for formal data extraction and quality assessment.
RESULTS: Of the 127 publications identified, 12 unique publications met inclusion criteria for analysis. Study population included aesthetics (n = 6), blepharospasm (n = 1), cervical dystonia (n = 2), chronic anal fissure (n = 1), and hyperhidrosis (n = 2). Studies compared ONA to ABO dose conversion ratios of 1:2.5 (n = 3), 1:3 (n = 6), and 1:4 (n = 3). In these studies, an ONA:ABO conversion of 2.5 was associated with similar or lower rates of side effects for ABO, but also chance of less efficacy than ONA; an ONA:ABO conversion of 1:3 was associated with similar or higher efficacy for ABO, but an increased rate of adverse effects; and with ONA:ABO of 1:4, higher efficacy but an excessive rate of intolerable side effects for ABO.
CONCLUSION: A unit dose conversion ratio of ONA to ABO between 1:2.5 and 1:3 is the most appropriate evidence-based conversion estimate to achieve comparable safety and efficacy for therapeutic and aesthetics chemodenervation procedures.

95. Development and validation of a user-friendly multiple regression equation with increased accuracy and precision for the prediction of free phenytoin concentration in adult patients *Tony K. L. Kiang, B.Sc.(Pharm), Ph.D., ACPR*[1], Wendy Cheng, B.Sc.(Pharm), ACPR[1], Penny Bring, B.Sc.(Pharm), ACPR, Pharm.D.[1], Mary Ensom, B.Sc.(Pharm), Pharm.D., FASHP, FCCP, FCSHP, FCAHS[2]; (1) Department of Pharmacy, Vancouver General Hospital, Vancouver, BC, Canada (2) Faculty of Pharmaceutical Sciences, University of British Columbia, Vancouver, BC, Canada
PURPOSE: The Winter-Tozer equation is biased and imprecise in predicting free phenytoin concentrations. Although various equations with improved performance have been developed for specific patient populations (e.g. critical care), a more reliable general equation is still lacking. This study systematically developed and validated a novel regression equation and compared its predictive performance in adult patients.
METHODS: Age, serum creatinine (mg/dL), albumin (g/dL), steady-state total phenytoin concentration (μg/mL), and free phenytoin concentration were extracted retrospectively for adults admitted to critical care, general medicine, and neurology (n = 133). Subjects were excluded if enzyme inducers or inhibitors were administered. The study population was randomly divided into a development (n = 83) and validation set (n = 50). Spearman rank correlation and multiple linear regression were conducted on log-transformed data using SigmaStat (v 3.5). Mean prediction error (accuracy) and mean absolute error (precision) were calculated. Statistical difference ($p < 0.05$) was determined using Wilcoxon Rank-Sum test.
RESULTS: For the entire sample (mean ± SD): age (64 ± 19 years), serum creatinine (1.0 ± 0.7 mg/dL), albumin (2.6 ± 0.7 g/dL), total phenytoin concentration (10.9 ± 5.1 μg/mL), and free phenytoin concentration (1.4 ± 0.8 μg/mL). The development and validation sets were comparable. Spearman rank correlation and forward/backward stepwise multiple regression analyses incorporating all variables in the entire sample indicated that only albumin ($R^2 = 0.09$) and total phenytoin concentration ($R^2 = 0.53$) correlated with free phenytoin concentration. Subsequently, a multiple linear regression equation was generated using these 3 variables in the development set: Log(free phenytoin) = −0.602 − (0.956*Log(albumin)) + (1.066*Log(total phenytoin)), $R^2 = 0.85$, which exhibited reduced mean prediction error (−0.03 ± 0.28 vs 0.4 ± 0.4 μg/mL, mean ± SD) and mean absolute error (0.2 ± 0.2 vs 0.4 ± 0.3 μg/mL) compared to the Winter-Tozer equation, respectively, in the validation set ($p < 0.05$).
CONCLUSION: We have developed and validated a novel, user-friendly regression equation with improved predictive performance of free phenytoin concentration using a large sample of adult patients. The robustness of the equation will be further tested.

96E. Correlation between unified Parkinson's disease rating scale and global impression of change scales *Jack J. Chen, Pharm.D.*[1], Khashayar Dashtipour, M.D., Ph.D.[2], Pejman Dalaie, M.D.[2], Karen Frei, M.D.[3], Kayvan Kani, M.D., MPH[2], Camellia Kani, M.D., MAS[2]; (1) College of Pharmacy, Marshall B. Kethcum University, Fullerton, CA (2) Loma Linda University, Loma Linda, CA (3) Loma Linda University, CA
Presented at the 67th Annual Meeting of the American Academy of Neurology, Washington, DC, April 18–25, 2015.

98. Evidence for a minimum effective total concentration of valproic acid in photosensitive epilepsy patients: Retrospective analysis from a placebo-controlled iv valproate infusion study *Ronald Reed, B.S., R.Ph., Pharm.D.*[1], Dorothee Kasteleijn-Nolst Trenite, M.D., Ph.D., MPH[2], William Rosenfeld, M.D.[3], Bassel Abou-Khalil, M.D.[4]; (1) Department of Pharmacy Practice, Husson University School of Pharmacy, Bangor, ME (2) Faculty of Medicine & Psychology, University of Rome "Sapienza" II, Roma, Italy (3) Neurology, St. Lukes Hospital, Chesterfield, MO (4) Department of Neurology, Vanderbilt University Medical Center, Nashville, TN

PURPOSE: The conventional minimum total plasma concentration (C_{min}) valproic acid (VPA) value associated with efficacy in epilepsy is 50 mg/L. Evidence for this value is sparse (Schobben F, *Eur J Clin Pharmacol*1975). Nevertheless, data for VPA C_{min} was adopted by many medical/pharmacological textbooks, including a prominent AED book (RH Levy, Editor, Antiepileptic Drugs, 5thEdition 2002, pp. 780–800). We retrospectively explored this C_{min} concept using data from a pharmacodynamic-EEG effect trial of ivNaVPA in photosensitive epilepsy patients.

METHODS: The pharmacodynamic effect of an anti-epileptic drug (AED) can be determined by repeated photic stimulation in patients showing a Photo-Paroxysmal EEG Response (PPR). Standardized electro-encephalographic procedures were used (Kasteleijn-Nolst Trenitè DGA. *Neurophysiol Clin* 1999). PPR was transformed into standardized photosensitive range (SPR) units by blinded EEG reader (DKNT). A prospective, placebo-controlled, single-blind study, hourly stimulation, was performed (n = 13; 3M; 19–56 year-old). After Day 1 (placebo infusion × 12 hours), patients received ivNaVPA on Day 2; bolus to 30 mg/L over ~1 hour, increasing by ~6.4 mg/L/hour × next 11 hours, attempting to reach 100 mg/L. IRB approval was obtained; all patients signed informed consent. We used ANOVA, mixed-model analysis to compare change in PPR and VPA oncentrations over time (measured via HPLC).

RESULTS: Twelve (3 M; 19–56 years; 4 without AEDs) completed full EEG data × 2 days; 1 patient dropped. Total and free plasma VPA climbed steadily in all patients, ranging from 19–115 mg/L; free VPA ranged up to 18 mg/L. A decrease was observed for high flash frequency threshold ($p < 0.044$) and SPR units ($p < 0.041$) for all eye conditions. Statistically significant changes in high threshold & SPR generally started at hour #5, corresponding to total plasma VPA concentrations of 53 mg/L for the acute infusion.

CONCLUSION: The acute photosensitive suppressive effect of VPA starts at total plasma concentrations = 53 mg/L, correlating with the lower threshold of the therapeutic range used clinically.

99E. AEDs reduce the upper photosensitivity limit more than the lower photosensitivity limit in photosensitive patients: Implications for the design of the photosensitivity model Dorothee Kasteleijn-Nolst Trenite, M.D., Ph.D., MPH[1], *Ronald Reed, B.S., R.Ph., Pharm.D.*[2]; (1) Faculty of Medicine & Psychology, University of Rome "Sapienza" II, Roma, Italy (2) Department of Pharmacy Practice, Husson University School of Pharmacy, Bangor, ME
Presented at the American Epilepsy.

100. Intravenous versus Oral Acetaminophen for Pain Control in Neurocritical Care Patients *Dan Nichols, Pharm.D. Candidate 2016*[1], Pramit Nadpara, Ph.D.[1], Perry Taylor, Pharm.D.[2], Gretchen Brophy, Pharm.D., BCPS, FCCP, FCCM, FNCS[1]; (1) Virginia Commonwealth University School of Pharmacy, Richmond, VA (2) Virginia Commonwealth University Health System, Richmond, VA

PURPOSE: Intravenous (IV) acetaminophen (APAP) is used in neurocritical care (NCC) patients for its analgesia without sedation or antiplatelet activity. Research suggests that IV APAP produces earlier and higher levels in plasma and CSF compared to PO APAP. This study evaluates the analgesic effects of IV and PO APAP and use of adjunctive opioid therapy in NCC patients with moderate to severe pain.

METHODS: This retrospective study included patients admitted to the Neuroscience intensive care unit (NSICU) between May 1, 2012 and April 30, 2013 who received ≥1 dose of IV APAP. IV and PO APAP doses administered with a pre-dose pain score ≥4 within 1 hour of dosing were compared. Pain intensity difference (PID) was calculated as the change between the pain score prior to each dose and at 30 minutes, 1, 2, 3, and 6 hours post-dose. Pre and post-dose milligram-morphine-equivalents (MME) was defined as total MME given within 6 hours before and after APAP dosing, respectively. Descriptive statistics and a non-parametric analysis of covariance was used with control for potential confounding variables.

RESULTS: A total of 309 NSICU patients received 1601 doses of IV and 1367 doses of PO APAP during the study. The PID at 30 minutes post-dosing was significantly higher among those receiving IV APAP as compared to those receiving PO APAP ($p = 0.003$). However, no significant difference in PID was seen at 1 ($p = 0.2$), 2 ($p = 0.677$), 3 ($p = 0.386$), and 6 hours ($p = 0.672$). Furthermore, there was no significant difference in pre and post-dose MME between the two groups ($p = 0.456$ and 0.684).

CONCLUSION: IV APAP was significantly better than PO APAP at relieving pain within 30 minutes of dose administration, but no differences were seen following that time period. No difference was seen in opioid usage between the two groups.

Nutrition

101. Stakeholders views on why child obesity is rising in Lagos, Nigeria *Adeteju Adedini, B.Pharm., M.Sc.(Clinical Pharmacy)*; Clinical Pharmacy and Biopharmacy, University of Lagos, Nigeria, Ogun, Nigeria

PURPOSE: Child obesity is on the rise globally. According to the World Health Organization, the number of obese children would increase to 70 million by 2025 if no intervention is made. An increase in the prevalence of overweight and obesity amongst school children in Lagos State, Nigeria has been established but specific factors promoting its prevalence are unknown. The aim of this study is to identify the commonly expressed factor(s) responsible for the rise in prevalence of child overweight and obesity in Lagos, Nigeria

METHODS: Five focus group discussions were conducted with different groups of stake-holders involved in child care, namely: parents, teachers and health workers. Participants were recruited using a purposive sampling method; a validated question guide was employed for the discussion sessions. The discussions were recorded, collated, analysed using Grounded theory to extract themes.

RESULTS: Six themes emerged from the discussions as follows: *Civilization and lifestyle imbalance* resulting from busy work schedules of young mothers leading to adoption of westernized culture promoting preference for processed and fast food meals; *Insecurity and congestion* of the state which discourages out-door activities; *Ignorance of the populace* on the prevalence of child obesity in the state; *Inadequate educative and enlightenment programmes* in schools and by the Nigerian government; *Myths* on child care and body physique and *Societal perceptions*of the children born into affluent homes.

CONCLUSION: Some of the factors responsible for the rise in the prevalence of child obesity in Lagos, Nigeria have been identified. Preventive strategies to control the prevalence of obesity in children residing in Lagos state is considered for further studies.

Oncology

102. Outcomes of a clinical pharmacy service in the checking and validation of chemotherapy prescriptions to prevent medication errors: a 21-month study from a Chilean pediatric hospital *Silva M Felipe,*[1], Henríquez C. M[a] Jesús,[1], Concha V Emma, M.D.[2], Villarroel C. Milena, M.D.[2], Morales V. Jorge,[1]; (1) Clinical

Pharmacy Service (2) Oncology Unit, Hospital Dr. Luis Calvo Mackenna, Santiago, Chile
PURPOSE: To determine the incidence of potential medication errors in the chemotherapy prescriptions of pediatric oncology in- and outpatients.
METHODS: Every chemotherapy prescription and protocol from a pediatric sixteen bed inpatient oncology unit were checked daily from August 2012 to June 2014 (21 months). The revision was made by the Clinical Pharmacy Service and all chemotherapy orders required a check before preparation. The data was registered daily in an Excel spreadsheet as follows: patient name, file number, chemotherapy protocol, Physician name, medication error, and observations. The medication error type and patient outcome were classified according to the The National Coordinating Council for Medication Error Reporting and Prevention (NCC MERP).
RESULTS: Seven hundred and four (704) chemotherapy prescriptions with their administration protocols were checked. Three pharmacists participated in the checking process in 44%, 30%, and 26% of the prescriptions. One hundred sixty three potential errors were found (23.2%), and their type and incidence was as follows: wrong strength/concentration 109 (66.9%), improper dose 27 (16.6%), other 14 (8.6%), wrong time 7 (4.3%) and wrong rate 6 (3.7%). The incidence of improper dosing from all the prescriptions was 3.8% and 13 (48.1%) were related to non-cytostatic drugs. Fourteen (51.9%) improper doses corresponded to cytostatic drugs where 78.6% and 21.4% could have lead to over- orunderdosage respectively. The acceptance rate for the prescription corrections was 100% and according to the patient outcome all errors were classified as potential errors (B) because they ocurred but did not reach the patient.
CONCLUSION: Prescription errors are common in the clinical setting and they can be prevented by having a pharmacist check the chemotherapy before administration. Improper dose errors are very important to detect and prevent because they could cause significant harm to patients.

103. Are community pharmacists in Japan equipped to ensure the safe use of oral anticancer agents? *Shinya Suzuki, M.S.*[1], Gary Yee, Pharm.D., FCCP, BCOP[2], Hiroomi Sakurai, M.S.[3], Kenji Kawasumi, M.S.[4], Makoto Tahara, M.D., Ph.D.[5], Shinichiro Saito, B.S.[1], Philip Johnson, M.S.[6], Rick Abbott, B.Sc.(Pharm)[7], Kazushi Endo, B.Sc.(Pharm)[8]; (1) Department of Pharmacy, National Cancer Center Hospital East, Kashiwa, Japan (2) University of Nebraska Medical Center, Omaha, NE (3) Department of Pharmacy, Keio University Hospital, Tokyo, Japan (4) Department of Pharmacy, National Cancer Center Hospital East, Japan (5) Division of Head and Neck Medical Oncology, National Cancer Center Hospital East, Kashiwa, Japan (6) Premier, Tampa, FL (7) Dr. H. Bliss Murphy Cancer Center, St. John's, NF, Canada (8) The Japanese Society of Hospital Pharmacists, Tokyo, Japan
PURPOSE: Oral anticancer agents offer significant benefits over parenteral anticancer therapy and the number of oral agents is increasing. In a recent study of community pharmacists in Canada, Abbott et al. reported that more education and training on oral anticancer agents were required (J Oncol Pharm Pract 2014; 20:29–39). To evaluate the adequacy of education and training on oral anticancer agents in Japan, a survey of community pharmacists was conducted.
METHODS: Between May and June 2014, community pharmacists were asked to complete the same questionnaire used by Abbott et al. (translated into Japanese).
RESULTS: Three hundred community pharmacists responded to an online survey and 283 community pharmacists responded to a mailed survey. Nearly 85% of the respondents were between 30 and 60 years of age. The respondents' median number of years of experience was 14 years. Overall, 60% of the respondents dispensed five or fewer prescriptions for oral anticancer agents each week. Only 6–10% of respondents felt that they had received adequate education regarding oncology or oral chemotherapy. Although 81% of Japanese pharmacists had attended at least one continuing education event related to oncology in the past two years, only 54% felt comfortable dispensing oral anticancer agents and only 40% felt comfortable educating patients on oral chemotherapy. In a multivariate analysis, comfort in educating patients on oral chemotherapy was associated with an understanding of chemotherapy cycles and doses (odds ratio = 4.89, 95% CI [2.53–9.45]) and number of continuing education events attended (odds ratio = 1.67, 95% CI [1.35–2.08]). Age, number of years of experience, and number of oral chemotherapy prescriptions dispensed each week were not associated with comfort in educating patients on oral chemotherapy.
CONCLUSION: These results in Japanese pharmacists are similar to those reported in Canadian pharmacists, and demonstrate the need for additional education and training on oral chemotherapy.

104E. Efficacy and safety from RECOURSE: a multicenter, randomized, double-blind, phase 3 study of TAS-102 versus placebo with best supportive care in patients with metastatic colorectal cancer refractory to standard therapies *Thomas Ferencz, R.Ph., BCOP*[1], Howard Hochster, M.D.[1], Alfredo Falcone, M.D.[2], Takayuki Yoshino, M.D.[3], Rocio Garcia-Carbonero, M.D., Ph.D.[4], Nobuyuki Mizunuma, M.D.[5], Kentaro Yamazaki, M.D.[6], Yasuhiro Shimada, M.D.[7], Guillem Argiles, M.D.[8], Yoshito Komatsu, M.D.[9], Alberto Sobrero, M.D.[10], Eveline Boucher, M.D.[11], Marc Peeters, M.D., Ph.D.[12], Eric Van Cutsem, M.D., Ph.D.[13], Alberto Zaniboni, M.D.[14], Ben Tran, MBBS, FRACP[15], Mona Wahba, M.D.[16], Gihan Atalla, R.Ph.[16], Heinz-Josef Lenz, M.D., FACP[17], Atsushi Ohtsu, M.D., Ph.D.[3], Robert J. Mayer, M.D.[18]; (1) Yale Cancer Center, New Haven, CT (2) University of Pisa, Pisa, Italy (3) National Cancer Center Hospital East, Kashiwa-city, Japan (4) Hospital Universitario Virgen del Rocio, Sevilla, Spain (5) The Cancer Institute Hospital of Japanese Foundation for Cancer Research, Koto-ku, Japan (6) Shizuoka Cancer Center, Sunto-gun, Japan (7) National Cancer Center Hospital, Chuo-ku, Japan (8) Vall d'Hebron University Hospital, Barcelona, Spain (9) Hokkaido University Hospital, Sapporo, Japan (10) IRCCS Ospedale San Martino IST, Genova, Italy (11) Centre Eugene Maquis, Rennes cedex, France (12) Antwerp University Hospital, Belgium (13) Leuven Cancer Institute, UZ Leuven, Leuven, Belgium (14) Fondazione Poliambulanza, Brescia, Italy (15) The Royal Melbourne Hospital, Victoria, Australia (16) Taiho Oncology, Inc., Princeton, NJ (17) USC Norris Comprehensive Cancer Center, Los Angeles, CA (18) Dana-Farber Cancer Institute, Boston, MA
Presented at the 16th World Congress on Gastrointestinal Cancer of the European Society of Medical Oncology, Barcelona, Spain, June 25–28, 2014

106E. Thromboembolic events and thromboprophylaxis in thalidomide-treated multiple myeloma patients in Hong Kong – a retrospective study *Keary Zhou, Pharm.D.*, Ting Ting Ng, B.Pharm., Tsz Wai Lin, B.Pharm.; School of Pharmacy, The Chinese University of Hong Kong, Shatin, Hong Kong

107. Development of a predictive method for sensitivity to anti-EGFR Mabs using proteome analysis *Ayumu Nagamine*,, Daisuke Nagano,, Takuya Araki,, Koujirou Yamamoto,; Department of Clinical Pharmacology, Gunma University Graduate School of Medicine, Maebashi, Japan
PURPOSE: Genetic mutations of *KRAS* negatively predict success of anti-epidermal growth factor receptor monoclonal antibodies (anti-EGFR Mabs), and known as one of critical factors determining the efficacy of anti-EGFR Mabs. On the other hand, more than half of patients without *KRAS* mutations are still resistant to anti-EGFR Mabs. Recently, qualitative or quantitative changes of several proteins are focused on as biomarkers to

predict drug effects, since they directly affects the drug efficacy. In this study, to develop more sensitive and useful biomarker for anti-EGFR Mabs efficacy, We analyzed proteins derived from *KRAS*wild-type colorectal cancer (CRC) cell lines with different sensitivity to anti-EGFR Mabs comprehensively, and detect peptide peaks correlated with the sensitivity to anti-EGFR Mabs.
METHODS: CRC cell lines with different sensitivities to anti-EGFR-Mabs, cetuximab, without *KRAS*, *NRAS*, *BRAF* and *PIK3CA* mutation (sensitive: C99, SW48, partial resistant: HT55, resistant: CACO2, COLO320DM) were used. Total proteins were digested by trypsin and analyzed by LC-TOF/MS. Principal component analysis (PCA) and orthogonal partial least-squares-discriminant analysis (OPLS-DA) were performed to find specific components for cetuximab sensitivity.
RESULTS: Around 26,000 peaks derived from 5 cell lines including 501 and 1,391 specific peaks to C99 or SW48 and CACO2 or COLO320DM, respectively, were detected. In those peaks, 15 and 1 peaks were determined as common peaks to sensitive cell lines and resistant cell lines, respectively. Ten peaks showed significant correlations with sensitivity of cetuximab, and 1 peak (m/z 1221.412) was extracted as an independent factor by multi regression analysis ($p < 0.001$).
CONCLUSION: Using LC-TOF-MS analysis, PCA and OPLS-DA, we could extract some peaks which significantly correlate with sensitivity to cetuximab. We will identify the protein composed by those peaks using LC-MS/MS analysis and assess the usefulness of those peaks as biomarkers to predict efficacy of anti-EGFR Mabs in future.

Other

109. Defining a step-wise approach for clinical pharmacy services in a dental medicine clinic to maximize interprofessional collaboration
Lisa M. Palmisano, Pharm.D., BCACP[1], Jill S Borchert, Pharm.D., BCPS, FCCP[1], Jan Kum, Pharm.D. Candidate[2], Leslie LaMontagne, Pharm.D. Candidate[2], Gary Drahos, D.D.S., M.J., R.Ph.[3]; (1) Department of Pharmacy Practice, Midwestern University, Downers Grove, IL (2) Chicago College of Pharmacy, Midwestern University, Downers Grove, IL (3) College of Dental Medicine – Illinois, Midwestern University, Downers Grove, IL
PURPOSE: The purpose of this study was to examine the specific trigger(s) and interventiom(s) of the pharmacy consults which were provided to various dental faculty, students, and patients in a dental medicine clinic since the initiation of the Pharmacy Consult Protocol in December 2013.
METHODS: A retrospective chart review from December 2013 to May 2014 was done by evaluating the Pharmacy Consult Forms within the dental electronic medical record database. Descriptive statistics were used to analyze the following data: 1) triggers for each pharmacy consult type, 2) total interventions provided and in respect to specific triggers, and 3) overview of the patients' medical conditions and number of medications which the clinical pharmacist encountered.
RESULTS: Over 6 months, there were 267 pharmacy consults provided to various dental faculty, students, and/or patients. From all pharmacy consults, the most common specific triggers were patients' documented elevated blood pressure(s) (18%, n = 48), medication questions (15.4%, n = 41), anticoagulation use (14.2%, n = 38), unclarified past medical/family history (13.1%, n = 35), or multiple complex medical conditions (12.4%, n = 33). On average, there were 3.0 + 1.4 intervention types provided during a single consult (total interventions, n = 791). Of the ten types of interventions, 24.5% (n = 194) consisted of educating the dental faculty, students, and/or patients to enhance their understanding of disease state management and 17.2% (n = 136) were assessing the patient's health status. The average patient was taking 7.8 + 5.4 medications and had 4.3 + 2.6 current or past medical conditions.
CONCLUSION: The specific triggers of this study provides insight on which risk stratifications in the Pharmacy Consult Protocol should be modified to elicit a pharmacy consult in the dental clinic. The modifications may allow for more thorough direct pharmacy interventions which would aim to ultimately enhance the patient care provided in the dental medicine clinic.

110. Analysis of quality-related events and true errors in telepharmacy
Jessica Vickers, Pharm.D.[1], Rex W. Force, Pharm.D., BCPS, FCCP[2], Autumn Hayes, Pharm.D.[1]; (1) College of Pharmacy, Idaho State University, Pocatello, ID (2) Department of Family Medicine, Departments of Family Medicine and Pharmacy Practice, Idaho State University, Pocatello, ID
PURPOSE: Telepharmacy is a viable option for rural communities lacking traditional community pharmacy (TCP) service. Error rates in telepharmacy may differ from TCP. To evaluate this, we developed a reporting system to document error rates in telepharmacy and compared them with literature based rates in TCP and established telepharmacies.
METHODS: A data collection system was created to identify types and workflow locations of quality-related events (QRE) and true errors. QRE included errors that occurred at any point up to the patient's receipt of the prescription. True errors were defined as those discovered after patient receipt of the medication. Data collection was based on non-punitive self-report; pharmacy staff were educated on the process. Errors were categorized based on harm potential. Statistical process control charts were developed to track error rates and QRE over time. Comparisons will be made with literature-based estimates of error rates in TCP and telepharmacy settings.
RESULTS: The data collection period was 10/13/14–2/6/15. During this period, 135 QRE were recorded in 11,492 prescriptions (1.17%); 9 true errors occurred (0.078%);. Published error rates in telepharmacies for QRE and true errors were 1.34% and 0.17%, respectively. In TCP, true error rates reported in the literature range from about 0.5–4%. Of the QRE and true errors in this project, 42.5% were unlikely to cause harm, 25.7% were possibly harmful, and 31.7% were likely to cause harm. Statistical process control charts have indicated a stable process over time.
CONCLUSION: Based on these data, the QRE and true error rates observed in this telepharmacy setting are comparable to those reported in the literature in other telepharmacy projects and are lower than many studies evaluating true errors in TCP.

Pain Management/Analgesia

111. Efficacy and Safety of Epidural tramadol versus morphine for postoperative pain after Cesarean section in China: a meta-analysis
Sang Xu, M.Sc.; Department of Pharmacy, Sir Run Run Shaw Hospital, School of Medicine, Zhejiang University, Hangzhou, Zhejiang, China
PURPOSE: To evaluate the efficacy and safety of epidural tramadol versus morphine for postoperative pain after cesarean section in China.
METHODS: We searched the PubMed, Embase, Cochrane, Medline Ovid, CNKI, Vip and Wanfang databases up to January 2015 for randomized controlled trials (RCTs) in Chinese population published in the English and Chinese languages. All the trials studied the efficacy and safety of epidural tramadol for postoperative pain after cesarean section. The quality of included RCTs was assessed and the data was extracted by two reviewers independently using the Cochrane method.
RESULTS: Seven RCTs were included with a total of 274 participants who received epidural tramadol and 275 participants who received epidural morphine. These studies all used visual analogue scale (VAS) to measure pain intensity, indicated that the postoperative 8 hours, participants who received epidural morphine had less pain (MD = 0.09; 95% confidence interval [CI] [−0.06, 0.23], p = 0.25) than patients who received epidural tramadol; postoperative 12 hours, participants who received epidural tramadol had less pain (MD = −0.09; 95% confidence interval [CI] [−0.22, 0.05], p = 0.21) than patients who received epidural morphine.

Postoperative 24 hours, participants who received epidural morphine had less pain (MD = 0.14; 95% confidence interval [CI] [−0.09, 0.38], p = 0.22) than patients who received epidural tramadol.Adverse events (e.g., nausea and vomiting (RR = 0.40, 95% Cl [0.21, 0.75], p = 0.004); pruritus (RR = 0.17, 95% Cl [0.06, 0.43], p = 0.0002); uroschesis (RR = 0.16, 95% Cl [0.05, 0.47], p = 0.0009); respiratory depression [OR = 0.15, 95% Cl (0.02, 1.35), p = 0.09]. Among these adverse events pruritus is occurred most often with morphine than tramadol.
CONCLUSION: Morphine showed significant improvement in pain intensity than tramadol for postoperative pain after cesarean section in China, but it's adverse events, like respiratory depression may lead to life threatening, and pruritus occurred more often cause the participants can't tolerate. However, tramadol's adverse events are reversible and not life threatening.

112. Methadone and QTc prolongation in pain and palliative care patients: a case control study *Katherine Juba, Pharm.D.*[1], Tina Khadem, Pharm.D.[2], David Hutchinson, Pharm.D.[1], Jack Brown, Pharm.D., M.S., BPS[1]; (1) Department of Pharmacy Practice, Wegmans School of Pharmacy, St. John Fisher College, Rochester, NY (2) Department of Pharmacy, University of Rochester Medical Center – Highland Hospital, Rochester, NY
PURPOSE: Methadone (ME) is commonly used in pain and palliative care (PPC) patients with refractory pain or intolerable opioid adverse effects (AEs). A unique ME AE is its QTc interval prolongation risk but most evidence exists in methadone maintenance therapy (MMT) patients. Our goal was to identify QTc interval prolongation risk factors in PPC patients receiving ME and other medications known to prolong the QTc interval and develop a risk stratification tool.
METHODS: We performed a case control study of adult inpatients at the University of Rochester receiving ME for pain management between 3/2011 and 3/2014. Patients with a QTc >470 msec (males) and >480 msec (females) were matched 1:2 according to age, history of QTc prolongation, and gender with patients who did not have a prolonged QTc interval. QTc prolongation risk factors were collected for both groups. Patient demographics were analyzed using descriptive statistics. Univariate analysis was performed using conditional logistic regression on single covariates. Classification and regression tree analysis was used to identify ME exposure and QTc prolongation.
RESULTS: Cases as compared to controls on average had more chronic diseases such as heart failure (35.6% versus 10.6%, p = 0.001), rheumatologic disorders (29% vs 9%, p = 0.001), chronic kidney disease (34% vs 22%, p = 0.03) and moderate/severe liver disease (11% vs 1%, p = 0.001). Predictors of QTc prolongation included moderate/severe liver failure (RR: 31, p = 0.02), CHF (RR: 5, p = 0.001), PUD (RR: 5, p = 0.001), rheumatologic disorders (RR: 4, p = 0.001), famotidine use (RR: 4, p = 0.05) and methadone doses >45 mg/day (RR: 2, p = 0.04).
CONCLUSION: In this cohort of PPC subject's predictors of QTc prolongation included common chronic medical conditions, famotidine use, and patients receiving methadone doses >45 mg/day.

Pediatrics

116. Saliva and plasma oxcarbazepine concentrations in pediatric patients with epilepsy *Ying Zhou,*; Department of Pharmacy, Peking University First Hospital, Beijing, China
PURPOSE: Monohydroxycarbamazepine (MHD, 10-hydroxy-carbamazepine) is the main active metabolite of oxcarbazepine (OXC). The relationship between plasma and saliva concentrations of MHD was prospectively studied on Chinese epileptic children. The proper MHD concentration range in plasma and saliva for epileptic children was investigated and the effective and safety rate of oxcarbazepine in pediatric patients was also preliminarily assessed.
METHODS: Blood and saliva samples were collected and MHD levels were measured by high performance liquid chromatography system. The correlation between saliva and plasma MHD concentrations was analyzed by statistical software SPSS (Version 16.0). Through investigating the effectiveness and security of oxcarbazepine, the authors initially identified the proper MHD concentration range in plasma and saliva special for epileptic children.
RESULTS: Thirty-two pairs of blood and salivary samples were obtained from 28 pediatric epileptic patients (13 males, 15 females; mean age, 5.77 ± 3.53 years). There was an apparent positive correlation between MHD plasma and saliva concentration (Y = 1.14x + 3.44 [n = 32], R = 0.888, p < 0.01). MHD saliva/plasma ratio did not affected by pediatric patients' age and sex. The effective plasma concentration range of oxcarbazepine was 4.3–30 μg/mL, and the corresponding saliva concentration range was 2.2–28 μg/mL for pediatric patients in this study. Oxcarbazepine treatment was 62.5% effective and the safety rate was 65.6% according to this study.
CONCLUSION: High correlation between plasma and salivary MHD levels supported the use of saliva instead of plasma for OXC monitoring in Chinese epileptic children. The plasma and saliva MHD concentration ranges for pediatrics were obtained and the effective and safety rates were evaluated. The obtained equations in the present study could be useful for clinical use to monitor the OXC concentration by saliva and to adjust the dosage regimen.

117. Early Use of Indomethacin for Prevention of Intraventricular Hemorrhage: a case study highlighting the importance of secondary outcomes *Jennifer Pham, Pharm.D.*; Department of Pharmacy Practice, College of Pharmacy, University of Illinois at Chicago, Chicago, IL
PURPOSE: Prophylactic indomethacin may be administered to extremely low birth weight (ELBW) neonates to prevent intraventricular hemorrhage (IVH). The purpose of this study was to determine whether prophylactic indomethacin is associated with reduced incidence of severe IVH when compared to historical controls. Secondary purposes were to determine the incidence of patent ductus arteriosus (PDA) and other comorbidities and to evaluate adverse effects associated with prophylactic indomethacin.
METHODS: This was a retrospective case-control study of all ELBW neonates given indomethacin for IVH prevention from 9/1/10 to 8/31/13. Neonates who did not receive indomethacin for IVH prevention, matched by birth weight (BW) subgroups (<500 g 500–750 g, 751–1000 g) served as controls (1:1). Data collection included demographics, outcomes, and adverse effects including renal insufficiency, necrotizing enterocolitis, intestinal perforation, and gastrointestinal bleed.
RESULTS: A total of 158 neonates were included (mean BW: 819 ± 156 g, gestational age: 26.8 ± 1.9 weeks). There was no difference in baseline demographics. Rates of severe IVH were similar between groups (12.7% vs 13.9%, p = 1.0). The incidences of PDA (29.1% vs 64.6%, p = 0.0001), bronchopulmonary dysplasia (70.9% vs 86.1%, p = 0.0322) and pulmonary hemorrhage (1.3% vs 11.4%, p = 0.0177) were significantly lower in the indomethacin group. The need for pharmacological closure of the PDA (13/9% vs 40.5%, p = 0.0001) and surgical ligation (3.8% vs 19%, p = 0.0046) were also significantly lower in the indomethacin group. The cost of indomethacin (prophylaxis/treatment) and surgical ligation ($66,000 vs $108,000, p < 0.0001) is significantly less in the indomethacin group. No differences in mortality, length of stay, or adverse effects were noted.
CONCLUSIONS: Although prophylactic indomethacin did not decrease the incidence of severe IVH in ELBW neonates, rates of PDA, bronchopulmonary dysplasia, and pulmonary hemorrhage were significantly lower. The reduced need for PDA treatment may represent a significant cost savings.

118. Cisatracurium infusion rates in infants and children receiving extracorporeal membrane oxygenation (ECMO) *Marcia L. Buck, Pharm.D.*[1], Samuel Addison, RRT[1], Gary Fang, M.D.[2]; (1) University of Virginia Children's Hospital, Charlottesville, VA (2)

Department of Pediatrics, School of Medicine, University of Virginia, Charlottesville, VA
PURPOSE: Cisatracurium is often used during ECMO to minimize the risk of cannula, intravenous catheter, or endotracheal tube displacement. There are currently no studies evaluating dosing requirements in this population.
METHODS: A single-center retrospective study was performed in patients <18 years of age on ECMO between 7/1/11 and 12/31/14. Cisatracurium infusion rates, duration, bolus doses, and adverse effects were evaluated.
RESULTS: Twenty-six of 67 ECMO patients (39%) received cisatracurium infusions. The median patient age was 2.5 months (range 1 day–4 years); 20 (77%) had cardiac disease and 6 had pulmonary disease. All patients were on reduced-volume circuits; 24 on veno-arterial ECMO and 2 on veno-venous. Cisatracurium was initiated at 1.8 ± 1.4 μg/kg/minute. Eight patients were on cisatracurium at cannulation. Sedation and analgesia included morphine (25 patients), midazolam (19), fentanyl (4), and dexmedetomidine (4). Cisatracurium infusions were titrated to produce weakness without complete neuromuscular blockade, allowing patients to maintain slight movements of fingers or toes. Twenty patients required a dose increase, with a maximum infusion rate of 4.2 ± 3.5 μg/kg/minute. Bolus doses (0.1–0.5 mg/kg) were used in all patients, while16 also received rocuronium (0.5–2 mg/kg). The median duration of ECMO was 150 hours (range 38–809 hours), with a cisatracurium duration of 74 hours (range 4–242 hours) and a final infusion rate of 4.0 ± 3.6 μg/kg/minute. Fourteen patients (54%) survived to decannulation. No dislodged cannulas, catheters, or endotracheal tubes were noted. There were no adverse effects attributed to cisatracurium, and none of the patients experienced residual muscle weakness after discontinuation.
CONCLUSIONS: Cisatracurium infusion rates during ECMO were similar to those documented in several pediatric studies. In spite of the prolonged infusions and potential differences in pharmacokinetics with ECMO, there was no evidence of a need for higher initial infusion rates or more rapid dose escalation in this population.

119. Neonatal indomethacin for prevention of intraventricular hemorrhage: a study of plasma concentrations, pharmacogenomic factors, and outcomes Deborah Raithel, Pharm.D.[1], Jennifer Pham, Pharm.D.[2], Larisa H. Cavallari, Pharm.D.[3], Donna Kraus, Pharm.D.[2], *Kirsten Ohler, Pharm.D.*[2]; (1) University of Chicago Medicine, Comer Children's Hospital, Chicago, IL (2) College of Pharmacy; Department of Pharmacy Practice, University of Illinois at Chicago, Chicago, IL (3) Department of Pharmacotherapy and Translational Research, University of Florida, Gainesville, FL
PURPOSE: Indomethacin may be administered to extremely low birth weight neonates to prevent intraventricular hemorrhage (IVH). The purpose of this study was to (1) determine if a difference exists in indomethacin plasma concentrations between neonates who develop IVH and those who do not; (2) evaluate cytochrome P450 (CYP)2C9 and CYP2C19 polymorphisms in relation to indomethacin plasma concentrations and outcomes.
METHODS: This prospective cohort study included neonates who received at least one dose of indomethacin (0.1 mg/kg intravenously every 24 hours for 3 doses) for IVH prevention. Indomethacin trough concentrations were determined 24 hours after each dose. CYP2C9 and CYP2C19 polymorphisms were determined by PCR and pyrosequencing or capillary sequencing. Perinatal risk factors for IVH were assessed.
RESULTS: Seven (32%) of the 22 neonates developed IVH; grade II: 3, grade III: 2, grade IV: 2. No difference in perinatal risk factors was observed except more neonates who developed IVH were exposed to antenatal indomethacin (57.1% vs 42.9%, $p = 0.021$). Plasma indomethacin concentrations were not significantly different between groups at any time point (0.27 vs 0.22 μg/mL, 0.47 vs 0.5 μg/mL, 0.8 vs 0.77 μg/mL; $p = 0.278$, 0.739, and 0.842, IVH vs no IVH, respectively). Neonates with a CYP2C9 reduced function allele (*2, *3 or *8) had higher indomethacin concentrations than those with normal enzyme activity genotype, while ultra-metabolizers (CYP2C19 *1/*17 and *17/*17) had lower indomethacin concentrations; however, these differences were not statistically significant. There was no association between any genotype and occurrence of IVH.
CONCLUSIONS: Neonates exposed to antenatal indomethacin may be at higher risk for IVH. Indomethacin trough concentrations were not associated with IVH prevention, nor were they significantly altered by CYP2C9 or CYP2C19 polymorphisms. The role of ontogeny of CYP enzymes or genes involved in indomethacin pharmacodynamics for IVH prevention in extremely low birth weight neonates remains to be determined.

120. Therapeutic drug monitoring of voriconazole in children with cancer *Claudio González,*[1], María Jose Rojas, M.D.[1], Rodolfo Villena, M.D.[1], Ariel Parra,[2], Marcela Zubieta, M.D.[1], Carmen Salgado, M.D.[1], Mirta Acuña, M.D.[2], Donna Benadof, M.D.[2]; (1) Hospital Exequiel González Cortés, Santiago, Chile (2) Hospital Roberto del Río, Santiago, ChileFungal infections can complicate the disease progression in children with cancer. Voriconazole is the treatment of choice for many invasive fungal infections (IFI) and its pharmacokinetic is highly variable between individuals due to hepatic metabolism and drugs interactions, which justify the use of therapeutic drug monitoring to adjust doses.
PURPOSE: To evaluate the frequency to achieve appropriate voriconazole plasma levels in pediatric patients with cancer and IFI.
METHODS: We included children with cancer and diagnosis IFI from two Chilean hospitals who were treated with voriconazole. At fifth day, voriconazole levels were taken to continue or adjusts the dose. A level between 1 and 5.5 μg/mL was considered appropriate.
RESULTS: We evaluated the plasma levels of voriconazole for 15 patients (66.6% were men (10/15); average age 7.5 years, 11 patients with hematology malignancies and 4 with solid tumors). There was a total of 40 levels, of these a 47.5% reached therapeutic level. In assessing the first levels of each child, 33% of the evaluated level was adequate (5/15), with an average dose of 14.8 mg/kg/day. 60% of the cases (9 levels), required dose adjustment (8 in the group that did not reach level) and 1 in the group that arrived at a therapeutic level. Of the group that did not reach therapeutic level and required dose adjustment, the frequency of scope of therapeutic level in a second level of control was 57% (4/8) with an average dose of 22,5 mg/kg/day.
CONCLUSION: The dosage of voriconazole is insufficient to reach therapeutic levels in two thirds of children with cancer. Higher dose and frequent measurement of plasma levels should be considered in this situation.

121. A review of pediatric intravenous vancomycin dosing at a Tertiary Hospital in Singapore *Cheryl Neoh, B.Sc.(Pharm)*[1], Mas Suhaila Isa, MBBS, MRCPCH (UK)[2], Tsingyi Koh, Pharm.D., BCPS[1]; (1) Department of Pharmacy, National University Health System Singapore, Singapore (2) Department of Pediatric Infectious Disease, National University Health System Singapore, Singapore
PURPOSE: Previous studies have shown that vancomycin doses 60 mg/kg/day is required to achieve serum trough levels of 10–20 μg/mL in pediatric patients. The purpose of this study is to determine the proportion of patients achieving serum trough levels based on institutional practice of 40–60 mg/kg/day, the optimal initial vancomycin dosing regimen in pediatric patients, and to identify patient-specific factors that can affect dose needs.
METHODS: A retrospective chart review of predominantly Asian patients 1 month to 18 years old prescribed vancomycin between July 2013 and November 2014 at our institution was conducted. Patients were included if they had at least one appropriate steady-state trough level drawn. Patients were excluded if they were in the neonatal intensive care unit, renally impaired or had incomplete information available.
RESULTS: A total of 73 unique patients and 189 steady-state troughs were analyzed. Of these, 28.6% troughs achieved thera-

peutic targets. Mean starting dose was 50.3 mg/kg/day, titrated to a mean of 63.4 mg/kg/day over an average of 2.9 days to achieve serum trough levels of 10–20 μg/mL.

Table 1. Mean dose requirement to achieve trough 10–20 μg/mL:

	1 month to 6 months (Total n = 7)	7 months to 7 year (Total n = 92)	>7 years (Total n = 90)
All (Total n = 189)	60.53 (n = 5)	66.72 (n = 21)	59.02 (n = 28)
Hematology/ Oncology (Total n = 134)	56.76 (n = 2)	68.26 (n = 12)	58.63 (n = 22)
Non-Hematology/ Oncology (Total n = 55)	63.04 (n = 3)	64.66 (n = 9)	60.45 (n = 6)

CONCLUSION: The findings from this study demonstrates that initial doses of at least 60 mg/kg/day is required to achieve vancomycin trough levels of 10–20 μg/mL in Asian pediatric patients. Our data suggests that patients <7 months and >7 years have lower vancomycin dose requirements compared to patients aged 7 months – 7 years. Hematology/Oncology patients between 7 months – 7 years may require doses up to 70 mg/kg/day. Larger in-depth studies are warranted to confirm this observation.

Pharmacoeconomics/Outcomes

122. Liposomal bupivacaine compared to no local infiltration for postsurgical analgesia in total knee and hip arthroplasty: a randomized, prospective, observational, pilot study *Kristin Hillman, Pharm.D.*, Richa Airee, Pharm.D., BCPS, Jerry Robinson, Pharm.D., BCPS, Rachel Lopacki, B.S.; Pharmacy Department, Huntsville Hospital, Huntsville, AL

PURPOSE: This study was designed to determine the efficacy and safety of the local infiltration of liposomal bupivacaine and the cost-effectiveness as an analgesic for patients undergoing total knee and hip arthroplasty (TKA/THA).

METHODS: After randomization, patients who received no local infiltration (n = 23) for postsurgical analgesia were compared to patients who received liposomal bupivacaine (n = 22). All patients received patient-controlled analgesia for the first 24 hours post analgesia stop time (AST) and oral opioids in the second and third 24 hours post AST. Comparisons of opioid consumption, numeric pain scales, and adverse drug reactions (ADRs) were assessed. A planned sample size of 43 patients would have 90% power to detect a 5% difference in opioid consumption using the two-tailed t-test and in numeric pain scales using the Mann-Whitney U-Test.

RESULTS: No ADRs were reported.

Average Opioid Consumption	Exparel (morphine equivalents)	No local infiltration (morphine equivalents)	p-Value
First 24 hours	49 mg	48.5 mg	0.96
Second 24 hours	59.3 mg	56.6 mg	0.82
Third 24 hours	38.8 mg	47.8 mg	0.45
Total 72 hours	151.6 mg	150.3 mg	0.96

Average Numeric Pain Scale	Exparel	No local infiltration	p-Value
First 24 hours	2.5	2.8	0.27
Second 24 hours	2.5	2.3	0.84
Third 24 hours	2.4	2.5	0.5
Total 72 hours	2.4	2.3	0.69

CONCLUSIONS: Liposomal bupivacaine proved ineffective in reducing opiate use without a significant change in pain scores. Recommend not to use this drug for TKA/THA leading to a $300 cost avoidance per surgery and approximately a $540,000 cost avoidance per year.

123. Evaluation of intravenous immune globulin prescribing patterns prior to and following a standardized prescribing algorithm at a tertiary care center *Calvin Ice, Pharm.D.*[1], Lance Oyen, Pharm.D.[2]; (1) Department of Pharmacy Services, Mayo Clinic Hospital – Rochester, Rochester, MN (2) Department of Pharmacy Services, College of Medicine Mayo Clinic, Mayo Clinic Hospital – Rochester, Rochester, MN

PURPOSE: Intravenous immune globulin (IVIG) products are utilized for various indications in numerous patient populations, resulting in inconsistent provider prescribing. To provide consistent patient care across medical disciplines and to explore cost-containment strategies for one of our highest medication expenditures, our institution implemented an IVIG prescribing algorithm that included dosing recommendations for 68 institutionally-approved indications, standardized dosing based on ideal body weight, and pharmacist-driven dose rounding to five gram increments. The present study was conducted to determine adherence to the IVIG algorithm and its impact on IVIG utilization.

METHODS: This retrospective descriptive analysis was conducted at Mayo Clinic in Rochester, Minnesota. Included patients received at least one IVIG dose in March 2014 (pre-algorithm timeframe) or in October-November 2014 (post-algorithm timeframe). Summary statistics were computed for IVIG algorithm adherence, indication, and dosing. Data for these endpoints and demographics were abstracted from the electronic medical record.

RESULTS: A total of 266 unique patients were included, resulting in 128 pre-algorithm and 198 post-algorithm patients receiving IVIG in the two timeframes. IVIG was primarily utilized in adult patients (84%) in the outpatient setting (83%). Complete algorithm adherence to all criteria increased from 28% pre-algorithm to 55% within five months following implementation. The discrete algorithm criteria improved were: approved indications (19%), appropriate body weight dosing (54%), appropriate dose rounding (33%), and dose consistency with recommendations (15%). These changes resulted in 8.7% decrease in IVIG grams purchased comparing October-December 2013 to 2014 despite 17% increase in patients receiving IVIG.

CONCLUSIONS: This analysis demonstrated more consistent inter-provider patient care with IVIG prescribing and reduced IVIG grams purchased with implementation of the standardized algorithm. The results of this study are presently being applied within our institution to develop prescribing algorithms for other high cost medications, and a similar concept may prove useful to develop consistency and cost containment at other institutions.

124. Intradermal versus intramuscular influenza vaccination in Hong Kong elderly: A cost-effectiveness analysis Man-Kit Leung, B.Pharm., *Joyce You, Pharm.D., BCPS*; School of Pharmacy, The Chinese University of Hong Kong, Hong Kong

PURPOSE: Influenza results in excess morbidity and mortality and causes significant burden in a society. Outcomes of influenza vaccination program are influenced by vaccine coverage rate. Intramuscular (IM) influenza vaccine is currently reimbursed by the government in Hong Kong for elderly, yet needle anxiety is a barrier of vaccine coverage. Microneedle technology delivers vaccine intradermally (ID) and enhances elderly's willingness to accept influenza vaccination. The cost-effectiveness of ID and IM influenza vaccines were compared in Hong Kong elderly from healthcare payer's perspective.

METHODS: A decision tree model was used to simulate outcomes over a 12-month period in elderly aged 65 years or older when ID and IM influenza vaccines were offered. Model inputs were derived from literature. Outcome measures included total

cost and quality-adjusted life-year (QALY) loss due to seasonal influenza infection. Robustness of model was examined by sensitivity analysis.
RESULTS: In base-case analysis, ID vaccine (USD38.25 and 0.00237 QALY loss) was more costly with lower QALY loss than IM vaccine (USD34.82 and 0.00253 QALY loss) (USD1 = HKD7.8). Incremental cost per QALY saved by ID versus IM was USD21,438. Using the Hong Kong gross domestic product (GDP) per capita (USD37,910) as threshold of willingness-to-pay (WTP) per QALY, ID influenza vaccine was the cost-effective option. Base-case results were sensitive to three factors. IM influenza vaccine would become cost-effective if elderly was older than 76 years old, influenza vaccine effectiveness was less than 22%, or coverage rate of ID vaccine was less than 46%. In 10,000 Monte Carlo simulations, ID and IM vaccines were cost-effective in 57% and 43%% of time (at WTP = GPD per capita), respectively. If WTP threshold was 3x GPD per capita, ID vaccines would be cost-effective in 92% of simulations.
CONCLUSION: ID influenza vaccine appears to be cost-effective when comparing to IM vaccine in Hong Kong elderly.

125. Cost-effectiveness of myeloid growth factor prophylaxis strategies for febrile neutropenia among non-Hodgkin's lymphoma patients receiving curative-intent R-CHOP chemotherapy *Xiao Jun Wang, B.Sc.*[1], Tiffany Tang, M.D.[2], Mohd Farid, M.D.[2], Richard Quek, M.D.[2], Miriam Tao, M.D.[2], Soon Thye Lim, M.D.[2], Hwee Lin Wee, Ph.D., B.Sc.(Pharm) (Hons)[1], Alexandre Chan, Pharm.D., MPH, FCCP, BCPS, BCOP[1]; (1) Department of Pharmacy, National University of Singapore, Singapore, Singapore (2) Department of Medical Oncology, National Cancer Centre Singapore, Singapore, Singapore
PURPOSE: To compare the cost-effectiveness of various myeloid growth factor prophylaxis strategies for reducing febrile neutropenia (FN) risk among Non-Hodgkin's Lymphoma patients receiving curative-intent R-CHOP chemotherapy.
METHODS: A Markov model was created to compare seven prophylaxis strategies in a cohort of patients receiving six cycles of R-CHOP in Singapore: (1) Primary Prophylaxis (PP) with nivestim (biosimilar filgrastim) throughout all cycles of chemotherapy; (2) PP with nivestim at the first two cycles of chemotherapy; (3) Secondary Prophylaxis (SP) with nivestim; (4) PP with pegfilgrastim throughout all cycles of chemotherapy; (5) PP with pegfilgrastim at the first two cycles of chemotherapy; (6) SP with pegfilgrastim; and (7) no prophylaxis (NP). Hospital's perspective was taken, and cost-effectiveness was expressed as costs per FN episode avoided over six cycles of chemotherapy. Probabilistic sensitivity analysis was conducted.
RESULTS: Strategy #3, #6, and #7 were dominated in the base case analysis by strategy #5. Costs associated with strategy #2, #5, #1, and #4 were US$ 3,813, US$ 4,056, US$ 4,545, and US$ 5,331, respectively. The incremental cost effectiveness ratios for strategy #5 vs #2, strategy #1 vs #5, and strategy #4 vs #1 were US$ 13,532, US$ 22,565 and US$ 30,452 per FN episode avoided, respectively. At a willingness-to-pay (WTP) of US$ 6,581 to avoid one FN episode, the probabilities of strategy #2 and #5 to be cost-effective were 56.0% and 42.8%, respectively. PP with pegfilgrastim throughout all chemotherapy cycles would have the highest probability to be cost-effective, if the WTP per FN episode prevented was beyond US$ 33,700.
CONCLUSION: In Singapore, PP with pegfilgrastim throughout all chemotherapy cycles is the most effective, but more costly than other strategies. The cost-effective prophylaxis strategy would depend on the WTP to avoid one episode of FN.

126. Cost-effectiveness of pharmacist-managed anticoagulation service compared with usual care in older Singaporean adults with atrial fibrillation Wen Bing Brandon Chua, B.Sc.(Pharm) (Hons)[1], *Hua Heng McVin Cheen, B.Sc.(Pharm) (Hons)*[2], Ming Chai Kong, B.Sc.(Pharm), M.Sc.(Pharm)[2], Li Li Chen, B.Pharm., M.Pharm. (Clinical)[2], Hwee Lin Wee, B.Sc.(Pharm) (Hons), Ph.D.[1]; (1) Department of Pharmacy, National University of Singapore, Singapore, Singapore (2) Department of Pharmacy, Singapore General Hospital, Singapore, Singapore
PURPOSE: Pharmacist-managed anticoagulation service (ACC) has been implemented in many healthcare institutions in Singapore. However, its cost-effectiveness has not been evaluated. This study aimed to evaluate the cost-effectiveness of ACC compared with usual care (UC) for the management of older Singaporean adults with atrial fibrillation (AF) on oral anticoagulation with warfarin.
METHODS: A Markov model with a 3-month cycle length and lifetime horizon was constructed to compare costs and quality-adjusted life-years (QALYs) of ACC and UC from the patient's and healthcare provider's perspectives. There were four possible pathways based on time in therapeutic range (TTR) with cut-off of 70%: ACC TTR $\geq$ 70%, ACC TTR < 70%, UC TTR $\geq$ 70%, UC TTR < 70%. The target population was a hypothetical cohort of 70-year-old Singaporean AF patients taking warfarin. Local data from national disease registries, patient surveys, hospital administrative and financial databases were used whenever available. When local data were not available, data were drawn from published studies and limited to the Asian population whenever possible. Extensive one-way sensitivity analyses and multivariate probabilistic sensitivity analyses were performed. Costs and QALYs were discounted by 3% per annum.
RESULTS: Pharmacist-managed ACC improved effectiveness by 0.14 and 0.19 QALYs at TTR $\geq$ 70% and TTR < 70% respectively compared with UC. From the patient's perspective, ACC reduced costs by US$921.70 (TTR $\geq$ 70%) and US$1,101.17 (TTR < 70%). Similar results were obtained from the healthcare provider's perspective, with ACC reducing costs by US $1,129.66 (TTR $\geq$ 70%) and US$1,272.86 (TTR < 70%) compared with UC. Results were sensitive to the relative risk of stroke between ACC and UC in all comparisons. Probabilistic sensitivity analyses demonstrated that ACC was the dominant strategy in 75% to 77% and 78% to 80% of the time from the patient's and healthcare provider's perspective respectively at a willingness-to-pay threshold of US$62,145 (SG$69,050)/QALY.
CONCLUSION: Pharmacist-managed ACC is cost-effective in the management of older Singaporean adults with AF.

Pharmacoepidemiology

127. Use and adherence of anxiety-hypnotic medications among the elderly and national health insurance beneficiaries in Taiwan *Hsiang-Wen Lin, M.S., Ph.D.*[1], Hsin-Hui Tsai, M.S., Ph.D.[2], Feng-Chi Liu, M.S., Ph.D.[3], Chia-Ing Li, M.S., Ph.D.[4], Chun-Hui Liao, M.D., M.S., Ph.D.[5], Chih-Hsueh Lin, M.D., M.S., Ph.D.[6], Che-Yi Chou, M.D., Ph.D.[7], Chin-Kai Chang, M.D., M.S.[8], Yow-Wen Hsieh, M.D., M.S., Ph.D.[9], Chin-Chuan Hung, M.S., Ph.D.[1], Yi-Hui Lin, M.S., Ph.D.[1], Tsai-Chung Li, M.S., Ph.D.[10]; (1) School of Pharmacy and Graduate Institute, China Medical University, Taichung, Taiwan (2) Department of Cosmetic Science, Providence University, Taichung, Taiwan (3) Department of Pharmacy, China Medical Unviersity Hospital, Taichung, Taiwan (4) Department of Medical Research, China Medical University Hospital, Taichung, Taiwan (5) Department of Psychiatric, China Medical University Hospital, Taichung, Taiwan (6) Department of Family Medicine, China Medical University Hospital, Taichung, Taiwan (7) Department of Internal Medicine, China Medical University Hospital, Taichung, Taiwan (8) Department of Rehabilitation, China Medical Univeristy Hospital, Taichung, Taiwan (9) Department of Pharmacy, China Medical University Hospital, Taichung, Taiwan (10) Graduate Institute of Biostatistics, China Medical University, Taichung, Taiwan
PURPOSE: With limited restriction to access different medical specialties in Taiwan, the National Health Insurance (NHI) bene-

ficiaries can retrieve anxiety-hypnotic prescriptions with few difficulty. This study aimed to examine the utilization, and adherence of anxiety-hypnotic medications in Taiwan.
METHODS: A retrospective population-based research was performed using the random samples of 2 million NHI claimed data. Beneficiaries with at least one anxiety-hypnotic medication in outpatient settings were evaluated for their prevalence, incidence, total prescription days covered (PDC) and persistent rates at 30 to 360 days, respectively, with 7- or 14-day gap for the individual or classes of anxiety-hypnotic medications among all and elderly NHI beneficiaries in 2009 using descriptive analyses.
RESULTS: Those anxiety-hypnotic medications and hypnotic specific medications accounted 7.88% and 4.93% of all prescriptions, whereas 11.93% and 6.89% were prescribed for the elderly, respectively. Of 290,949 patients were prescribed with 1739,958 items of anxiety-hypnotic medications, the elderly accounted for 26.0%, 18.36% and 17.91% of all prevalent anxiety-hypnotic users, incident anxiety-hypnotic users, and incident hypnotic users, respectively. 8.66% and 5.64% of beneficiaries were newly prescribed with anxiety-hypnotic and hypnotic specific medications, respectively, whereas the elderly accounted for 18.36% and 11.66%, respectively. The PDC of total anxiety-hypnotic medications were 100.5 ± 123.0 and 145.7 ± 134.7 days among all anxiety-hypnotic prevalent users and elderly, respectively, and reduced to approximately one-third for new users. The top three medications with higher PDC among all and elderly users were flunitrazepam, clonazepam, and zolpidem. The persistence rates declined dramatically to less than 25% after 1-month and less than 2.5% after 6-month.
CONCLUSIONS: Although anxiety-hypnotic medications accounted for less than 8% of prescribed medications in 2009, approximately one-quarter were ever prescribed for the elderly with one and half month more covered days. The long-term use of flunitrazepam, and zolpidem, especially in elderly people, warrants further explorations and risk/benefit assessments.

Pharmacogenomics/Pharmacogenetics

128. Impact of polymorphisms of the GGCX gene on maintenance warfarin dose: systematic review and meta-analysis *Jinhua Zhang, Ph.D.*[1], Lihong Tian, M.D.[2]; (1) Department of Pharmacy, Fujian Medical University Union Hospital, PR China, Fuzhou, China (2) Department of Hematology, Fujian Medical University Union Hospital, Fuzhou 350001, PR China, Fuzhou, China
PURPOSE: Warfarin is the most commonly used anticoagulant. Single nucleotide polymorphisms (SNPs) of CYP2C9, VKORC1 and CYP4F2 are known for their significant effects on warfarin dose, but the effect of gamma glutamyl-carboxylase (GGCX) is controversial. We investigated the impact of GGCX SNPs on mean daily warfarin dose (MDWD) by conducting a systemic review and meta-analysis of the literature.
METHODS: Strict inclusion criteria were established, and literature searching undertaken using PubMed, Cochrane Library, EMBASE, Chinese Biomedical Literature?Database, Chinese National Knowledge Infrastructure and ChainInfo on articles published before 22 September 2014. Revman v5.2 was used to analyze the relationship between GGCX SNPs and MDWD.
RESULTS: We included 12 studies focusing on the impact of GGCX SNPs on MDWD. GGCX (rs699664) AA carriers required a 9% (95% confidence interval [CI]: 1%˜C17%) lower MDWD than GGCX (rs699664) GG carriers. Other comparisons in GGCX (rs699664; GA versus GG, A versus GG) showed no significant differences. No evidence of association was found between rs12714145 polymorphisms and MDWD. GGCX (rs11676382) G carriers required a 30% (95% CI: 16˜C45%) lower MDWD than GGCX (rs11676382) CC carriers.
CONCLUSIONS: This meta-analysis was the first to report the relationship between GGCX SNPs and MDWD. The results showed that SNPs of GGCX (rs699664) and (rs11676382) had a small-to-moderate significant association with MDWD.

129. Genotype-guided antiplatelet therapy with platelet reactivity testing: A cost-effectiveness analysis Minghuan Jiang, B.Sc., M.Phil., *Joyce You, Pharm.D., BCPS*; School of Pharmacy, The Chinese University of Hong Kong, Hong Kong
PURPOSE: Clopidogrel is an antiplatelet agent activated by P450 enzyme system (CYP). Carriers of CYP2C19 loss-of-function (LOF) alleles are poor metabolizers (PM) (with two LOF alleles) or intermediate metabolizers (IMs) (with one LOF alleles). Clinical findings showed high-dose clopidogrel (225 mg daily) in IM patients achieved platelet reactivity level similar to standard-dose clopidogrel (75 mg) in non-carriers of LOF alleles. We evaluated potential cost-effectiveness of genotype-guided antiplatelet therapy with platelet reactivity testing for patients with acute coronary syndrome (ACS) after percutaneous coronary intervention (PCI).
METHODS: A life-long Markov model was used to simulate outcomes in a hypothetical cohort of ACS patients aged 60 years undergoing PCI: Universal clopidogrel (75 mg daily), universal new antiplatelet agent (ticagrelor or prasugrel) and genotype-guided therapy with platelet reactivity testing (PG-PRT). Patients in PG-PRT were genotyped. Non-carriers of CYP2C19 LOF alleles were started on clopidogrel standard dose (75 mg daily). PMs received a new antiplatelet agent. IMs were started on high-dose clopidogrel (225 mg daily) and tested platelet reactivity in 24–48 hours. Patients with high platelet reactivity were switched to a new agent. Model inputs were derived from literature. Outcome measures were total cost and quality-adjusted life-year (QALY). Robustness of model was examined by sensitivity analysis.
RESULTS: In base-case analysis, PG-PRT was less costly (USD71,356) with higher QALYs (8.1026 QALYs) when comparing to universal clopidogrel (USD76,334 and 7.9188 QALYs) and universal new antiplatelet agent (USD79,179 and 7.9637 QALYs). Base-case results were robust to variation of all model inputs. In 10,000 Monte Carlo simulations, PG-PRT was less costly with higher QALYs than universal clopidogrel (by USD5,317 [95% CI 5285–5349] and 0.3122 QALYs [95% CI 0.3117–0.3127]) and universal new antiplatelet (by USD7,931 [95% CI 7893–7969] and 0.2794 QALYs [95% CI 0.2790–0.2798]).
CONCLUSION: Genotype-guided antiplatelet therapy with platelet reactivity testing appears to be cost-saving and more effective than universal use of clopidogrel or new antiplatelet agent.

131. Impact of NQO1 variants on stable warfarin doses in Korean patients with mechanical cardiac valves *Jee-Eun Chung, M.S.*[1], Byung Chul Chang, M.D., Ph.D.[2], Hyesun Gwak, Ph.D., Pharm.D.[1]; (1) College of Pharmacy & Division of Life and Pharmaceutical Sciences, Ewha Womans University, Seoul, South Korea (2) Department of Thoracic and Cardiovascular Surgery, Yonsei University Medical Center, Seoul, South Korea
PURPOSE: NAD(P)H dehydrogenase, encoded by NAD(P)H quinine oxidoreductase 1 (NQO1), is an enzyme that catalyzes the reduction of quinines, including vitamin K. Given its potential role in vitamin K metabolism, this study aimed to investigate the effects of NQO1 genotype on stable warfarin doses.
METHODS: We tested possible effects of genotypes on variability in warfarin response using 209 Korean patients with mechanical cardiac valves. Genotypes of NQO1, vitamin K epoxide reductase complex subunit 1 (VKORC1), cytochrome P450 (CYP) 2C9 and CYP4F2 were determined.
RESULTS: One single nucleotide SNP, rs1800566(C>T), was significantly associated with stable warfarin doses and variant homozygote carriers of this SNP required lower stable warfarin doses than those with the wild C allele (4.85 ± 1.61 vs 5.60 ± 1.95 mg; $p = 0.038$). As for the polymorphism of rs10517(C>T),

patients with variant T allele had higher warfarin dose requirements, as compared to those with wild-type homozygote (CC) with a barely detectable statistically significant difference (5.70 ± 2.17 vs 5.18 ± 1.84 mg; p = 0.055); this SNP was clearly influenced stable warfarin doses in patients carrying VKORC1 variant homozygote (5.20 ± 1.70 vs 4.62 ± 1.11 mg; p = 0.014). Multivariate analysis showed that rs10517 increased contribution to the overall warfarin dose variability by 1.3%.
CONCLUSION: Our results showed that NQO1 gene was associated with stable warfarin doses in Korean patients.

132. Influence of UDP-glucuronosyltransferase polymorphisms on warfarin dosing requirement *Sook Hee An, Ph.D.*[1], Kyung Eun Lee, Pharm.D.[2], Byung Chul Chang, M.D., Ph.D.[3], Hyesun Gwak, Ph.D., Pharm.D.[4]; (1) College of pharmacy, Wonkwang university, Iksan, South Korea (2) College of Pharmacy, Chungbuk National University, Cheongju, South Korea (3) Department of Thoracic & Cardiovascular Surgery, Yonsei University Medical Center, Seoul, South Korea (4) College of Pharmacy & Division of Life and Pharmaceutical Sciences, Ewha Womans University, Seoul, South Korea
PURPOSE: Although polymorphisms of the vitamin K epoxide reductase complex 1 (VKORC1) and CYP2C9 have been studied to affect warfarin dosing, few studies of phase II biotransformation associated with influencing genes have been conducted. Therefore, this study aimed to evaluate the effect of uridinediphosphate (UDP)-glucuronosyltransferase (UGT) polymorphisms on warfarin dosing requirement.
METHODS: One hundred ninety-one patients with mechanical cardiac valves who were on warfarin anticoagulation therapy and maintained INR levels of 2.0–3.0 for 3 consecutive times were included in this retrospective study. *UGT1A1* rs887829, *UGT1A1* rs4148323, *CYP2C9* rs1057910, *CYP2C19* rs4244285, *VKORC*1 rs9934438, and *CYP4F2* rs2108622 were genotyped. The association between genotypes and warfarin dosing requirement was evaluated using multiple linear regression, adjusted for demographic and clinical factors.
RESULTS: The *UGT1A1* rs887829, *CYP2C9* rs1057910, *VKORC*1 rs9934438, *CYP4F2* rs2108622 polymorphism and age were significantly associated with warfarin maintenance dose. Patients with the T allele in *UGT1A1* rs887829 (CT or TT) required higher dose than patients with the CC genotype (6.33 ± 2.42 mg vs 5.16 ± 1.57 mg, p = 0.003). In patients with the *CYP2C9* wild homozygotes, *UGT1A1* rs887829 polymorphism was significant associated with warfarin maintenance dose. Similarly, in patients with the *CYP2C19* wild homozygotes, variant *UGT1A1* rs887829 showed significant association with warfarin maintenance dose. The *UGT1A1* rs887829 polymorphism explained 5.5% of the overall warfarin dose variability.
CONCLUSION: Our results suggest that UGT polymorphism might be determinants of warfarin dosing requirement. The exact mechanisms of *UGT* rs887829 on dosing requirement of warfarin merit further research.

133E. Fewer cardiovascular events after percutaneous coronary intervention with genotype-guided antiplatelet therapy: results from the UF health personalized medicine program *Larisa H. Cavallari, Pharm.D.*[1], Oyunbileg Magvanjav, M.D./Ph.D. Student[2], David Anderson, M.D.[3], Aniwaa Owusu Obeng, Pharm.D.[2], Ben Kong, Pharm.D.[2], Teresa Vo, Pharm.D.[2], Jennifer Ashton, Pharm.D.[4], Benjamin Staley, Pharm.D., BCPS[4], Amanda Elsey, MHA[1], Rhonda Cooper-DeHoff, Pharm.D., M.S., FAHA, FCCP[5], Kristin Weitzel, Pharm.D., CDE, FAPhA[6], Michael Clare-Salzler, M.D.[7], David R. Nelson, M.D.[8], Julie Johnson, Pharm.D., BCPS, FAHA, FCCP[9]; (1) Department of Pharmacotherapy and Translational Research, University of Florida, Gainesville, FL (2) University of Florida, Gainesville, FL (3) Division of Cardiovascular Medicine, University of Florida, Gainesville, FL (4) University of Florida Health Shands Hospital, Gainesville, FL (5) Division of Cardiovascular Medicine, Department of Pharmacotherapy and Translational Research Center for Pharmacogenomics, University of Florida, Gainesville, FL (6) Department of Pharmacotherapy and Translational Research, Center for Pharmacogenomics, University of Florida, Gainesville, FL (7) Division of Endocrinology, Diabetes, and Metabolism, Center for Immunology and Transplantation, University of Florida, Gainesville, FL (8) Division of Gastroenterology, Hepatology & Nutrition, University of Florida, Gainesville, FL (9) UF Health Personalized Medicine Program, Department of Pharmacotherapy and Translational Research, Center for Pharmacogenomics, University of Florida, Gainesville, FL
Presented at the ASCPT 2015 Annual Meeting in New Orleans, LA as a Late Breaking Abstract Presentation.

134. Impact of GGCX, STX1 and FPGS polymorphisms on warfarin dose requirement in Caucasians and Egyptians *Issam Hamadeh, Pharm.D.*[1], Larisa H. Cavallari, Pharm.D.[2], Julie Johnson, Pharm.D., BCPS, FCCP, FAHA[3]; (1) Pharmacotherapy and translational Research, University of Florida, Gainesville, FL; (2) Department of Pharmacotherapy and Translational Research, University of Florida, Gainesville, FL; (3) UF Health Personalized Medicine Program; Department of Pharmacotherapy and Translational Research, Center for Pharmacogenomics; University of Florida, Gainesville, FL
PURPOSE: Warfarin remains the gold standard for anticoagulation despite its cumbersome drawbacks, most notably the interindividual variability in dose required to attain a therapeutic INR. Current genetics based algorithms predict 30–50% of variability depending on race. Our objective was to determine associations between weekly warfarin dose requirement and *GGCX, FPGS, and STX1B* polymorphisms that have not been well studied in Caucasians and Egyptians.
METHODS: Our patient cohort included 454 adults (304 Caucasians and 150 Egyptians) on a stable warfarin dose that achieved a therapeutic INR on three consecutive visits. Genetic samples were obtained, and genotyped using Pyrosequencing for rs12714145 in *GGCX,* rs7856096 in *FPGS*, and rs4889606 in *STX1B*. GGCX (CAA)n repeats were dertermined by fragment analysis. To compare differences in warfarin dose by genotype, ANOVA or t-test was used. Multiple regression analysis was performed to assess individual effects of each polymorphism.
RESULTS: Minor allele frequencies for rs12714145, rs7856096 and rs4889606 in Caucasians and Egyptians were: 44%, 2.2%, 35%, and 36.7%, 2%, and 50%, respectively. *GGCX* (CAA)n repeats, rs12714145 and rs7856096 were not significantly associated with variability in warfarin dose, whereas rs4889606 was significantly associated in univariate analysis. However, rs4889606 was no longer significant when the common *VKORC1* polymorphism (−1639 G>A, rs9923231) was included in the regression model, due to significant linkage disequilibrium between the 2 SNPS.
CONCLUSION: Polymorphisms in *GGCX* and *FPGS* had no impact on warfarin dose requirements in Caucasians and Egyptians, and the effect of *STX1B* variant was not independent of the common *VKORC1* variant, well known to affect warfarin dose.

Pharmacokinetics/Pharmacodynamics/Drug Metabolism/Drug Delivery

138E. Pharmacokinetic and pharmacodynamic interactions between canagliflozin and 7 potentially coadministered medicines *Michael Davies, Ph.D.*[1], Christopher Sikes, Pharm.D.[2], Damayanthi Devineni, Ph.D.[3]; (1) Diabetes – Medical Affairs, Janssen Scientific Affairs, LLC., Raritan, NJ (2) Janssen Scientific Affairs, LLC (3) Janssen Research & Development, LLC

Presented at the 49th Midyear Clinical meeting And Exhibition of The American Society of Health-System Pharmacists, Orange County, CA, December 7–11, 2014.

139E. Pharmacokinetics of novel extended-release formulation aspirin in healthy volunteers *Jeff Patrick, Pharm.D.*[1], Larry Dillaha, M.D.[1], Danielle Armas, M.D.[2]; (1) New Haven Pharmaceuticals, Inc., Branford, CT (2) Celerion, Tempe, AZ
Presented at American Diabetes Association 75th Scientific Sessions, Boston, MA; June 5–9, 2015.

Psychiatry

140E. Adjunctive brexpiprazole (OPC-34712) in patients with major depressive disorder and anxiety symptoms: an exploratory study Lori L. Davis, M.D.[1], Ai Ota, B.Sc.[2], Pamela P Perry, M.S.[3], Kana Tsuneyoshik, B.S.[2], *Anna Eramo, M.D.*[4], Ross A Baker, Ph.D., MBA[5]; (1) Veterans Affairs Medical Center, Tuscaloosa, AL (2) Otsuka Pharmaceutical Co., Ltd., Tokyo, Japan (3) Otsuka Pharmaceutical Development and Commercialization, Inc., Princeton, NJ (4) Lundbeck LLC, Deerfield, IL (5) Otsuka Pharmaceutical Development & Commercialization, Inc., Princeton, NJ
Presented at American Psychiatric Association, Toronto, Canada, May 16–20, 2015.

141. Evaluation of sedative hypnotic use among inmate-patients at a correctional facility *Omeed Valipour, B.S.*[1], Kelly Lee, Pharm.D., MAS, BCPP, FCCP[1], Brett Johnson, M.D.[2], Lin Chen-Peng, Pharm.D.[2]; (1) Skaggs School of Pharmacy and Pharmaceutical Sciences, University of California San Diego, La Jolla, CA (2) Department of Psychiatry, Richard J. Donovan Correctional Facility, San Diego, CA
PURPOSE: Sedative-hypnotic use is highly prevalent among those with mental health diagnoses and within correctional facilities. The purpose of this study was to describe the prevalence of sedative-hypnotic use among inmate-patients with mental health diagnoses and polypharmacy (prescribed ≥10 medications). Utilization patterns and risk factors for sedative-hypnotic use were compared between those enrolled in an enhanced outpatient program (EOP) and those not enrolled (non-EOP).
METHODS: Medical records of inmate-patients with at least one mental health diagnosis and polypharmacy as of July 2014 were reviewed. Demographics, prison time, sedative-hypnotic, medical and psychiatric diagnoses, and any non-pharmacologic intervention for sleep disorders were recorded. Primary outcome was the prevalence of sedative-hypnotic use in this high risk population. Inmate-patients were grouped depending on their enrollment in the enhanced outpatient program (EOP) for secondary outcomes. Descriptive and chi-square statistics were used for analyses and conducted using IBM SPSS version 21.
RESULTS: Prevalence of sedative-hypnotic use among 502 inmate-patients with a mental health diagnosis and polypharmacy was 144 (28.7%). All inmate-patients were male, mean age and prison time were 54 and 16 years, respectively, and 43% were Black. Mean number of psychiatric diagnoses (2.64 ± 1.15 vs 1.93 ± 1.74, $p \leq 0.001$), mean number of sedative-hypnotic medications (1.83 ± 0.87 vs 1.46 ± 0.75, $p < 0.01$), and mean therapy days (non-pharmacologic intervention) (14.62 ± 11.66 vs 7.47 ± 6.14, $p = 0.003$) were statistically significant between those in EOP and non-EOP. In both groups, mirtazapine and hydroxyzine were most prescribed sedative-hypnotics and major depression and polysubstance use disorders were top two diagnoses.
CONCLUSIONS: Prevalence of sedative-hypnotic use is high among inmate-patients with mental health diagnosis and polypharmacy. Patients with depression and polysubstance use disorders are at high risk of sedative-hypnotic use. Future studies are necessary to evaluate long-term consequences of sedative-hypnotic use and establish parameters to guide safe withdrawal of sedative-hypnotics in the correctional facility.

142. Metabolic syndrome monitoring for inmate-patients prescribed antipsychotic therapy *Elika Hefazi, B.S.*[1], Brett Johnson, M.D.[2], Lin Chen-Peng, Pharm.D.[2], Kelly Lee, Pharm.D., MAS, BCPP, FCCP[1]; (1) Skaggs School of Pharmacy and Pharmaceutical Sciences, University of California San Diego, La Jolla, CA (2) Department of Psychiatry, Richard J. Donovan Correctional Facility, San Diego, CA
PURPOSE: Prevalence of metabolic syndrome in schizophrenia is 2 times higher than in the general population. Metabolic symptoms are triggered or exacerbated by antipsychotic medications. Approximately 20% of all psychotropic prescriptions for inmate-patients at a California correctional facility involve antipsychotic medications. Primary objective of this study was to evaluate the prevalence of metabolic syndrome (MetS) among inmate-patients prescribed antipsychotics and compare characteristics between MetS and no metabolic syndrome (No MetS) groups.
METHODS: Medical records of inmate-patients prescribed a first or second generation antipsychotic for at least 6 months as of July 2014 were reviewed. Demographics, prison time, antipsychotic, and metabolic parameters were collected. Criteria for MetS included 3 of the following: BMI ≥ 30, BP ≥ 130/85 mmHg, HbA1C ≥ 6, triglycerides ≥ 150 mg/dL or HDL-C < 40 mg/dL. Antipsychotics were classified as low or high risk based on metabolic risk potential. Descriptive and chi-square statistics were used for analyses and conducted using IBM SPSS version 21.
RESULTS: First or second generation antipsychotics were prescribed to149 inmate-patients for at least 6 months and 63 (42.3%) inmate-patients met criteria for MetS. All inmate-patients were male, mean age and prison time between the MetS and No MetS were 49 vs 46 years ($p = 0.046$) and 2.6 vs 3.1 years ($p = 0.185$), respectively; 79% were Hispanic in the MetS group. Of those with MetS, 59% of inmate-patients received high-risk antipsychotics vs 56% of inmate-patients in the No MetS group who received low risk antipsychotics ($p = 0.079$). Of those with MetS and abnormal metabolic findings, 33%, 52% and 24% of inmate-patients were not prescribed diabetes, lipid or hypertension therapy, respectively.
CONCLUSION: Prevalence of metabolic syndrome is high among inmate-patients receiving antipsychotic medications. Despite regular monitoring of metabolic parameters, patients may not receive adequate treatment for metabolic conditions. Timely monitoring and intervention are needed to prevent significant morbidity and mortality.

143E. Adjunctive brexpiprazole (OPC-34712) in patients with major depressive disorder and irritability: an exploratory study François Menard, M.D.[1], Fava Maurizio, M.D.[2], Charlotte Kampp Davidsen, M.S.[1], *Anna Eramo, M.D.*[3], Ross A Baker, Ph.D., MBA[4]; (1) H. Lundbeck A/S, Denmark (2) Massachusetts General Hospital, Boston, MA (3) Lundbeck LLC, Deerfield, IL (4) Otsuka Pharmaceutical Development & Commercialization, Inc., Princeton, NJ
Presented at the Society of Biological Psychiatry, Toronto, Canada, May 14–16, 2015.

144E. Deltoid injection of aripiprazole once-monthly in the treatment of schizophrenia Timothy Peters-Strickland, M.D.[1], Arash Raoufinia, Pharm.D.[2], Anna-Greta Nylander, Ph.D., MBA[3], Ross A Baker, Ph.D., MBA[1], *Anna Eramo, M.D.*[4], Na Jin, M.S.[2], Robert D McQuade, Ph.D.[1], Peter Hertel, Ph.D.[3], Frank Larsen, Ph.D.[3]; (1) Otsuka Pharmaceutical Development & Commercialization, Inc.,

Princeton, NJ (2) Otsuka Pharmaceutical Development & Commercialization, Inc., Rockville, MD (3) H. Lundbeck A/S, Valby, Denmark (4) Lundbeck LLC, Deerfield, IL
Presented at American Society of Clinical Psychopharmacology, Miami, FL, June 22–25, 2015.

145E. Aripiprazole once-monthly dual chamber syringe Timothy Peters-Strickland, M.D.[1], *Ross A Baker, Ph.D., MBA*[1], Anna Eramo, M.D.[2], David Unger, Ph.D.[1]; (1) Otsuka Pharmaceutical Development & Commercialization, Inc., Princeton, NJ (2) Lundbeck LLC, Deerfield, IL
Presented at US Psychiatric and Mental Health Congress, Orlando, FL, September 20–23, 2014.

146E. Primary non-adherence to antidepressants: differences by class *Heather Anderson, Ph.D.*[1], Gerald Pulver, Ph.D.[2], Sam Ellis, Pharm.D.[3], Mykel Walsh, B.S.[3], John Lynch, MPH[4], Robert Valuck, Ph.D.[3]; (1) Department of Clinical Pharmacy, University of Colorado Denver Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO (2) School of Medicine, University of Colorado Denver (3) University of Colorado Denver Skaggs School of Pharmacy and Pharmaceutical Sciences (4) Connecticut Center for Primary Care, Inc.
Presented at ISPE, August, 2015.

Substance Abuse/Toxicology

147. Prescription monitoring program trends among individuals arrested in maine for trafficking prescription drugs in 2014 *Stephanie Nichols, Pharm.D., BCPS, BCPP*[1], Kenneth McCall, Pharm.D.[2], Leslie Ochs, Pharm.D., PhD, MSPH, BCPS[2], Christina Holt, M.D., MSc, MA[3], Gary Cattabriga, BS[4]; (1) Department of Pharmacy Practice, Husson University, School of Pharmacy, Bangor, ME (2) Department of Pharmacy Practice, College of Pharmacy, University of New England, Portland, ME (3) Department of Family Medicine, Maine Medical Center, Portland, ME (4) Center for Community and Public Health, University of New England, Portland, ME
PURPOSE: This study evaluates Maine Prescription Monitoring Program (PMP) trends among individuals arrested in 2014, in Maine, for prescription drug "trafficking" including: furnishing, distributing, or selling. The objective of this study is to identify and describe the individuals who were arrested for controlled-substance prescription trafficking and their degree of penetration in the healthcare system via identification of matching PMP records.
METHODS: Arrest and PMP records were linked and de-identified in this retrospective, case-controlled study.
RESULTS: There were 2003 substance related arrests reported by the Maine Diversion Alert Program in 2014; of these, 594 (30%) were considered "trafficking", and of these, 235 (40%) involved controlled prescription medications. The mean age of these 235 persons was 33 years (range 18–77) and 155 (66%) were male. The prescription categories included: 153 prescription opioids (65%), 7 stimulants (3%), 7 benzodiazepines (3%), and 77 unspecified controlled prescription drugs (33%). These trafficking arrests were geographically distributed throughout the state with the highest counts in the 3 most populous cities; Portland (18), Lewiston (16), and Bangor (14). Fifty-seven individuals (24%) received a PMP prescription within 90 days prior to the arrest which matched the substance involved in the drug diversion. Of these 57 people: more than half (31 people, 54%) used one prescriber, while only one person (2%) utilized 5 + prescribers. Similarly, while more than half (35 people, 61%) used one pharmacy, no-one used 5 + pharmacies within 90 days prior to the date of arrest. The payment method for these matching prescriptions was commercial insurance (28), Medicaid (19), Medicare (5), and Cash (5).
CONCLUSIONS: The majority of persons arrested in this study for prescription drug trafficking did not have PMP records and did not directly obtain the diverted medication from a licensed pharmacy. Of the cohort who did, utilization of 5 prescribers or pharmacies and cash payment were uncommon.

Transplant/Immunology

149. Does prophylaxis strategy matter? CMV reactivation in moderate risk (R+) heart transplant recipients *Christina Doligalski, Pharm.D., BCPS*, Esther Liu, Pharm.D., BCPS; Department of Pharmacy, Tampa General Hospital, Tampa, FL
PURPOSE: CMV is a significant complication in heart transplant recipients (HTR). Little evidence exists to guide prophylaxis in moderate risk (R+) patients.
METHODS: An IRB-approved review of all moderate risk (recipient IgG+) HTR transplanted from 10/2011-8/2013 was conducted at a single center; pertinent data was collected for the first post-transplant year. CMV reactivation (CMV-R) was defined as a treated viremia (>200 copies/mL) or tissue-invasive disease (pathologically proven). All R+ recipients who received thymoglobulin induction (used to delay initiation of tacrolimus) received 3 months of valganciclovir followed by 3 months of valacyclovir (THYMO/VGCV); R+ HTR receiving steroid-only induction received 6 months of valacyclovir (STER/VAC).
RESULTS: Fifty-one R+ HTR were included. The 1-year CMV-R rate was 23.5%(12/51); all CMV-R was treated viremia. Demographics and donor status did not affect reactivation; immunosuppression was similar at time of prophylaxis stop (Table 1). Incidence of CMV-R in R+ HTR receiving THYMO/VGCV was significantly lower than R+ HTR receiving STER/VAC (12.1% versus 44.4%, $p = 0.009$). Time to CMV-R was also longer in THYMO/VGCV (197 versus 48 days; $p < 0.001$). Rejection following CMV-R was higher in STER/VAC (12.5% versus 0%, $p < 0.001$). Viral load was similar between groups, and readmission was required in 25% of cases.

	CMV Reactivation (n = 12)	No CMV Reactivation (n = 39)	p-value
Age, mean (range)	57.9 (39–70)	55.8 (28–70)	0.6
Male, n (%)	7 (58.3)	28 (71.8)	0.38
Caucasian, n (%)	9 (75)	25 (64.1)	0.48
Donor status			
Donor –	5 (41.7)	16 (41)	0.91
Donor +	7 (58.3)	23 (59)	
Mean mycophenolate dose, mg	1090.9	1593.8	0.067
Mean tacrolimus level, ng/mL	9.18	12.1	0.038
Median time to rejection, days	45	40	0.12

CONCLUSION: A high rate of CMV-R was found in this R+ HTR population, and use of STER/VAC prophylaxis led to early reactivation and increased rejection. This is the first study to evaluate CMV-R specifically in the R+ HTR population, and reinforces the need for aggressive CMV prophylaxis regardless of induction strategy.

150. Minimizing BK virus renal allograft loss through immunosuppression regimen Alyson Meyer, Pharm.D. Candidate[1], Jennifer Deyo, Pharm.D.[2], Tomasz Kozlowski, M.D.[3], RuthAnn Lee, Pharm.D.[4], Timothy Bruflat, Pharm.D.[5], Robert Dupuis, Pharm.D.[6]; (1) UNC Eshelman School of Pharmacy, Chapel Hill, NC (2) University of North Carolina Memorial Hospital - Department of Pharmacy, Chapel Hill, NC (3) UNC School of Medicine - Department of Surgery, Chapel Hill, NC (4) UNC Healthcare, Chapel Hill, NC (5) UNC Eshelman School of Pharmacy, Chapel Hill (6) Pharmacotherapy, UNC Eshelman School of Pharmacy, Chapel Hill, NC

PURPOSE: This study examines graft loss rate following institution specific immunosuppression (IS) modulation with regards to BK virus re-activation post-renal transplant.

METHODS: Analysis was subdivided into two groups, those with viruria/viremia (non-BKVN) and those who progressed to BK virus nephropathy (BKVN). Per center protocol, urine cytology decoy cell screening is performed week 2, 4, months 3, 6, 9, 12, 15, 18, 24 and 36 post-transplant. If positive (>10 decoy cells/HPF), quantitative BK PCR is drawn. Low BK detection (PCR <250 copies/mL) suggests a 50% decrease in anti-proliferative and reduction in CNI goal by 30%. PCR >250 copies/mL indicates obtaining a renal biopsy. Diagnosis of BKVN suggests reduction of CNI goal (20–50%), discontinuation of MMF, addition of leflunomide and prednisone.

RESULTS: In 212 adults receiving a renal transplant alone we observed reactivation of BK virus, 33 of which developed BKVN. Fifteen patients with Stage A BKVN, 16 with Stage B and 2 with Stage C. IS regimen changes included reduction in tacrolimus trough (60.6%, n = 128), reduction in mycophenolic acid (MPA) (24.2%,n = 51), discontinuation MPA (81.8%, n = 173), the addition of leflunomide (57.5%, n = 122) or azathioprine (18%, n = 38) and re-initiation of corticosteroids (65%, n = 138). Only one graft loss occurred following confirmed BKVN.

CONCLUSION: Published rates of graft loss for stages A, B and C BKVN are <10%, ~50% and <80%, respectively (Egli et al. Nephrol Dial Transplant; 2007: (8) viii72-viii82). Our center specific results include a graft loss rate of 3% among all diagnosed stages of BKVN. In contrast to current guidelines, this center follows a protocol with more aggressive screening, a lower threshold for acquiring blood PCRs and IS adjustment, along with the addition of leflunomide and prednisone therapy. This study supports continued use of our current center BK protocol to minimize renal allograft loss secondary to BKVN.

151. Re-initiation of corticosteroids during treatment for BK-virus nephropathy does not decrease renal allograft survival *Timothy Bruflat, Pharm.D.*[1], Tomasz Kozlowski, M.D.[2], Alyson Meyer, Pharm.D. Candidate[3], RuthAnn Lee, Pharm.D.[4], Robert Dupuis, Pharm.D.[5], Jennifer Deyo, Pharm.D.[6]; (1) UNC Eshelman School of Pharmacy, Chapel Hill (2) UNC School of Medicine - Department of Surgery, Chapel Hill, NC (3) UNC Eshelman School of Pharmacy, Chapel Hill, NC (4) UNC Healthcare, Chapel Hill, NC (5) Pharmacotherapy, UNC Eshelman School of Pharmacy, Chapel Hill, NC (6) University of North Carolina Memorial Hospital - Department of Pharmacy, Chapel Hill, NC

PURPOSE: The objective of this study was to determine whether re-initiation of prednisone led to increased rates of renal allograft loss following diagnosis of BK-polyoma virus nephropathy (BKVN).

METHODS: Thirty-three adults with a single renal allograft transplanted 2005–13 at UNC developed biopsy-confirmed BKVN. Protocol specifies urine decoy cell screening at weeks 2, 4, months 3, 6, 9, 12, 15, 18, 24 and 36 post-transplant. A positive screening (>10 decoy cells/HPF) indicates quantitative BK PCR with renal biopsy for PCR result >250 copies/mL. BKVN-positive biopsy indicates a reduction in calcineurin inhibitor trough level by 30–50%, discontinuation of antiproliferatives and addition of leflunomide with prednisone 5 mg daily. Only patients with 12 months of data were included in the dosage analysis (n = 20).

RESULTS: One patient experienced graft loss due to BKVN. Prednisone was initiated in 65% (n = 21); 39.4% (n = 13) were on prednisone prior to BK diagnosis. The average preexisting prednisone dose was 8 mg/day. The average dose at 1 month was 8.5 mg/day in the preexisting group versus 12.5 mg/day in the BK-initiated group (p = 0.35). Prednisone dose averages were 6.39 versus 7.33 mg/day 12 months post biopsy confirmed BKVN (p = 0.07).

CONCLUSIONS: Re-initiation of prednisone did not decrease renal allograft survival due to BKVN. These results suggest that re-initiating prednisone is a viable strategy to offset the reduction in maintenance immunosuppression used to treat BKVN.

Women's Health

152. Prevention of preterm labor with hydroxyprogesterone caproate (17OHP): does conversion from compounded to commercial formulation change health system resource utilization and patient access? *Kristina Falk, Pharm.D.*[1], Christie Bobowski, Pharm.D.[1], Anisha Doshi, Pharm.D.[1], Sherif Abdou, Pharm.D.[2], Rebecca Stone, Pharm.D.[3]; (1) Pharmacy Practice/ Center for Women's Health, University of Illinois at Chicago - College of Pharmacy, Chicago, IL (2) Pharmacy Practice/ Center for Women's Health, University of Illinois Hospital and Health Sciences System, Chicago, IL (3) College of Pharmacy, Department of Pharmacy Practice, University of Illinois at Chicago, Chicago, IL

PURPOSE: To compare the utilization of health system resources and medication access in an outpatient clinic using 17OHP in the compounded form versus the commercial form which requires prior authorization (PA).

METHODS: Retrospective cohort evaluation of patients prescribed 17OHP for prevention of preterm labor at the University of Illinois at Chicago between January 1, 2012 and April 15, 2014. Patients received weekly 17OHP injections and were identified by administration records. Compounded product was used prior to May 2013, commercial product was phased in and used exclusively after October 2013. Compounded product did not require insurance PA, commercial product did. Primary outcomes include days to 17OHP initiation, number of doses, and clinical pharmacy case management hours. Data was extracted from clinic log sheets and medical records using a Redcap standardized data collection sheet. Excel was used for descriptive statistics and student's t-test.

RESULTS: A total of 102 patients were included; 60 (59%) received compounded product and 42 (41%) commercial product. The majority of patients were African American (57%), with a mean age of 30 ± 5.6 years. Commercial product required a mean of 13.9 ± 8.9 days to initiate compared to 9.9 ± 10.5 days for compounded (p = 0.047). There was no significant difference in total doses administered (mean 12.7 ± 6.4 versus 10.7 ± 6.0, p = 0.11). Patient access to compounded product required approximately 30 minutes of pharmacist case management per patient per course of therapy versus an average of 150 minutes of pharmacist or pharmacy student case management for commercial product.

CONCLUSION: Introduction of commercial 17OHP stimulated conversion from compounded to commercial formulation as mandated by FDA regulation. Prior authorization requirements for the commercial formulation did not change quantity of medication administered, but did incur additional health system cost through increased utilization of clinical pharmacy services and delayed patient access.

CLINICAL PHARMACY FORUM
ADR/Drug Interactions

153. A multi-faceted approach to improving adverse drug reaction capture across a diverse group of hospitals *Steven Johnson, Pharm.D.*, Gretchen Lindsey, Pharm.D., Joseph Dula, Pharm.D., BCPS, Katherine Marchionda, Pharm.D.; Pharmacy Systems, Inc., Dublin, OH

PURPOSE: To enhance capture of adverse drug reactions (ADRs) using a multi-faceted approach, with a goal of identifying relevant safety signals to drive performance improvement activities within participating hospitals.

METHODS: Baseline ADR capture rates were calculated for each participating hospital in 2013, and quantified by total #ADR and #ADR/100 discharges. Each hospital also completed the Institute for Healthcare Improvement Adverse Drug Event Trigger Tool on 20 randomly selected inpatient charts in 2013. Participants then implemented 2 or more methods of enhancing capture of ADRs in 2014 (ADR trigger drug utilization reports, ICD-9 code reports, medication use evaluations, radiology contrast review, staff education to improve spontaneous reporting). The ADR capture rate was compared pre- and post-intervention. ADR trends were evaluated to identify opportunities for medication use evaluation (MUE) and/or new clinical programs to decrease the potential for preventable harm.

RESULTS: Results from 10 participating hospitals are currently available. Baseline ADR capture rates averaged 1.74 ADR/100 discharges (range 0.07–10.82) in these hospitals. Post-intervention ADR capture rates averaged 4.14 ADR/100 discharges (range 1.16–19.88), with 9/10 (90%) of hospitals showing improved ADR capture versus baseline. Targeted education of staff was employed to improve ADR capture at 10/10 (100%) of hospitals, followed by use of trigger tools (7/10, 70%), ICD-9 code reports (4/10, 40%), and sequential MUE (3/10, 30%). Four hospitals used more than 2 methods to increase ADR capture. One hospital implemented a new automatic pharmacist managed dosing program for colistimethate injection, one hospital implemented a pharmacist-driven inpatient hyperkalemia prevention monitoring program, and two hospitals implemented pharmacist managed outpatient anticoagulation clinics using ADR data as part of the business justification.

CONCLUSION: Our multifaceted approach produced clinically meaningful increases in ADR capture at most participating hospitals, provided signals to drive MUE activities, and helped justify expanded clinical roles for pharmacists.

154. Rifabutin for treating tuberculosis in HIV infected adult patients receiving a boosted protease inhibitor containing antiretroviral regimen: experiences of neutropenia from an urban clinic Tinashe Mudzviti, B.Pharm (Hons), MPhil (M.D.)[1], Tinei Shamu, HBMLS[2], Cleophas Chimbetete, MBChB, MPH[2], Charles Maponga, Pharm.D., MHPE[1], Gene Morse, Pharm.D.[3]; (1) School of Pharmacy, University of Zimbabwe, Harare, Zimbabwe (2) Newlands Clinic, Zimbabwe Aids Care Foundation, Harare, Zimbabwe (3) Translational Pharmacology Core, Center of Excellence in Bioinformatics and Life Sciences, School of Pharmacy, University at Buffalo, Buffalo, NY

PURPOSE: Rifabutin dosing during ritonavir co-administration remains a matter of debate due to the possible drug interaction. Some studies have demonstrated that rifabutin 150 mg thrice weekly is inadequate, other studies in healthy subjects suggest that rifabutin 150 mg on alternate days, thrice weekly or every 4 days is adequate when administered with ritonavir. Several guidelines now recommend rifabutin 150 mg once daily when co-administered with a ritonavir boosted protease inhibitor (PI). We evaluate the effect of once daily rifabutin dosing when co-administered with a ritonavir boosted PI on neutropenia.

METHODS: This was a retrospective cohort study in patients receiving a boosted PI and rifabutin 150 mg once daily from Newlands Clinic, Harare, Zimbabwe. Participants had absolute neutrophil count tests prior to commencement of rifabutin 150 mg and another conducted post commencement of rifabutin. All participants were already on either ritonavir boosted lopinavir or atazanavir as part of their antiretroviral regimen. Data was collected and analyzed with Stata version 12.

RESULTS: Twenty-two participants with a median age of 24.3 (range 15.8–45.1) years participated, with 68% of them being female. Seventeen (77.3%) participants had reductions in absolute neutrophil counts after commencing rifabutin. Median decline in neutrophil count for all participants was 650 cells/μL (IQR = 100–1,500). Twelve participants had neutropenia (absolute neutrophil count less than 1,500) whilst on rifabutin therapy. Median baseline neutrophil count was 1,850 cells/μL (IQR = 1,300–2,600 cells/ μL) and after a median duration of 87 days (58–129 days) on rifabutin therapy, median absolute neutrophil count was 1,150 cells/μL (IQR = 700–2,000 cells/μL).

CONCLUSION: Co-administration of a boosted PI with rifabutin led to a decline in absolute neutrophil counts in the majority of patients. More than half of the participants were neutropenic when co-administered once daily rifabutin with a ritonavir boosted PI.

Adult Medicine

156. Asthma management in the primary care setting: Is a pharmacy student conducted telephone outreach program successful in completing annual asthma evaluation and management documentation in an urban academic medical center? Rebecca Stone, Pharm.D.[1], Anthony Sterlinski, Pharm.D. Candidate[2], Nicole Guska, Pharm.D. Candidate[2], Margaret Allison, Pharm.D. Candidate[2], Jenna Boznos, Pharm.D. Candidate[2], Clare Kane, Pharm.D. Candidate[2], Lori Wilken, Pharm.D.[1], Christine Rash, Pharm.D.[1], Brianna Goen, Pharm.D. Candidate[3]; (1) College of Pharmacy, Department of Pharmacy Practice, University of Illinois at Chicago, Chicago, IL (2) University of Illinois at Chicago (3) University of Illinois at Chicago, Chicago, IL

PURPOSE: Completion of an asthma control test (ACT) and asthma action (AAP) plan improves asthma control. Some HMO insurance groups require a minimum percentage of patients with asthma have annual documentation of both in order for the practice site to attain maximum financial reimbursement. This pilot study evaluates a pharmacy student telephone outreach program, supervised remotely by a clinical pharmacist, for successful completion of annual ACT and AAP.

METHODS: This retrospective chart review evaluates patients included in an asthma outreach program at UI Health Family or General Medicine Clinics from July 1, 2013 to May 15, 2014. A list of patients with asthma was generated. Student pharmacists made three separate attempts to contact patients to complete an ACT and AAP; patients who were not reached were mailed a letter requesting they contact the clinic. Per ACT score, patients with uncontrolled asthma were instructed to schedule an appointment.

RESULTS: One hundred and fifteen adult patients were identified, of which 92 were included (10 had complete ACT and AAP, 4 had no asthma diagnosis, 11 were not called for an unknown reason). Telephone contact was successful in 61% of subjects: 27% on first attempt, 33% on second attempt or greater. Of patients reached, ACT and AAP documentation was completed for 86%, 14% declined participation. Thirty nine percent were unable to be reached: 28% did not answer, 10% had an incorrect phone number, 1% was not available.

CONCLUSIONS: This pilot outreach program completed annual ACT and AAP documentation for over half of the patients contacted. Ideally ACT and AAP should be completed during routine visits, however this documentation may potentially be omitted in patients with well controlled asthma. Pharmacy student outreach successfully contacted patients requiring additional management and increased the percentage of patients meeting requirements for optimal HMO reimbursement within this health care system.

Ambulatory Care

157. Transition from a grant-funded clinical pharmacy program into an innovative, sustainable, value-based model in a Federally Qualified Health Center *Jeff Freund, Pharm.D.*[1], Emily Kosirog, Pharm.D.[1], Joseph Vande Griend, Pharm.D.[1], Gina Moore, Pharm.D., MBA[1], Tillman Farley, M.D.[2], Joseph Saseen, Pharm.D.[3]; (1) University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO (2) Salud Family Health Centers, Fort Lupton, CO (3) Department of Clinical Pharmacy, University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO

PURPOSE: Financial support of clinical pharmacy services in Federally Qualified Health Centers (FQHC) is challenging. Grant funding used to initiate clinical pharmacy services can be difficult to sustain with fee-for-service reimbursement. This reimbursement is especially challenging in the largely uninsured and Medicaid-based populations of FQHCs. Opportunities to support clinical pharmacy services in Colorado-based FQHCs using new funding sources including Accountable Care Collaboratives (ACCs) like the Regional Care Collaborative Organizations (RCCOs) for Colorado Medicaid are evolving. We describe the transition of this grant-funded clinical pharmacy program into a sustainable program using a value-based funding model.

METHODS: A two-year program grant was awarded by The Colorado Health Foundation in 2012 to establish provision of an integrated clinical pharmacy program for underserved Coloradoans. Two clinical pharmacists developed comprehensive medication management services within two clinics of the Salud Family Health Centers, an FQHC serving both English and Spanish speaking patients. Additional clinical support was provided by PGY2 residents and pharmacy students. Metrics evaluated included number of patients seen, chronic disease endpoints, and provider satisfaction. As the grant period concluded, alternative funding methods were sought.

RESULTS: Clinical metrics demonstrated significant reductions in A1c, blood pressure, and LDL-C, as well as high provider satisfaction ratings. Both Salud and the School have a strong desire to maintain the program. Positive metrics were extrapolated to RCCO patients receiving care at Salud and provided the justification necessary to fund this clinical pharmacy program. The RCCO financially supports the personnel needed to provide clinical pharmacy services at Salud.

CONCLUSION: Metrics solidified the value of the clinical pharmacists. New funding opportunities within ACCs exist and will continue to evolve for clinical pharmacy services that demonstrate positive outcomes. Clinical pharmacy programs should evaluate metrics that coincide with those by which ACCs are measured to justify reimbursement for clinical pharmacy services.

158. Evaluating the impact of a medication therapy management clinic for outpatients within an academic medical center heart hospital *Amy Schultz, Pharm.D.*[1], Diana Vinh, Pharm.D., BCPS[2], Trisha Jordan, Pharm.D., MS[2], Charles Bush, M.D.[3], Melissa Snider, Pharm.D., BCPS, CLS[1]; (1) Department of Pharmacy, The Ohio State University Wexner Medical Center (2) The Ohio State University Wexner Medical Center (3) Division of Cardiovascular Medicine, The Ohio State University Wexner Medical Center

PURPOSE: The objective of this study was to evaluate the clinical interventions and operational outcomes of a pharmacist-managed medication therapy management (MTM) clinic within an academic medical center heart hospital.

METHODS: A retrospective chart review was conducted on patients within a pharmacist-managed MTM clinic between November 18, 2013 and April 18, 2014. Appointments were assessed for clinical interventions and operational outcomes that included identified drug therapy problems, barriers to adherence, number and type of recommendations made to a physician, number and type of referrals placed, duration of appointments; when applicable, time to first scheduled appointment from discharge, and time to subsequent hospital admission following MTM clinic appointment.

RESULTS: The service was utilized by a variety of clinicians, including both inpatient and outpatient physicians, nurses, and pharmacists. Primary reason for referral was post-heart failure exacerbation discharge. Visits were either telephonic (n = 9) or face-to-face (n = 21). Of the 30 patients managed in the pharmacist-managed MTM clinic, none were readmitted within 30 days of discharge. Following MTM interventions, compliance with Centers for Medicare and Medicaid Services (CMS) Core Measures increased to 100%, and improved adherence to national practice guidelines was seen. There were an average of 2.3 identified drug related problems per patient, resulting in 1.6 clinical interventions identified and 1.3 accepted interventions per patient. Of the 49 recommendations, 96% were accepted.

CONCLUSION: This study demonstrated that for patients in a pharmacist-managed MTM service within an academic medical center heart hospital, improved adherence to clinical practice guidelines and CMS Core Measure compliance were seen and that these patients were not readmitted within 30 days. The clinical interventions had a high acceptance rate, supporting promising clinical benefits in achieving therapeutic goals, and furthering a patient's medication and disease state understanding.

159. Enhancing pharmacist involvement in antimicrobial stewardship within the ambulatory setting through utilization of the electronic medical record (EPIC) *Anna Kostric, Pharm.D.*[1], Candace Minter, Pharm.D.[2], Mary Morin, RN, MSN, BSN, NEA-BC, RN-BC[3], Michael Charles, M.D., FAAFP[1]; (1) Sentara Medical Group, Norfolk, VA (2) Pharmacy Administration, Sentara Medical Group, Norfolk, VA (3) Sentara Healthcare System-Sentara Medical Group, Norfolk, VA

PURPOSE: To impact antibiotic prescribing practices within the ambulatory setting through the use of the electronic medical record by improving antimicrobial stewardship for identified infections commonly associated with sepsis and hospital admission secondary to treatment failure.

METHODS: A multidisciplinary team developed strategies to optimize antimicrobial prescribing patterns and aim for improved patient outcomes within a medical group. From this collaboration, a group of infection-specific electronic medication order sets were established to guide prescribing practices surrounding the treatment of four sources of infection associated with sepsis: cellulitis, urinary tract infection, pneumonia and diverticulitis. The antibiotic order sets were created based upon evidence-based guidelines, affordability and clinical decision-making to ensure optimal empiric antibiotic therapy. Each order set is pre-populated with the appropriate dose and treatment duration for first line antibiotic therapy, determined by infection type and presence of comorbidities. Additionally, preferred alternatives are specified in the case of contraindication, presence of allergy/intolerance, and/or drug-drug interactions. As part of this initiative, the multidisciplinary team is developing synchronous electronic "best practice advisories" (BPA) that display when an antibiotic is ordered to notify the prescriber of the presence of drug-drug interactions or need for renal dose adjustments. An electronic sepsis risk assessment tool was also developed to facilitate outpatient early identification and provide guidance for therapy escalation (ex. hospitalization, parenteral antibiotic therapy). Additional electronic tools developed include, printable patient education instructions and computer-based training modules to be completed by providers annually to raise awareness of order set availability and provide education surrounding up-to-date treatment guidelines. Lastly, reports will be generated to monitor prescriber use of these tools and identify areas for improvement and growth.

RESULTS: n/a.

CONCLUSION: n/a.

160. Evaluation of ambulatory care clinical pharmacy providers on type 2 diabetes patient outcomes in a veteran population *Lisa Chastain, Pharm.D., BCACP*[1], Krystal Edwards, Pharm.D., FCCP, BCPS[2], Carlos Alvarez, Pharm.D., M.Sc., BCPS[3]; (1) Pharmacy Practice - Ambulatory Care Division, Texas Tech University Health Sciences Center, Dallas, TX (2) Texas Tech UHSC School of Pharmacy, Dallas, TX (3) Texas Tech University Health Sciences Center

PURPOSE: By working as a collaborative health care team, clinical pharmacy specialists (CPS) can improve type 2 diabetes mellitus (T2DM) patient care outcomes and improve healthcare effectiveness data. To evaluate the impact of co-managed care with CPS providers on T2DM patient outcomes at an outpatient veteran clinic via change in hemoglobin A1c (A1c).

METHODS: A retrospective chart review was performed comparing collaborative practice with CPS to usual care (UC) in T2DM patients. The primary objective was to compare change in A1c at 1 year. Secondary objectives included evaluations of obtaining nationally recognized healthcare effectiveness (HEDIS) measurements of A1c, blood pressure (BP), LDL, and urinary albumin excretion (UAE) measurements and other clinical outcomes. Alpha was set at 0.05 with use of Chi-Square, Fisher's exact, signed rank, or paired t-tests for statistics.

RESULTS: Baseline patient characteristics were similar with median age 61.5, primarily male and BMI 33.5 kg/m^2 between the CPS group (n = 100) and the UC group (n = 99). A1c was significantly different between groups as the CPS group had a baseline median A1c of 9.2% while the UC group had a baseline median A1c of 7.6% ($p < 0.001$) and more patients in the CPS group were on intensive insulin regimens (42% versus 22% in UC, $p = 0.002$). Within 1 year a median A1c decrease of 1.2% was achieved in the CPS group versus an A1c increase of 0.2% in the usual care group ($p < 0.001$). At 12 months, there was a higher percentage of A1c, BP, LDL, and UAE measurements evaluated in the CPS group ($P < 0.05$).

CONCLUSION: Co-managed care involving CPS and primary care providers results in greater improvement in A1c reduction for high risk patients. Co-managed care also increases incidence of adequate monitoring of HEDIS measures.

161. School of nursing and college of pharmacy partnership in the development of a primary care clinic *Kylee Funk, Pharm.D., BCPS*[1], Jane Anderson, DNP, ANP-C, FNP-C, RN[2], Thomas Clancy, PhD, MBA, RN, FAAN[2], Tom Larson, Pharm.D.[1], Todd Sorensen, Pharm.D.[1]; (1) Pharmaceutical Care & Health Systems, University of Minnesota College of Pharmacy, Minneapolis, MN (2) University of Minnesota School of Nursing, Minneapolis, MN

PURPOSE: Legislative changes in the state of Minnesota in 2015 removed the requirement that nurse practitioners prescribe medications under a collaborative agreement with a physician. In anticipation of these changes, University of Minnesota's School of Nursing created a business plan for a nurse-managed primary care clinic. Pharmacist inclusion in this clinic was seen as an asset and the potential for benefits were strengthened further since pharmacists are allowed to work under a collaborative practice agreement with nurse practitioners in Minnesota.

METHODS: This clinic is located in a housing unit created for economically disadvantaged adults, many of whom are disabled and previously homeless. Caseworkers in the housing unit will work in conjunction with the primary care team (composed of nurse practitioners and pharmacists) to provided highly coordinated care for the tenants of the housing unit.

RESULTS: Data will be collected to explore the distribution of clinical functions of nurse practitioners and pharmacists in this clinic. As the interprofessional practice grows, referral patterns, distribution of clinical efforts, and cost of care measurements will help define the level of effectiveness and efficiency that this unique team provides. In addition, the revenue model of pharmacist provision of medication therapy management services through this clinic will be evaluated. Patient-level outcomes will include analysis of rates of emergency room visits before and after implementation of the on-site clinic. Patient and caseworker satisfaction with the clinical services will also be measured.

CONCLUSION: This clinic provides an opportunity to study an innovative model of primary care services delivered by a team of nurse practitioners and pharmacists.

162. 2015 updates on the accomplishments and initiatives of the ACCP ambulatory care practice and research network (PRN) *James Lee, Pharm.D., BCACP*[1], Sweta Patel, Pharm.D., BCPS[2], Golden Peters, Pharm.D., BCPS[3], Amy Leung, Pharm.D., BCPS[4], Gregory Castelli, Pharm.D., BCPS[5]; (1) University of Illinois at Chicago College of Pharmacy, Chicago, IL (2) Mercer University College of Pharmacy, Atlanta, GA (3) Saint Louis College of Pharmacy, Saint Louis, MO (4) Phoenix VA Health Care System, Phoenix, AZ (5) West Virginia University School of Pharmacy, Morgantown, WV

PURPOSE: To provide an update of the initiatives and achievements of the ACCP Ambulatory Care PRN and its membership.

METHODS: The Ambulatory Care PRN membership is queried biannually regarding individual professional accomplishments such as promotions, appointments, awards, funding, and scholarly activities. PRN committees provide updates on the progress and accomplishments achieved through charges and initiatives. Data obtained through surveying tools and web-based communications have been compared to previous years. A record of accomplishments are continuously documented and reported via the ACCP PRN Report.

RESULTS: As of 2015, the Ambulatory Care PRN consisted of over 2100 members, showing positive growth in practice scope, area, and career stages. PRN committees continue to forge forward on initiatives ranging from advocacy to professional activity and scholarship skills development. Advocacy efforts include developing tools to advance the College's Medicare Coverage Initiative. New strategies for expanding and optimizing PRN funding to support member participation in research training programs, trainee travel, and the development of clinical innovations through PRN Seed Grant support have been pursued. Initiatives aimed at improving the value of PRN professional and networking benefits, as well as new strategies for expanding PRN recruitment targeting a broad scope of ACCP meetings and membership levels, are being reviewed and further developed.

CONCLUSION: The Ambulatory Care PRN continues to show positive growth in membership depth, serves as a significant professional resource for its membership through expanded funding and participation opportunities, and maintains its status as an integral constituent of ACCP. 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 leadership, educational, and innovation opportunities with the objective of furthering the practice and impact of clinical pharmacy in ambulatory care pharmacist development and patient care provision.

163. Impact of pharmacist-initiated home blood pressure monitoring and telephonic interventions Josephine Aranda, Pharm.D., Krista Mecadon, BS, Bhakti Patel, BS, *Debra Reid, Pharm.D.*; School of Pharmacy, Northeastern University, Boston, MA

PURPOSE: According to the Centers for Disease Control and Prevention, only 47% of Americans diagnosed with hypertension have their blood pressure (BP) under control and only 51% are adherent to their hypertension medications. The purpose of this study is to assess the impact of pharmacist-initiated home blood pressure monitoring (HBPM) and telephonic interventions on improving blood pressure control.

METHODS: This prospective, open-label study at a federally qualified health center will enroll adult patients referred by primary care physicians to clinical pharmacy for hypertension management. Eligible patients will attend at least one clinical

pharmacy visit for initial education and blood pressure check, and agree to daily home blood pressure monitoring (HBPM). Patients will be provided a BP monitor and instructions to take and record BP values twice each morning and twice each evening. Follow up calls from a clinical pharmacist, resident, or students will be conducted every two to four weeks to collect results from HBPM, assess medication adherence, and implement appropriate interventions. The Million Hearts Initiative DRAW tool will be used to assess adherence and guide the pharmacist-patient interactions. Primary outcomes will include percentage of patients with controlled BP (per JNC-8 guidelines) and changes in systolic and diastolic BP at 4, 8, and 12 months. Secondary outcomes will include improvements in medication adherence.
RESULTS: In a pilot program, 132 patients attended a clinical pharmacy visit for hypertension management. Mean BP was 134/82 mm Hg, and 65% (86) of patients achieved a BP goal of <140/90 mm Hg. Prospective data collection is currently ongoing to further evaluate the impact of HBPM and pharmacist-initiated telephonic interventions on BP control.
CONCLUSION: Pending.

164. Clinical pharmacist involvement in the management of patients in a heart failure clinic: a quality improvement initiative *Robin Klasek, Pharm.D.*[1], Nisrine Haddad, Pharm.D.[1], Rafael Felippi, Pharm.D., BCPS[2], Meghan Mccomb, Pharm.D., BCPS[1], Arvind Bhimaraj, M.D, M.P.H, FACC[3], Michael Liebl, Pharm.D., BCPS[1]; (1) Department of Pharmacy, Houston Methodist Hospital, Houston, TX (2) Houston Methodist Physicians' Alliance for Quality, Houston Methodist Hospital, Houston, TX (3) Methodist DeBakey Heart & Vascular Center, Houston Methodist Hospital, Houston, TX
PURPOSE: The Affordable Care Act requires the Centers for Medicare and Medicaid Services to reduce payments to hospitals with excess readmissions. Heart failure (HF) affects over 5.1 million individuals in the US with a national, unplanned 30-day readmission rate of 22.7%. We assessed the feasibility and benefits of pharmacy services in a private physician HF clinic, in an effort to improve transitions of care, promote patient compliance and ultimately reduce re-hospitalizations.
METHODS: Pharmacy residents provided services three days a week in a private physician group HF clinic. Residents were available to all patients with priority given to patients discharged from the hospital within the past 90 days. Residents identified patient medication discrepancies, provided medication education, reviewed diagnostic tests and laboratory values, recommended appropriate immunizations, and collaborated with physicians to optimize medication therapy. All discrepancies and interventions were documented using an adapted medication-discrepancy tool reported by Coleman et.al.
RESULTS: After 22 clinic days, there were 151 patient encounters with 54 (35.8%) of patients being recent hospital discharges. Residents spent 24.6 minutes per patient with the majority of contact time during what was traditionally "down-time" for the patient. Feedback from clinic staff noted no delays, but rather improved patient progression. Discrepancies in medication lists were identified in 108 (71.5%) patients while adverse drug reactions were noted in 14.6% of patients. There were 40 (26.5%) patients with performance or knowledge deficits, and non-adherence was identified in 17.2% of patients. Residents recorded 2.7 medication interventions per patient including 139 medication list discrepancy resolutions and 57 recommendations to physicians resulting in therapy or monitoring changes. Rates of HF readmissions within 30 days are being collected for analysis at this time.
CONCLUSION: Inclusion of residents in an outpatient HF clinic promotes medication optimization, facilitates detection of medication discrepancies, increases patient contact time and promotes multidisciplinary care.

166. Implementation and evaluation of a comprehensive medication review in patient centered medical home *Anne Yoo, Pharm.D., BCPS*[1], Marie Marcelino, Pharm.D., MBA, BCACP[1], Tami Remington, Pharm.D., BCPS[2], Hae Mi Choe, Pharm.D.[2]; (1) University of Michigan Health System, MI (2) University of Michigan Health System, University of Michigan College of Pharmacy
PURPOSE: The elderly and those on high numbers of medications are at greater risk of having drug-related problems. There are many challenges in wide dissemination of CMR by community pharmacists due to lack of patient engagement and provider acceptance of pharmacist's therapeutic recommendations. Most recent national statistics showed only 6% of eligible patients received CMR. In 2016, CMR participation rate will be included in the STAR rating. Patient Centered Medical Home (PCMH) pharmacists provide a unique solution to current delivery of CMR. The primary objective is to measure participation rates for CMR-eligible patients and develop effective strategies for patient outreach and provider engagement. The secondary objective is to measure patient satisfaction.
METHODS: U-M prescription drug plan members taking five or more chronic prescription medications (not including over the counter and herbal medications) were offered CMR service with a PCMH clinical pharmacist. Student pharmacists of University of Michigan College of Pharmacy enrolled eligible patients via telephone. The service included two appointments (face-to-face or telephone) in which the pharmacist evaluated medications for safety, efficacy, and cost. Recommendations were communicated to the treating specialist and primary care provider and then implemented at the follow up appointment.
RESULTS: From January 15, 2014 until September 15, 2014, 270 of 489 (55.2%) eligible patients agreed to partake in the CMR service. Of those patients who were actually reached, 69.1% agreed to participate.Out of 133 surveys, on a 5-likert scale (1 = worst and 5 = most), patients found the service to be helpful (avg 4.68), comfortable (avg 4.93), useful (avg 4.67), comfortable (avg 4.93), convenient (avg 4.65) and was overall satisfied (avg 4.75).
CONCLUSION: Integrating CMR into a PCMH university setting in which PCMH pharmacists have existing professional relationships with providers has shown to increase patient participation rate compared to national statistics. Patients are also highly satisfied with the service as well.

Cardiovascular

167. Development and validation of a risk score to identify hospitalized patients at risk for torsade de pointes and sudden cardiac death *Jason Haney, Pharm.D.*; Department of Clinical Pharmacy & Outcome Sciences, South Carolina College of Pharmacy, Charleston, SC
PURPOSE: QT interval prolongation (QTP) is the best known surrogate marker for torsade de pointes and sudden cardiac death. This study created a risk prediction tool and attempted to validate its ability to identify patients at the greatest risk for QTP in order to allow risk mitigation.
METHODS: Medical records of 100 randomly selected hospitalized adults (80% general wards, 20% intensive care) in a private community hospital were reviewed. Patient factors including heart rate, QTc interval, comorbidities, electrolytes, QTc-prolonging drugs, and associated drug interactions were documented. Exclusion criteria included lack of continuous cardiac monitoring and completely paced ventricular rhythms. Several risk factors automatically flagged a patient for review. QTP was defined by three published methods. Patients were stratified by QTP risk level using the weighted sum of all other risk factors. The risk score was validated by correlating the presence of QTP with the risk stratification.
RESULTS: Eighty percent of screened patients received at least one QT-prolonging drug. Three of the 33 auto-reviewed patients

had >1 auto-review risk factor. Having ≥1 high risk QTc-prolonging drug, ≥2 moderate risk drugs with a high risk score, and baseline QTc ≥500 msec were the most common auto-review flags. Five of the 14 high-risk patients were not auto-reviews, with heart failure, serum Mg ≤1.2, combinations of QTc-prolonging drugs, female sex, and at-risk HR-QTc pair being their most common factors. The risk score was directly correlated with the average QTc interval (R^2 = 0.42). All definitions of QTP were directly correlated with risk stratification, with HR-QTc nomogram being the strongest (R^2= 0.51).
CONCLUSION: The risk prediction tool appears to identify hospitalized patients at the highest risk of QTP and provides a safety mechanism allowing clinicians to mitigate patient risk. The high number of auto-reviews may be challenging for hospital-wide utilization.

168. A student pharmacist-led public health initiative for early identification of cardiovascular and kidney disease risk factors *Mena Raouf, Pharm.D. Candidate*[1], Christopher Wilming, Pharm.D. Candidate[1], Taylor Kelsey, Pharm.D. Candidate[1], Carol LaFleur, BS[2], Katherine Cabral, Pharm.D.[1], Amy Barton Pai, Pharm.D.[3]; (1) Albany College of Pharmacy and Health Sciences (2) North East Kidney Foundation (3) Albany College of Pharmacy and Health Sciences/ NY State CKD Coalition
PURPOSE: Cardiovascular (CV) disease remains a leading cause of mortality in the United States and nearly 26 million patients are at risk for kidney disease. The SCCP chapter at Albany College of Pharmacy and Health Sciences (ACPHS) provides free CV and renal risk (CaRE) screening in collaboration with the North East Kidney Foundation. The goal is to evaluate, counsel and educate underserved populations on CV and renal risk factors.
METHODS: SCCP at ACPHS conducted CaRE screenings at two health expo events on campus (2014, 2015). Participants were walk-ins from the surrounding community. CaRE screenings involve an interprofessional approach utilizing pharmacy and nursing students to conduct CV screening, risk assessment, and education. Participants completed a health questionnaire (self-reported risk factors, family history), then had their blood pressure and random blood glucose measured They were triaged by blood pressure and glucose values for microalbuminuria screening. After the screenings, participant data were entered to the 'American Heart Association My Life Check' using iPad technology. Participants cardiovascular and renal risk factors were reviewed by a student pharmacist. Participants then received consultation on their documented risk factors, educational materials and self-management support tools (e.g. blood glucose logs, pill boxes)
RESULTS: Out of 126 patients screened, 24% had elevated blood pressure (>140/90 mmHg), 31% reported having high cholesterol, and 5% reported that they smoke. Out of 66 patients screened, 6% patients who reported antihypertensive medications use were above target BP goal, 6% of participants on medication for diabetes had elevated (>180 mg/dL) blood glucose levels, and 3% had both uncontrolled hypertension and diabetes.
CONCLUSIONS: The CaRE screening program provides underserved communities access to laboratory and clinical data to evaluate their risk for CV and kidney disease. The program also allows students to gain early direct patient care experience and fosters interprofessional relationships.

Clinical Administration

169. Checking the clinical pathway prescription to promote rational drug use *Wei Lina, M.D.*; Pharmacy Department, The Affiliated Hospital of Qingdao University, Qing dao, China
PURPOSE: Clinical pathway is refer to the optimal care process of a particular diagnosis or procedure. Multidisciplinary professionals make rules including doctors, pharmacists,nurses and managements. It is proved to be an effective and improved tool that rationalizing clinical schedule arrangements, ensuring patients better medical care, meanwhile, promoting cost-effectiveness of clinical services. Clinical pharmacists play an important role during the whole process as participants and supervisors. Therefore, this study is to explore the mode of clinical pharmacists in managing clinical pathway and promoting rational drug use.
METHODS: According to the guideline of clinical pathway or single disease promulgated by National Health and Family planning Commission of China and Special prescription reviews of Beijing Medical Institutions. The electronic medical record system of 88 clinical pathway diseases in 22 clinical departments in Affiliated Hospital of Qingdao University was given the drug rationality review.
RESULTS: In 44 diseases about the perioperative use of antimicrobial agents, 31.58% are variety choice inappropriately, 13.64% are dose timing appropriately, the main factors including economics and covering the spectrum of organisms too many. In support therapy of 88 diseases, 30.68% variety choice inappropriately, 18.18% directions appropriately, 4.5% solvent poor choices. Main problems including economics and did not give attention to both liver and kidney function and the dose of elderly patients with adjustment.
CONCLUSION: Economics is major problem influencing on the rationality of clinical pathways, at the same time the safety of special groups should be ensured. Right antimicrobial drugs and proper timing choose can be a powerful weapon to control antimicrobial drugs. Checking the clinical pathway administration template can be used as a platform for clinical pharmacists to managing the clinical pathway and promoting the rational drug use.

170. Clinical specialist-led quality assurance review of a pharmacy vancomycin dosing service Michael Spinner, M.A., Pharm.D., Julie Barnes, Pharm.D., Seth Bauer, Pharm.D., FCCM, BCPS, Andrea Pallotta, Pharm.D., BCPS, AAHIVP, Jennifer Sekeres, Pharm.D., BCPS (AQ-ID), Jonathan Williams, Pharm.D., M.S., Elizabeth Neuner, Pharm.D., BCPS [AQ-ID]; Department of Pharmacy, Cleveland Clinic, Cleveland, OH
PURPOSE: Cleveland Clinic's pilot Pharmacy Vancomycin Dosing Service (PVDS) began in August 2010 and expanded hospital-wide December 2013. After providers order a PVDS consult, all departmental pharmacists are involved with vancomycin therapeutic management using a standardized protocol. To ensure a consistent, high-quality PVDS, a quality assurance (QA) review was developed. The review's purpose is to ensure high level clinical care, provide individual feedback, and determine future areas of improvement. Our objective is to describe the PVDS QA review process and provide results from 2014.
METHODS: Pharmacists document vancomycin therapeutic management via notes in patients' electronic medical records. For Q1 and Q2 2014, every pharmacist had 5 notes randomly chosen for review. Clinical specialists reviewed and scored appropriateness of initial dosing, drug level interpretation, dose adjustments, and documentation. Pharmacists received individual feedback outlining areas of strength and suggestions for improvement from their reviewer. For Q3 and Q4, only pharmacists who previously scored < 80% were reviewed.
RESULTS: There were 4,367 PVDS consults ordered that were managed by 89 pharmacists in Q1 and Q2. Eighteen clinical specialists performed QA reviews. Initial vancomycin dose and frequency chosen by the pharmacist were correct 97% and 95% of the time respectively in Q1, and 98% and 95% correct in Q2. Appropriateness of drug level interpretation and subsequent dose adjustments were 90% and 87% respectively in Q1, and increased to 96% and 92% in Q2. Proper documentation including note timing and clarity remained consistently high throughout (> 94%). Eighty-two of 89 pharmacists successfully met a > 80% scoring threshold during the first two quarters. Pharmacists reviewed in Q3 and Q4 scored lower on level interpretation and subsequent dose adjustments.

CONCLUSION: The PVDS is operating at a high-quality level clinically and administratively. Level interpretation and dose adjustment score improvements in Q2 reflect successful incorporation of feedback by pharmacists from their colleagues.

Community Pharmacy Practice

171. Development of an innovative technology-driven transitions of care service to improve medication use in rural populations *Caitlin K. Frail, Pharm.D., MS, BCACP*[1], Oscar W. Garza, PhD, MBA[1], Alison L. Huet, Pharm.D.[2]; (1) Pharmaceutical Care and Health Systems, University of Minnesota College of Pharmacy, Minneapolis, MN (2) Jackson Pharmacy & Wellness Center, Jackson Center, OH

PURPOSE: Pharmacist-driven transitions of care have demonstrated the ability to reduce hospital re-admissions and improve patient outcomes. However, access to pharmacy services in rural areas limit opportunities for patients to benefit from face-to-face pharmacist care within the critical time period immediately following discharge. An innovative approach to in-home medication reconciliation and patient education supported by technology is one solution to increasing access to care for this population.

METHODS: This service is based on a partnership between a community pharmacy organization and nearby hospitals in rural Ohio. Upon discharge, the pharmacist reconciles and coordinates the hospital discharge orders with their community pharmacy records, the primary care provider, and the patient. Post-discharge medications are dispensed in a calendarized adherence packaging system. Medications are delivered to the patient's home by the community pharmacy's delivery service. At delivery, the patient receives education from the pharmacist via videoconferencing on a computer tablet. Unneeded medications are removed from the patient's home to prevent confusion. Pharmacists follow up with patients as needed based on their specific needs.

RESULTS: Data is currently being collected in order to empirically evaluate this process. Outcomes include re-admissions at 30 and 180 days following discharge and patient satisfaction with the service. Pharmacists also document drug therapy problems identified during medication reconciliation.

CONCLUSION: This innovative pharmacist care model may offer a solution to increasing access to pharmacy services for underserved patients during a critical transition in care.

172. Education of resettled refugees on utilization of US community pharmacy systems *Hyun-Su Kim, Pharm.D., MA*[1], Ben Michaels, Pharm.D.[2], Grace Kilbane, Pharm.D.[3], Jennifer Rodis, Pharm.D., BCPS, FAPhA[1]; (1) College of Pharmacy, The Ohio State University, Columbus, OH (2) Pharmacy Dept., The Kroger Co., Columbus, OH (3) Pharmacy Dept., Walgreens Co., Mansfield, OH

PURPOSE: General knowledge of the United States (US) medication use system is lacking in newly resettled refugees who are unaccustomed to healthcare in the US. In addition, language barriers can contribute to confusion regarding proper medication access and use. To address these gaps, this project aims to increase refugee knowledge of the US medication use system and provide education on availability and access to pharmacy services in the community.

METHODS: Central Ohio is an initial resettlement area accepting approximately 1000 new refugees to the US each year. Through collaboration with refugee resettlement agencies and in conjunction with The Ohio State University College of Pharmacy's Partner for Promotion, a national grocery store chain pharmacy developed an educational program called 'Orientation to Pharmacy Services' for refugees unaccustomed to US pharmacy services and systems. This educational session is held every other month and conducted by trained Doctor of Pharmacy students. A 2-hour educational session provides information on services available from community pharmacies, differences between over-the-counter and prescription medications, how to obtain a prescription, process for ordering refills, how to read a prescription label, and how to pick up medication from the pharmacy. This presentation is verbally interpreted into the refugees' home language(s) and supplemented by translated handouts. Impact of the education is being assessed through interviews and completed questionnaires with refugees.

RESULTS: Since July of 2013, one hundred-forty-four participants from seven different language groups have attended presentations. Participants have reported the presentation is helpful and would recommend it to others in his or her community. Additionally, refugees reported the presentation has enhanced their understanding of US medication use systems.

CONCLUSION: Pharmacists and pharmacy students are frontline health care professionals with an opportunity to provide general education to refugees and help them integrate into the US healthcare system and medication use process.

Drug Information

173. Evolution of the Drug Information Group at the University of Illinois at Chicago (UIC) College of Pharmacy into a revenue generating business unit *Michael Gabay, Pharm.D., JD, BCPS*[1], Courtney Krueger, Pharm.D.[2], Mary Moody, BSPharm[2]; (1) College of Pharmacy, University of Illinois at Chicago, Chicago, IL (2) Department of Pharmacy Practice, University of Illinois at Chicago, Chicago, IL

PURPOSE: To describe the history of the unique development of the UIC Drug Information Group and provide an overview of the current services offered.

METHODS: N/A.

RESULTS: Prior to 1997, drug information services at UIC consisted of traditional, internal drug information services offered to the affiliated medical center and surrounding community. Drug information services were provided by 3 drug information specialists and included newsletters, P&T committee support, and responses to drug information requests from healthcare providers and patients. Beginning in 1997, the Drug Information Group (DIG) was required to become self-supporting and, eventually, revenue generating, which is a unique model for an academic-based drug information service. The first major contract for drug

		Mean weekly dose (mg) ± SD			
Polymorphism	Race	Homozygous wild type	Heterozygous	Homozygous variant	p
rs12714145	Caucasian	35.4 ± 14.6	37.79 ± 16.14	36.87 ± 17.42	0.5
	Egyptian	35.15 ± 17.7	38.98 ± 18.7	40 ± 19.02	0.42
rs7856096	Caucasian	36.71 ± 15.2	33.10 ± 13.6	–	0.4
	Egyptian	35.28 ± 16.8	37.18 ± 19.3	–	0.48
rs4889606	Caucasian	45.46 ± 17.34	32.45 ± 11.61	22.95 ± 8.22	<0.0001
	Egyptian	47.14 ± 21.88	37.18 ± 16.09	27.83 ± 13.76	<0.0001

information services began in 1998 with a company who managed approximately 450 hospitals. This contract sparked expansion of the DIG to 5 drug information specialists and extended service hours. Currently, the DIG employs 10 residency-trained drug information specialists along with support staff to assist with operations, finance, and information technology. The range of services is always evolving. The DIG now responds to approximately 300 drug information requests submitted by health-system pharmacists per month. Drug information specialists assist requestors with managing both specific patient and policy-related questions. In addition to drug information requests, the DIG is involved in a variety of contractual researching and writing projects including: dossiers, standard response letters, manuscripts, newsletters, posters, formulary reviews, database development, and continuing education programs. The DIG has also expanded its client base through participation in advisory boards and development of consensus conferences for our clients.
CONCLUSION: Historically, the UIC DIG provided typical drug information services to our affiliated hospital; however, expansion of contractual services has allowed our Group to become financially self-supporting and provide revenue to the College in an innovative manner in order to expand its educational and service missions.

Education/Training

174. Advancing pharmacy practice in India through a unique clinical pharmacy learning series *Michelle Martin, Pharm.D.*[1], Sharon See, Pharm.D.[2], Krishna Kumar, PhD, MPS[3]; (1) Department of Pharmacy Practice, University of Illinois Hospital and Health Sciences System / UIC College of Pharmacy, Chicago, IL (2) Clinical Pharmacy Practice Department, St. John's University College of Pharmacy and Health Sciences, Jamaica, NY (3) Department of Pharmaceutical Sciences, Howard University, College of Pharmacy, Washington, DC
PURPOSE: The doctor of pharmacy degree was implemented in India in 2008, with the first class graduating in 2014. A clinical learning series for students was established in 2012 to assist in advancing clinical pharmacy practice in India.
METHODS: Since 2012, the Indian Association of Colleges of Pharmacy (IACP) Pharmacy Practice Module-Advanced Learning Series has presented 8 therapeutic modules across India. Conferences are held several times per year. Experienced clinical faculty from the United States are invited to teach the modules and share their clinical experience with the pharmacy students. Three faculty members each developed 6 hours of material to teach during the 3-day seminar on gastrointestinal and liver disease. Topics included pharmacokinetics, hepatitis C virus, liver disease and cirrhosis, irritable bowel syndrome, gastroesophageal reflux, constipation and diarrhea, and peptic ulcer disease.
RESULTS: The total number of participants in the 8thmodule was 294, of whom 141 filled out course evaluation forms. Faculty and students from 26 colleges of pharmacy across India traveled an average of 590 kilometers and 11 hours to attend the program. The average student age was 20.5 years and 92% were female. Ninety-six percent of the students reported that there was a high value in attending the conference, and 97 percent rated the program quality as positive. Eighty-nine percent of participants would recommend this conference to a colleague; 11% did not complete the question. Students' understanding of topics improved after attending the module, and faculty gained additional insight on clinical teaching.
CONCLUSION: Student and faculty attendees rated this program positively and appreciated learning about clinical pharmacy practice in the United States. This program increased student awareness of their important role in advancing pharmacy practice in India. This conference series continues to enroll pharmacy students across India and will develop additional therapeutic modules to serve student needs.

175. National characteristics of residency program interview processes *Jennifer H. Austin, Pharm.D.*[1], Katherine Mieure, Pharm.D.[2], Lynn Weber, Pharm.D.[3], Bryan McCarthy, Jr., Pharm.D., MS[1]; (1) University of Chicago Medicine, Chicago, IL (2) Department of Pharmacy, Massachusetts General Hospital, Boston, MA (3) Hennepin County Medical Center, Minneapolis, MN
PURPOSE: The growing interest in residency training within the profession of pharmacy has led to an increase in the number of applicants for residency positions and a subsequent need for more efficient and objective measures to allow for differentiation between candidates. This survey seeks to provide a description of the methods pharmacy residency programs use to select residency candidates.
METHODS: A 28-question electronic survey was distributed to 1717 residency program directors (RPDs) of ASHP-accredited and candidate programs in April 2014. Participants were asked questions to describe the residency program, the factors contributing to ranking residency candidates, and willingness to partake in the post-match scramble.
RESULTS: The survey was completed by 594 RPDs (35% response rate) representing 384 PGY1 programs, 193 PGY2 programs, and 17 combined PGY1/PGY2 programs. The majority of respondents (91%) represent hospital pharmacy programs. The most common qualities selected by RPDs that factor into ranking residency candidates were oral communication skills, motivation, and maturity. Over 90% of RPDs stated they would consider not ranking residency candidates mostly due to oral communication skills and maturity. Nearly all respondents (96%) are willing to participate in the scramble process, and 80% have modified their interview process when they have participated in past years.
CONCLUSIONS: Residency program interviews seek to evaluate specific qualities that will help differentiate who is a strong candidate for the residency program. Oral communication skills, motivation, and maturity of residency candidates play a large role in the ranking process for RPDs of both PGY1 and PGY2 programs.

176. Grow your role: incorporating student pharmacists into an existing global health program *Emily Peron, Pharm.D., MS*; School of Pharmacy, Virginia Commonwealth University, Richmond, VA
PURPOSE: The Humanitarian Outreach Medical Brigade Relief Effort (HOMBRE) at Virginia Commonwealth University (VCU) seeks to improve the health of underserved communities in Honduras, Peru, and the Dominican Republic while educating health professions students. For more than a decade, VCU medical students and medicine faculty have traveled abroad annually to staff clinics for residents of rural and underserved communities in these countries. VCU student pharmacist involvement began in five students in 2009 and has grown to 10 students in 2015. Approaches to integration and development of student pharmacists in HOMBRE will be described.
METHODS: Pharmacy team members are responsible for coordinating medication orders, formularies, and pharmacy supplies prior to departure. Once in-country, they dispense medications, maintain inventories, and counsel patients, providing care for more than 2,500 people annually. Student pharmacists also assist with medical and public health program development and maintenance. Students contribute their knowledge, skills, and compassion to those in need and, in return, become more culturally sensitive, gain an introductory knowledge of the broader determinants of health, and develop an understanding of key ethical issues impacting health-related brigades in international under-resourced settings.
RESULTS: In recent years, the following key changes have enabled integration and development of student pharmacists in HOMBRE: 1. Addition of School of Pharmacy representatives on the HOMBRE Board of Directors 2. Team-based learning incorporated into required interprofessional preparatory coursework 3.

Service learning credit and course credit for student pharmacists 4. Financial commitment from the School of Pharmacy to offset student travel expenses 5. Participation of School of Pharmacy faculty on short-term medical brigades
CONCLUSION: Harnessing physician site leader expertise and student pharmacist creativity allows School of Pharmacy faculty champions to meet the growing needs of student pharmacists to develop clinical skills, gain comfort working with a diverse patient population, and create meaningful global health partnerships.

Emergency Medicine

177. Initial opioid dosing in the emergency department for acute pain *Brian Faley, Pharm.D.*[1], Gabrielle Procopio, Pharm.D.[2], James Priano, Pharm.D.[1]; (1) Ernest Mario School of Pharmacy, Rutgers, The State University of New Jersey, Piscataway, NJ (2) Department of Pharmacy Practice and Administration, Ernest Mario School of Pharmacy, Piscataway, NJ
PURPOSE: Opioid medications have been the standard of care for pain control in the Emergency Department (ED) for many years. Recently, The Joint Commission (TJC) has issued a sentinel event alert regarding opioid use. The primary objective was to characterize opioid prescribing habits by ED providers for opioid-naïve patients who require intravenous (IV) morphine or hydromorphone for acute pain. Secondary objectives were reduction in pain scores, additional opioids, adjunctive use, and patient satisfaction with pain relief.
METHODS: A retrospective chart review of opioid-naïve adult patients who presented to the ED and received IV morphine or hydromorphone for acute pain was conducted. Patients were excluded if IV morphine or IV hydromorphone was ordered by non-ED providers.
RESULTS: Data was collected and analyzed on 102 patients. The average initial dose for patients who received morphine was 4.2 mg (0.05 mg/kg) versus 7.5 mg (0.1 mg/kg) morphine equivalents in the hydromorphone group ($p < 0.0001$). Initial pain scores were comparable in both groups with a value of 7.8 in the morphine group and 8.4 in the hydromorphone group ($p = 0.08$). Reduction on the Numeric Rating Scale (NRS) did not differ between patients who initially received morphine compared to hydromorphone (3.26 versus 4.06, $p = 0.17$). Subsequent opioids were necessary in 18 morphine patients and 25 hydromorphone patients ($p = 1.00$). Adjuncts were ordered on 26 and 13 patients who received morphine and hydromorphone, respectively ($p = 0.025$). There was no statistical difference in percentage of patients with acceptable pain relief.
CONCLUSION: Patients that present to our ED for acute pain received less total opioids if they were prescribed morphine. There was no difference in pain reduction or perception of pain control. In light of TJC's recommendations to limit the amount of opioids, institutions should examine their prescribing practices and institute a multimodal approach to pain control.

178. Evolution of emergency medicine clinical pharmacists' adult and pediatric consultations at a university teaching hospital over 5 years *Abby Bailey, Pharm.D.*[1], Stephanie Baker Justice, Pharm.D.[2], Regan Baum, Pharm.D.[1], Kyle Weant, Pharm.D.[3]; (1) Department of Pharmacy Services, University of Kentucky HealthCare, Lexington, KY (2) Department of Pharmacy, Charleston Area Medical Center, Charleston, WV (3) Department of Pharmacy, KentuckyOne Health, University of Louisville and Jewish Hospitals, Louisville, KY
PURPOSE: Clinical pharmacists in the Emergency Department (ED) have been shown to both reduce cost and medication errors. The objective of this project was to evaluate the current practice of emergency medicine pharmacists (EPh) at the University of Kentucky (UK) and describe how this practice has evolved since inception.
METHODS: Medical records of patients presenting from 2008–2014, who were evaluated in the UK Chandler Medical Center ED, and received care from EPh were retrospectively reviewed. Consultations were obtained from a self-documentation database.
RESULTS: A total of 19,380 patients were seen by EPh over the time period, with 18.1% of those being <18 years of age. EPh provided 33,495 unique consultations on these patients (1.7/patient). 85% of these consults occurred while patients were on the EM service. The most frequent consultations provided involved dosing recommendations (29.1%), medication preparation (24.0%), and pharmacotherapy recommendations (16.0%). The potential cost avoidance of these activities during the study period was $7,108,933. The estimated employee cost over the study period was $1,459,291, representing a cost benefit ratio of 4.9 to 1. The prevention of medication errors and therapeutic recommendations composed the majority of this cost avoidance. Pharmacotherapy consultations constituted 51% of cost avoidance in 2008 but 88% in 2014 ($p < 0.0001$). Cost avoidance per day increased consistently over the first four years of the review from $2876 in 2008 to a peak of $4184 in 2012.
CONCLUSION: The most frequent consultations provided by EPh involve dosing and pharmacotherapy recommendations. These activities have the potential to result in a significant cost savings for the hospital in addition to an improvement in overall patient care. The types of activities provided by EPh appear to significantly change over time and the financial benefits increase as these services evolve, yielding an increasing return on investment.

179. Patient versus pharmacist initiated follow-up for treatment of sexually transmitted diseases identified during emergency department visits Eric Gilliam, Pharm.D.[1], *Kevin Kaucher, Pharm.D.*[2]; (1) Skaggs School of Pharmacy and Pharmaceutical C238, University of Colorado, Aurora, CO (2) Department of Pharmacy and Emergency Medicine, Denver Health Medical Center, Denver, CO
PURPOSE: Gonococcal and chlamydial infections are sexually transmittable diseases (STD) commonly treated within emergency departments (ED). Treatment may be provided empirically or withheld while awaiting confirmation of infection. If treatment is not provided empirically, patient follow-up must be conducted. Patients are instructed to return to the ED or call back in order to learn final results of screening. In June 2014, the ED pharmacy service at Denver Health Medical Center implemented a culture follow-up procedure, including follow-up for all patients requiring treatment for STD infections. This chart review evaluates how the pharmacist-initiated STD call-back process reduces time to patient follow-up.
METHODS: All gonococcal and chlamydial infections identified during the six months pre and post implementation of the pharmacist initiated follow-up process were reviewed. For those patients who did not receive appropriate empiric therapy during the ED visit, all subsequent encounters and available records were reviewed to determine if and when patients were notified and when treatment occurred.
RESULTS: Ninety-seven patients were included in the review (pre-group = 47 patients; post-group = 50 patients). The pre and post groups were statistically similar in rate of appropriate empiric therapy prescribed (pre 42.6% versus post 34%) and types of infection present (83% versus 76% chlamydial infection present). Among the patients requiring follow-up for additional treatment, the time to notification was significantly reduced by the pharmacist initiated process (median (IQR) days to notification 22.5 (70) versus 3 (3), $P = 0.002$). The percent of patients lost to follow-up were lower after implementation of the new process (23% versus 16%, $p = 0.172$). Additionally, all patients unable to be reached by the pharmacist were mailed notification letters if unable to be reached by phone.
CONCLUSION: Pharmacist oversight of ED STD screening follow-up can reduce the time to patient notification compared to patient initiated follow-up.

Family Medicine

181. The pharmacist's role in readmission rates in transitional care management in a family medicine clinic *Ann M. Philbrick, Pharm.D.*[1], Ila M. Harris, Pharm.D.[2]; (1) Department of Pharmaceutical Care and Health Systems, University of Minnesota College of Pharmacy, Minneapolis, MN (2) Department of Family Medicine and Community Health, University of Minnesota Medical School, Minneapolis, MN
PURPOSE: To describe and assess the outcomes of a six month pilot of a Transitional Care Management (TCM) program at a family medicine clinic.
METHODS: Patients discharged from the clinic's affiliated hospital were contacted within two business days of discharge and asked to make an appointment for hospital follow up within seven business days. If a clinical pharmacist was available, patients were scheduled for a joint 40 minute appointment with the clinical pharmacist and medical provider. During these visits, the pharmacist reconciled the patient's medications, updated the medication list in the electronic health record (EHR), provided comprehensive medication management (CMM), and faxed the updated medication list to the patient's pharmacy with instructions to discontinue all medications not listed. If the clinical pharmacist was not present, patients were scheduled for a 40 minute appointment with the medical provider, who was responsible for ensuring the EHR medication list was up to date.
RESULTS: Thirty-five patients were seen for TCM during the first two months of the program, of which 21 (60%) were seen by a clinical pharmacist. Thirty-day readmission rates are available for 24 patients (16 pharmacist patients and 8 non-pharmacist patients), with one patient in each group readmitting at 30 days ($p = 0.6$). However the sample size is too small currently to detect a difference. Patient seen by the pharmacist had an average of 6.9 medication discrepancies and 2.86 drug-related problems (DRPs) identified. The most common DRP identified was indication – needs additional therapy (33.3% of all DRPs). Eighty percent of DRPs were resolved; the remaining were to be implemented at the next visit. The study is ongoing and six month data will be reported.
CONCLUSION: A clinical pharmacist provides a valuable role in the TCM process by not only identifying and resolving medication discrepancies, but also by identifying and resolving drug-related problems.

Gastroenterology

182. Role of the clinical pharmacist in the changing landscape of hepatitis C treatment *Jennifer Stark, Pharm.D., BCPS*; Veterans Healthcare System of the Ozarks, Fayetteville, AR
PURPOSE: To highlight the functions and growing opportunities for the clinical pharmacist in an outpatient clinic specializing in the treatment of chronic hepatitis C virus (HCV) infection.
METHODS: The treatment of chronic hepatitis C virus (HCV) infection has undergone significant changes in recent years. A clinical pharmacist was incorporated into an outpatient clinic that specializes in treating adult HCV infected patients. The pharmacist has a scope of practice to provide comprehensive HCV disease state management and monitoring, promote safe and effective use of the newest HCV treatment, and document both interventions and adverse drug events associated with HCV medications.
RESULTS: Functions of the clinical pharmacist were consistently documented in the electronic medical record. Documentation includes selecting optimal HCV treatment based on unique patient characteristics, screening for drug interactions with HCV medications, ensuring necessary medication changes prior to starting HCV treatment, monitoring adherence, developing written patient education for newly approved HCV treatments, monitoring for safety and efficacy during HCV treatment, identifying HCV infected patients in need of urgent treatment, and reporting adverse events that occur during treatment.
CONCLUSION: The newest HCV treatments are interferon-free with improved response rates, fewer adverse effects, shorter treatment duration, and with a significant increase in cost. Ensuring compliance and identifying clinically significant drug interactions are necessary for successful HCV treatment. A clinical pharmacist is well positioned to promptly recognize and manage drug interactions and medication related complications. Additionally, the pharmacist provides patient centered education, intense adherence education, safety and efficacy monitoring, and ensures that adverse effects to new agents are consistently documented and reported to appropriate local and federal agencies.

Hematology/Anticoagulation

183. The impact of a pharmacist-managed warfarin monitoring program for an orthopedic service utilizing a multidisciplinary approach at an academic medical center Nina Huynh, Pharm.D., BCPS[1], *Kirk Dennis, Pharm.D., BCPS*[2]; (1) Department of Pharmacy Practice, University of Illinois at Chicago, Chicago, IL (2) Department of Pharmacy, Rush University Medical Center, Chicago, IL
PURPOSE: Develop a pharmacist-managed warfarin monitoring program for an orthopedic service to 1) utilize a multidisciplinary approach without additional pharmacy resources to monitor warfarin therapy in patients undergoing total joint arthroplasty (TJA), 2) determine whether a pharmacist-driven service impacts management of warfarin therapy after TJA.
METHODS: Patients admitted for TJA from 2006 to present were offered to participate. The anticoagulation pharmacist designed and monitored 21 days of warfarin therapy. Data including age, gender, risk factor for venous thromboembolism and bleeding, kidney and liver function, medication history, international normalized ratio (INR), complete blood counts, warfarin dosage regimen were collected. Following hospital discharge, a qualified Home Health Care (HHC) service nurse, certified and trained by the anticoagulation pharmacist, oversaw the program from their practice sites under supervision of the anticoagulation pharmacist. Clinical outcomes included documented deep vein thrombosis (DVT), pulmonary embolism (PE), bleeding events, subtherapeutic and supratherapeutic INR. Ongoing assessment of pharmacy resources needed to implement the program was performed.
RESULTS: Approximately one thousand patients taking warfarin were monitored annually. Retrospective chart reviews of 300 randomly selected patients were evaluated. The average age of the patients was 61 years of age, and 38% were male. The average time to achieve therapeutic INR was 8.2 days, and 78% of patients achieved therapeutic INR. INRs were measured at least twice weekly after hospital discharge. Average dose of warfarin to maintain therapeutic INR was 4.5 mg daily. Approximately 50% of patients reported concomitant medications that altered anticoagulation effect, and therefore required careful monitoring. Combined documented DVT and PE was 6%. Incidence of major and minor bleeding was 8%. Additional pharmacy resources were not required since all resources were available on the orthopedic unit.
CONCLUSION: A pharmacist-managed warfarin monitoring program utilizing a multidisciplinary approach was successfully established for orthopedic patients without requiring additional pharmacy resources.

Infectious Diseases

185. What is the role of the clinical pharmacist in adult pneumococcal immunization programs? *Kimbal Ford, Pharm.D.*[1], Blair Capitano, Pharm.D.[1], Daniel Touchette, Pharm.D., MA[2], Rachel Chennault, Ph.D.[2], Verna Welch, Ph.D., MPH[1]; (1) Pfizer,

Inc., Collegeville, PA (2) American College of Clinical Pharmacy Research Institute, Lenexa, KS
PURPOSE: Evidence-based clinical practice recommendations are intended to standardize and improve patient care. Recommendation implementation requires a comprehensive, multi-disciplinary approach to recognize and overcome operational barriers and ensure success. Clinical pharmacists are well positioned to serve as vaccine advocates, facilitate partnerships with healthcare providers, and educate staff regarding vaccination awareness and compliance. This study was designed to assess the role of clinical pharmacists in adult pneumococcal immunization programs.
METHODS: A cross-sectional survey was issued to members of the American College of Clinical Pharmacy (ACCP) Practice Based Research Network (PBRN). Pharmacists receiving IRB approval and whose practice site included adult pneumococcal immunization guidelines or protocols were eligible. The aim of the study focused on describing pharmacist involvement in and support for the development, maintenance, education about, and use of pneumococcal immunization protocols (PIP) in both the inpatient and outpatient settings. Study results were analyzed using descriptive statistics.
RESULTS: Of 106 eligible participants, 45 participants completed 51 surveys (32 inpatient and 19 outpatient). Pharmacists were involved in development and implementation of PIP in (71.9%) inpatient and (21.1%) outpatient sites, maintaining PIP in (75.0%) inpatient and (21.1%) outpatient settings, and education of hospital staff regarding PIP in (34.4%) inpatient and (5.3%) outpatient settings. Pharmacists could order pneumococcal vaccine in (37.5%) inpatient and (15.8%) outpatient sites. Pharmacy driven review was used to encourage compliance with PIP in (28.1%) inpatient settings. Pharmacists performed vaccination screening in (31.6%) outpatient sites.
CONCLUSION: The predominate roles of clinical pharmacists in pneumococcal immunization in both the inpatient and outpatient setting was found to be as facilitators through policy development and implementation. Opportunity exists for pharmacists to enhance vaccine uptake and compliance with clinical recommendations through enhancing their role as educators and immunizers. Additional data to determine the health impact of the clinical pharmacist in pneumococcal disease prevention are needed.

186. A pharmacist lead latent tuberculosis infection clinic in a county health department *Christina M. Madison, Pharm.D., BCACP, AAHIVP*; Roseman University of Health Sciences College of Pharmacy, Henderson, NV
PURPOSE: Interdisciplinary team based approach to patient management includes a high degree of collaboration and communication among diverse healthcare professionals. The practice model of interdisciplinary team based healthcare has been shown to improve patient outcomes as well as increase patient satisfaction. Disease states that have a confirmed diagnosis and include medication intensive treatment regimens, offer an opportunity for specialty pharmacists to provide therapeutic management on a routine basis.
METHODS: A collaborative practice agreement (CPA) between the clinical infectious disease specialty (CIDS) pharmacist and infectious disease physician at the Southern Nevada Health District (SNHD) was approved in January 2014 by Nevada State Board of Pharmacy and implemented into practice in May 2014 to provide clinic services for a tuberculosis clinic (TBC). The CIDS at the SNHD received additional training in the area of tuberculosis (TB) in order to be proficient in independently leading a tuberculosis clinic. One section of the TBC follows all patients on treatment for active TB disease and referrals for new potentially active cases which is an interdisciplinary. A new clinic service was implemented following CPA approval focusing on diagnosis/treatment of latent TB infection (LTBI) that includes immigrants, contact investigation referrals, and physician referrals for patients receiving organ transplantation or receiving TNF-alpha therapy for autoimmune conditions. The clinical pharmacist obtains a targeted history, reviews laboratory and imaging results, makes decisions about LTBI treatment, and monitors the course of therapy.
RESULTS: Data regarding clinic implementation is currently prospectively being collected and analyzed in order to advocate for the implementation of clinics led by CIDS pharmacists in other public health departments offering TBC services in areas of decreased access to care.
CONCLUSION: A TBC at a county public health department led by a clinical infectious CIDS pharmacist can extend services already being provided by the physician led tuberculosis clinic within a defined patient population.

Medication Safety

187. AIM Model a novel and effective pharmaceutical care tool to optimise drug use process among patients as per their individual needs and demands *Mir Javid Iqbal, M. Pharm.*[1], Mohmmad Ishaq Geer, M Pharm, Ph.D[2]; (1) Pharmaceutical Sciences, University of Kashmir, Srinagar, India [2]pharmaceutical Sciences, University of Kashmir, srinagar, India
PURPOSE: To design implement and assess a novel pharmaceutical care model(AIM Model) focusing on individual patients drug related needs & problems and optimizing their drug therapy outcomes.
METHODS: Prospective, interventional, cohort study including 121 (66.48%) males and 61 (33.51%) females, admitted to the Internal and Pulmonary Medicine ward of a tertiary care hospital over a period of seven months were included in the study. The study was carried out in three steps as shown in AIM Model (Fig-1). At the outset Facility and health care staff assessment was done with the help of a questionnaire based study. Patient interview and medication use data was collected and assessed by the pharmacy practitioner. Drug-related needs and problems of patients were identified and Pharmaceutical care plans were formulated. Medication interventions were proposed, imparted and monitored. Finally the efficiency and reliability of the AIM Model was measured by means of a questionnaire based response from health care staff and patients.
RESULTS: Initial questionnaire based assessment revealed, poor knowledge and awareness regarding pharmaceutical care and lack of communication and coordination among health care workers. Over a period of seven months 8 causes of drug related problems DRPs were identified among which, drug use process & patient related factors accounted highest 32.4% & 23.29% respectively. A total of 388 DRPs with an average of 2.29 DRPs per patient were identified for which 233 interventions were made, besides imparting patient education and counselling to all patients. At the end questionnaire based feedback from healthcare staff and patients' revealed high efficiency and reliability of the model.
CONCLUSION: Pharmaceutical Care Services offered to the study patients by AIM Model proved beneficial in terms of better communication and coordination among health care staff, better patient compliance, improved health-related quality of life, optimized therapeutic outcomes and patient satisfaction.

188. Reducing the risk of acetaminophen overdose in hospitalized patients *Steven Johnson, Pharm.D.*[1], Kevin Szyskowski, BSPharm[2], Gay Alcenius, Pharm.D.[2], Ellen VanStee, BSPharm, MBA[2]; (1) Pharmacy Systems, Inc., Dublin, OH (2) Allegiance Health, Jackson, MI
PURPOSE: Acetaminophen overdose (receiving more than 4 g in a 24 hour period) has been reported to occur in hospital inpatients at a rate as high as 6.6%, and acetaminophen toxicity is the leading cause of acute liver failure. The rate of inpatient acet-

aminophen overdose had not been examined previously at our facility and was thought to be a potential risk point.
METHODS: Dispensing data from the automated dispensing cabinetry (ADC) system was utilized to estimate acetaminophen exposure for all patients via analysis using Microsoft Excel Pivot Tables. A sample of patients shown to have received more than 4 g of acetaminophen during one calendar day from ADC data was confirmed by examination of the electronic medication administration record. We measured the rate of inpatient overdose at baseline and after implementation of various process and formulary improvements.
RESULTS: ADC data was analyzed for a 6 month period from July 1, 2013 to December 31, 2013 (baseline). Over 58,000 transactions for acetaminophen-containing products were obtained, representing 13,760 unique patients in the baseline analysis. The baseline rate of inpatient acetaminophen overdose was 1.2% - although this was lower than the 6.6% reported in the published literature, it was higher than desired organizationally. We implemented formulary changes to decrease acetaminophen content of stocked products, staff education, and implemented a new range order policy to decrease the risk of overexposure to acetaminophen. The follow-up rate of inpatient overdose was 0.2% from July 1, 2014 to December 31, 2014.
CONCLUSION: The rate of inpatient acetaminophen overexposure decreased from 1.2% to 0.2% after implementation of formulary changes, a new range order policy, and staff education.

189. Implementation of a best practice alert to improve vancomycin monitoring *Diana Andrade, Pharm.D.*; Pharmacy, Memorial Hospital West, Pembroke Pines, FL
PURPOSE: Incorrectly drawn vancomycin levels (IDVL) can delay antimicrobial therapy and increase healthcare cost. The implementation of a vancomycin best practice alert (BPA) can improve accuracy of vancomycin blood sample collection. The goal of this study is to assess if use of a BPA has the potential to significantly decrease the number of IDVL.
METHODS: The vancomycin BPA pilot was initiated on October 2014. The alert was activated 2 hours prior to the collection time and stopped when the serum level was reported. A retrospective analysis of the appropriateness of vancomycin serum measurements was conducted for two months prior to and one month after the BPA implementation. A vancomycin level was deemed appropriate if it was drawn within 2 hours prior to administration of the dose and was not drawn after dose administration.
RESULTS: We tested the hypothesis of Ho: p1 = p2 versus H1: p1 not= p2 and found the test statistics: Chi Square= 3.150 with degrees of freedom 1, p = 0.075927. When using a significance level of 10% there is sufficient evidence to conclude that the proportion of IDVL differs before and after the BPA implementation. In addition of differing, and when comparing the sample proportions of incorrect drawings, we also observed that the proportion is decreased with the BPA.

	BEFORE BPA Implementation (June & July)	AFTER BPA Implementation (October)
Incorrectly drawn	15	3
Correctly	27	18

CONCLUSION: Implementation of the BPA indicated a decrease in the number of IDVL but was not statistically significant due to the limited sample size. The alert was limited only to vancomycin trough measurements. This posed a great drawback in the management of renal insufficient and hemodialysis patients for whom random serum measurements are ordered frequently. The alert is currently on going modification to better meet the need of the patient population.

Men's Health

190E. Pharmacokinetics and efficacy of a New SEDDS formuation of oral Testosterone Undeconoate (TU) in hypgonadial men: data from two phase 3 trials with different dose-titration algorithms *Merrell Magelli, Pharm.D.*; Medical, Clarus Therapeutics, Papillion, NE
Presented at the ENDO/ICE meeting, Chicago, IL, June 22–25, 2014

191E. Safety of a new SEDDS formulation of oral Testosterone Undecanoate (TU) in hypogonadal men: data from two phase 3 trials with different dose-titration algorithms *Merrell Magelli, Pharm.D.*; Medical, Clarus Therapeutics, Papillion, NE
Presented at ENDO/ICE, Chicago, IL, June 22–25

Oncology

193E. Clinical pharmacist integration into the oncology medical home *Mandy Chan, Pharm.D., BCPS*[1], Andrew Yu, Pharm.D.[1], Rebecca Lau, Pharm.D., BCOP[1], Eva Linh, Pharm.D. Candidate[1], Eric Chen, M.D., Ph.D.[2], Karen Birmingham, Pharm.D., BCPS[1]; (1) Group Health, Tukwila, WA (2) Group Health Permanente
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194E. Developing a new MODEL of TEAM-based, patient-centric care for ambulatory cancer patients Vivianne Shih, Pharm.D., Wei Chang Ang, BSc (Molecular Biology, Biotechnology), Lita Chew, MMedSci (Clinical Oncology), Kaung Yuan Lew, Pharm.D., Afidah Bte Manaf, BSc (Pharm), Su Wen Lim, MSc (Clin Pharm), Joen Chiang, BSc Pharm Hons, Seng Kok Ang, BSc (Pharm); Department of Pharmacy, National Cancer Centre Singapore, Singapore, Singapore
Presented at a local conference in Apr 2015

195. Adherence to oral endocrine therapy in Asian women with breast cancer Lita Chew, MMedSci (Clinical Oncology)[1], Jo Lene Leow, Ph.D.[2], Ka Lok Cheung, BSc (Pharm)[3], Chee Ping Lee, BScPharm (Hon)[4]; (1) Department of Pharmacy, National University of Singapore, Singapore, Singapore (2) Pharmacy, National Cancer Centre Singapore, Singapore, Singapore (3) Pharmacy, National University of Singapore, Singapore, Singapore (4) Department of Pharmacy, National Cancer Centre Singapore
PURPOSE: The primary objective of this study is to investigate adherence to oral endocrine therapy among women who are prescribed tamoxifen, anastrozole, letrazole and exemestane. Secondary objectives include determining patient characteristics associated with poor adherence, reasons for the poor adherence and their preferred strategies to improve adherence.
METHODS: A prospective interview was carried out at the National Cancer Centre in Singapore from December 2013 to January 2014. The Morisky Medication Adherence Scale (MMAS-4) was administered to assess adherence. Prescription records were analyzed for the presence of refill gaps to verify self-reported adherence. Patients answered questions regarding their demographics, therapy, medication adherence, reasons for poor adherence and preferred strategies to improve adherence. The association between patient characteristics and adherence was analyzed.
RESULTS: A total of 161 women who have started OAET at least 6 months ago were recruited in the study, of which less than half were adherent (40.4%). Patients who were younger,

employed, taking tamoxifen and receiving fewer chronic medications were found to be significantly more non-adherent. The majority of patients said they were forgetful (44.1%) and preferred the use of pill-boxes (52.8%). Many (46.6%) acknowledged the need for increased education by healthcare professionals.
CONCLUSION: Women with breast cancer in Singapore display low adherence to OAET. Patients are generally receptive to the implementation of various strategies to assist them with their medication-taking behavior.

Other

198. Clinical pharmacist interventions as a member of palliative medicine interdisciplinary team in a community hospital setting *Dharma Naidu, Pharm.D.*[1], Kimberly Jones, Pharm.D.[1], David Kanyer, BSPharm[1], John Hausdorff, M.D.[2]; (1) Department of Pharmacy, Community Hospital of the Monterey Peninsula, Monterey, CA (2) Palliative Medicine Service, Community Hospital of the Monterey Peninsula
PURPOSE: This study was conducted to quantify interventions and outcomes achieved by a clinical pharmacist assigned with daily responsibilities to the Palliative Medicine Interdisciplinary Team.
METHODS: The medical records of patients with a palliative medicine consult between November 1st 2013 and October 31st 2014 were retrospectively reviewed. Data was extracted on documented clinical pharmacist palliative care activities. Pain and symptom management outcomes before and after pharmacist intervention were reviewed through examination of clinical notes. Data on pharmacist recommendations for discontinuation of medications/treatments, participation in family meetings, and advance care planning was also collected.
RESULTS: The palliative medicine pharmacist documented interventions in 487 patients, which represents 57% of all patients with a palliative care consult. Of the 487 patients, 325 were on concurrent pharmacy managed pain protocol where the palliative pharmacist took the lead in pain/symptom management. The remaining 162 were seen by the palliative pharmacist for routine intake and assessments, development of goals of care, including holding family meetings and completing advance health care directives/POLST. The average pain score reduction (0 to 10 pain scale) was 2.6 points in acute pain patients and 2.8 points in chronic pain patients within 24 hours of pharmacist intervention. In patients who had a documented pain goal, the pharmacist was able to meet the goal in 91% of these patients. Other symptoms managed included anxiety, nausea and dyspnea. There was improvement from moderate/severe symptoms to none/mild symptoms post pharmacist intervention. Pharmacists documented 481 interventions related to discontinuation of medications/treatments not supporting palliative care goals. These included chemotherapy (2.7%), antimicrobials (15%), fluids/oral medications (53%), and laboratory tests (29.3%) with an estimated direct cost savings of $100,000.00.
CONCLUSION: This study demonstrates the value of a clinical pharmacist aligned with an interdisciplinary palliative care team in a community hospital setting.

199. A poster walk rounds at the ACCP Annual meeting: surveying for success *Christopher Paciullo, Pharm.D., BCPS, FCCM*[1], Scott Bolesta, Pharm.D., BCPS, FCCM[2], Pamela L. Smithburger, Pharm.D., MS, BCPS[3]; (1) Emory University Hospital, Atlanta, GA (2) Department of Pharmacy Practice, Wilkes University, Wilkes-Barre, PA (3) Pharmacy and Therapeutics, University of Pittsburgh School of Pharmacy, Pittsburgh, PA
PURPOSE: The purpose of a research poster at a professional meeting is two-fold. One is for the author(s) to disseminate their research findings. The other is for the research community to provide feedback and critiques of new research. In order to increase the extent that both of these activities happen, the ACCP Critical Care PRN decided to formalize the process during the 2014 Annual Meeting.
METHODS: The PRN organized six, one-hour long walk rounds during the three poster sessions at the 2014 Annual Meeting. There were 34 posters with a critical care theme selected for the walk rounds. Both moderators and poster presenters were contacted prior to the meeting, with instructions for a five-minute presentation on the poster followed by 3–5 minutes of question and answer. Following the ACCP Annual Meeting, a seven-question survey was sent out to the poster presenters, moderators and the PRN membership to assess the quality and impact of the walk rounds process.
RESULTS: The survey was taken by 38 individuals (22 presenters, 18 moderators, and 8 observers) and 35 completed it. Among respondents, 39% were experienced or new practitioners, 13% residents, and 8% students. Eighty-five percent of presenters agreed they enjoyed the opportunity to present their research during the walk rounds, and 60% felt it increased the number of individuals to share their research with. While 78% of respondents felt the walk rounds were well organized, moderators felt they knew the objectives better than presenters ($p = 0.004$). The amount of time spent on each poster was felt to be "just right" by 92% of respondents, and 94% felt the PRN should continue to conduct walk rounds.
CONCLUSION: Presenters, moderators and observers felt the first Critical Care PRN poster walk rounds were beneficial. Future planning will attempt to increase awareness of the walk rounds and its objectives.

200. Ambulatory care PRN membership benefits survey. Maria M. Thurston, Pharm.D., BCPS[1], Kristen Gardner, Pharm.D.[2], Elaine Nguyen, Pharm.D., MPH, BCPS[3], Lea E. dela Pena, Pharm.D., BCPS[4], Michael Thiman, Pharm.D., BCPS[5], Andrew Smith, Pharm.D., BCPS (AQ-CV)[6]; (1) Pharmacy Practice, Mercer University College of Pharmacy, Atlanta, GA (2) Center for Behavioral Medicine, Kansas City, MO (3) Boise Veterans Affairs Medical Center (4) Department of Pharmacy Practice, Dreyer Medical Clinic & Midwestern University Chicago College of Pharmacy, Downers Grove, IL (5) University of Georgia College of Pharmacy (6) UMKC School of Pharmacy, Kansas City, MO
PURPOSE: Evaluate currently offered Ambulatory Care PRN benefits and obtain ideas for future benefits.
METHODS: The 2014–2015 Ambulatory Care PRN Membership Committee was charged with surveying the membership to (1) determine the most important current PRN benefits members desire to continue and (2) request ideas for benefits beyond those currently offered to optimize perceived benefits of PRN membership. Following review of the 2014 Membership Committee report, new benefits were suggested. The financial implications of and interest in the noted suggestions are still being explored. The survey assesses ten areas in order to make comparisons: practice setting, disease states/topics of relevance, membership category, years of membership, awareness of benefits, utilization of benefits, barriers to benefit utilization, most important benefits to continue, changes to existing benefits, and recommendations for new benefits. Through survey analysis, the Committee hopes to explain differences between awareness of benefits and perceived utility of specific benefits and determine if the rating of a current benefit of low importance is an awareness/lack of use issue versus no true value.
RESULTS: The survey was electronically distributed to current members via the PRN electronic mailing list, with a one month response period specified. Preliminary respondents ($n = 113$) were mostly full members (74.3%) practicing in academia (41.6%) and health system outpatient clinics (28.3%) with 1–3 years (29.2%) of membership. A large gap in awareness relative to current PRN benefit utilization (average 28.1%, range [1.8–53.1%]) was demonstrated with respondents citing lack of time as the most common barrier. Final analysis is planned for early spring.

CONCLUSION: Upon completion of the survey assessment, collaboration with the Communications committee is imperative to determine how to best inform PRN membership of tools and resources available, including any new benefits that may be offered. The members' value of certain benefits may inform other PRNs' decisions about member benefits.

201. Development of a specialty medication prior authorization service at an urban academic medical center *Michelle Martin, Pharm.D.*[1], Elena Telebak, Pharm.D. Candidate[2], Paige Taylor, Pharm.D. Candidate[2], Olga Volozhina, Pharm.D. Candidate[2]; (1) Department of Pharmacy Practice, University of Illinois Hospital and Health Sciences System / UIC College of Pharmacy, Chicago, IL (2) University of Illinois Hospital and Health Sciences System / UIC College of Pharmacy, Chicago, IL

PURPOSE: Most insurance companies require the completion of time-consuming prior authorizations (PAs) before approving high-cost specialty medications, including hepatitis C virus (HCV) treatment. The HCV clinical pharmacist at our urban academic medical center enlisted the help of pharmacy students to complete paperwork associated with HCV treatment. The students developed a PA service to assist in obtaining HCV medication approval to allow the clinical pharmacist to spend time on other clinical responsibilities.

METHODS: After training, students developed a protocol for completing PAs, appealing denials, and obtaining PA extensions. They developed a procedure to utilize efficient methods for medication approval as well as documentation of PA status in the electronic medical record. The PA service also refers patients to various medication assistance programs for patients who are uninsured or underinsured. The PA team collaborates with liver center providers to document proof of medical need, and works with insurers, manufacturers, and patients to achieve timely approval and receipt of medications.

RESULTS: Since the inception of the service in June 2014, students have spent 240 hours developing the PA protocol and completing 88 PAs, with an overall medication approval rate of 87.7%. Eighteen patients were referred to assistance programs for medication coverage or financial benefits. The PA team has allowed the clinical pharmacist to spend more time on clinical activities and scholarship, and less time on paperwork. The students increased their HCV disease state knowledge, and improved their written and verbal communication skills with patients, providers, and insurance companies.

CONCLUSION: The implementation of a student PA team allows clinicians to focus on clinical services and scholarship instead of the lengthy specialty medication approval process. This PA team model may be employed at other universities across a variety of specialty clinic settings where students are eager to gain experience with managed care, and improve communication and documentation skills.

202. Naloxone pharmacist prescriptive authority program: early successes with prescribing Naloxone rescue kits in New Mexico *Amy Bachyrycz, Pharm.D.*[1], Shikar Shrestha, BSPharm[1], Dhara Shah, Pharm.D. Candidate[1], Dale Tinker, BA[2], Ludmila Bakhireva, M.D., MPH, Ph.D.[1]; (1) Department of Pharmacy Practice and Administrative Sciences, College of Pharmacy, University of New Mexico, Albuquerque, NM (2) New Mexico Pharmacists Association, Albuquerque, NM

PURPOSE: Current New Mexico legislation allows certified pharmacists to prescribe, dispense and educate patients about the naloxone rescue kits (NRKs). The objective of this study was to describe the preliminary data collected through the Naloxone Pharmacist Prescriptive Authority Program and to evaluate specific trends in opioid overdose prevention in New Mexico pharmacies.

METHODS: During 2014, 157 pharmacists participated in the training about prescription of NRKs and patient education. After prescribing and/or dispensing of NRKs, pharmacists participating in the Program were asked to complete a brief reporting form, which captured patient demographic characteristics, reasons for NRK prescriptions, and the concurrent use of other substances.

RESULTS: As of January, 2015, pharmacists reported dispensing NRKs to 62 patients during the first 9 months of the Program. The mean age of participating patients was 39.9 ± 14.8 years (range: 19–76 years) and there were 40% female participants. For the majority of patients (90%) NRKs were prescribed for the first time; for the remaining 10% it was a refill. The most common reason for NRKs prescription was due to high-dose of prescription opioids (37.1%), followed by long-term opioid use (35.4%). Request for NRKs by a patient was primarily from patients on opioid maintenance therapy. After opioids (heroin, opioid-maintenance, prescription analgesics), benzodiazepines were reported the most frequently as a co-exposure (17.7%). The majority of the patients (42%) reported polydrug use.

CONCLUSION: These preliminary results indicate that pharmacists can play a vital role in identifying high risk patients susceptible to opioid overdose and prescribe, dispense, and educate patients on the use of NRKs effectively, thus helping to minimize opioid overdose throughout the state. Future goal of the Program includes evaluation of pharmacists' and patients' perceived barriers towards prescribing and requesting NRKs, respectively.

203. Medication adherence survey of patients attending ambulatory clinics Bashayer al-Shehail, Jr., Pharm.D.[1], *Nadia Ismail, Sr., Msc Clinical Pharmacy*[2]; (1) Clinical Pharmacy, KFHU, alKobar, Saudi Arabia (2) Clinical Pharmacy, KFHU, al kobar

PURPOSE: The aim of this study is to estimates the degree of ambulatory care patients adherence with their current therapy.

METHODS: A cross sectional survey was conducted among ambulatory care patients greater than or equal to 18 years of age and who were willing to participate in our adherence survey. A medication adherence questionnaire was designed using the 8-item Morisky Medication Adherence Scale (MMAS-8) in addition a forward translation of the original questionnaire was carried out from English to Arabic language to produce a version that was as close as possible to the original questionnaire in concept and meaning.

RESULTS: Survey response rate was 86% (172/200); of the total sample of which (50%) were female and (50%) were male with age range 25 yrs to 75 yrs. Twenty-eight respondents (14%) were excluded from study due to incomplete questionnaire. Low adherence rate was reported by 59.8% of patients surveyed, and only (8.7%) reported high adherence rate. Furthermore 38% of patient surveyed reported to follow up in more than one healthcare institution.

CONCLUSION: Ours survey finding indicate a high rate of low adherence score among patients attending our ambulatory clinics.

204. A novel revenue-generating pharmacy-led transitions of care program Eric Dietrich, Pharm.D., BCPS, Steven Smith, Pharm.D., MPH, BCPS, *John Gums, Pharm.D., FCCP*; Department of Pharmacotherapy & Translational Research; Department of Community Health & Family Medicine, University of Florida, Gainesville, FL

PURPOSE: Transitions of care (TOC) services are increasingly employed to reduce adverse drug events and hospital readmissions. Most TOC services focus on Ò cost-savingsÓ to justify personnel costs. We describe a novel program that is revenue-generating and self-sustainable.

METHODS: A pharmacy-led TOC program was implemented in July 2013 for a Family Medicine (FM) service at a large academic hospital. Medical chart review was performed for patients discharged to home to screen for potential mediation related problems. Patients were contacted by telephone within 2 business days of discharge to provide counseling, solve problems, and coordi-

nate follow-up visits. The position was funded through revenue generated using transitional care management (TCM) billing codes (99495, 99496), rather than standard office visit codes (99214, 99215), by FM physicians during hospital follow-up visits.
RESULTS: From July 2013 - January 2015 approximately 2500 patients discharged to home from the FM service received the pharmacy-led TOC intervention. During July 2013 Ð June 2014 (FY14), 582 TCM visits were billed (mean, 49 visits/month); during July 2014 Ð January 2015 (FY15), 456 TCM visits were billed (65 visits/month). Collections were approximately $100,000 for FY14 ($8333/month) and $82,000 for FY15 ($11,714/month). Using TCM visit codes rather than standard visit codes resulted in an additional $4,583 of revenue generated per month in FY14 and $6,143 per month in FY15 to date.
CONCLUSION: We describe the implementation of an innovative pharmacy practice model in TOC through increased revenue generation using TCM codes rather than standard office codes for FM hospital follow-up visits; revenue generated exceeded the 0.3 FTE required for the TOC activities. This model has distinct advantages over those relying on presumed cost-savings through prevention of adverse events or readmissions and revenue generation increased over time, suggesting sustainability of the model. Additional data are being evaluated to determine the clinical impact of the service.

205E. Richmond global health alliance: utilizing diverse professionals and students in building a successful global health project in Peru. *Emily Peron, Pharm.D., MS*[1], Sean McKenna, M.D.[2], Sean Byrne, JD[3], Ranya Abi-Falah, BA, BS[2], Niyant Jain, BS[2], Paula Tamashiro, M.D.[4], Siddhartha Dante, M.D.[5], MaryGrace Apostoli, BA[6], Blair Armistead, MPH[7], Julie Armistead, WHNP[8]; (1) School of Pharmacy, Virginia Commonwealth University, Richmond, VA (2) School of Medicine, Virginia Commonwealth University, Richmond, VA (3) Hancock, Daniel, Johnson & Nagle, P.C., Richmond, VA (4) School of Medicine, University of San Martín de Porres, Lima, Peru (5) University of Chicago Medical Center, Chicago, IL (6) Salesforce, New York, NY (7) School of Medicine, University of Washington, Seattle, WA (8) West Virginia University Mary Babb Randolph Cancer Center, Morgantown, WV
Presented at All Together Better Health VII, Pittsburgh, PA, June 6–8, 2014.

Pharmacogenomics/Pharmacogenetics

206. Development and evaluation of pharmacogenomic clinical decision support within a large healthcare system *J. Kevin Hicks, Pharm.D. Ph.D.*[1], Marc Willner, Pharm.D.[1], Maya Wai, Pharm.D.[1], Thomas Daly, M.D.[2], Jeffrey Chalmers, Pharm.D.[1], David Stowe, RpH[1], Kathryn Teng, M.D.[3]; (1) Department of Pharmacy, Cleveland Clinic, Cleveland, OH (2) R. Tomsich Pathology & Laboratory Medicine Institute, Cleveland Clinic, Cleveland, OH (3) Medicine Institute, Cleveland Clinic, Cleveland, OH
PURPOSE: Cleveland Clinic's Personalized Medication Program is incorporating evidence-based pharmacogenomics into routine patient care. An initiative of our program is to develop clinical decision support (CDS) tools to guide pharmacogenomic testing and gene-based drug prescribing at the point of care. Herein, we describe the development of our pharmacogenomic CDS tools, and evaluate the impact on patient care.
METHODS: Provider-specific pharmacogenomic CDS tools were developed per electronic health record (EHR) Meaningful Use criteria for the gene-drug pairs *TPMT*-thiopurines, *HLA-B*57:01*-abacavir and *HLA-B*15:02*-anticonvulsants. Pharmacogenomic CDS was integrated into the EHR at 10 Cleveland Clinic hospitals and 16 outpatient centers in Ohio and Florida. A formative evaluation was conducted to determine if the alert language was easy to comprehend and if alerts disrupted workflows. From July 1, 2013 to June 30, 2014 we evaluated alert firing and prescribing practices for the first two gene-drug pairs, *TPMT*-thiopurines and *HLA-B*57:01*-abacavir, integrated into our EHR.
RESULTS: To accommodate provider-specific CDS at multiple hospitals and outpatient centers, a total of 50 custom rules and alerts (i.e., 7 for *TPMT*-thiopurines, 8 for *HLA-B*57:01*-abacavir, and 35 for *HLA-B*15:02*-anticonvulsants) were integrated into the EHR. Linked to the CDS tools were Cleveland Clinic specific pharmacogenomic guidelines that provide gene-based pharmacotherapy recommendations. Test results and pharmacogenomic guidelines were integrated into the EHR order composer field for clinician convenience. During the study period 936 *TPMT* and 342 *HLA-B*57:01* alerts fired. No patient positive for *HLA-B*57:01* was prescribed abacavir, and no patient with low/absent TPMT activity was prescribed a thiopurine. Only 13% of clinicians found the alerts to negatively disrupt workflow, and only 8% of clinicians found the alert language difficult to interpret.
CONCLUSION: Numerous custom rules and alerts are necessary when integrating pharmacogenomic CDS into a large healthcare system. Clinicians found our CDS to be minimally invasive and easy to comprehend.

207. Establishment of an electronic health record-driven pharmacist-managed clinical pharmacogenomics service *J. Kevin Hicks, Pharm.D. Ph.D.*, Marc Willner, Pharm.D., Jeffrey Chalmers, Pharm.D., Mandy Leonard, Pharm.D., David Stowe, RpH, Scott Knoer, Pharm.D.; Department of Pharmacy, Cleveland Clinic, Cleveland, OH
PURPOSE: Cleveland Clinic's Personalized Medication Program established a pharmacist-managed pharmacogenomics consultation service that is fully integrated into our electronic health record (EHR). An EHR-driven consultation service provides clinicians an efficient method of contacting a pharmacist to provide services such as 1) interpretation of pharmacogenomic test results, 2) providing patient-specific, gene-based pharmacotherapy recommendations, 3) answering questions about how pharmacogenomics may be used to address drug intolerance or nonresponse, or 4) providing pharmacogenomic education for patients.
METHODS: A pharmacogenomics consultation service is provided by clinical pharmacists trained in pharmacogenomics. Although pharmacogenomic pharmacists are centralized on Cleveland Clinic's Main Campus, this service is available to 9 Cleveland Clinic hospitals and 16 outpatient centers across Ohio. To provide all clinicians convenient access to our pharmacogenomic pharmacists, a consultation request tool was integrated into the EHR across all hospitals and outpatient centers in Ohio. Clinicians requesting a pharmacogenomics consultation must complete a short questionnaire to determine the purpose of the consult (e.g., test interpretation, dosing recommendations, or patient education). A contact number is provided for urgent questions. Consult requests are routed to a pharmacist via an EHR messaging system, and patient-specific recommendations are entered into the EHR. Additionally, a decision support alert fires at the point of pharmacogenomic test ordering that reminds clinicians of the pharmacogenomics consult service and provides a link to the consult order.
RESULTS: Because it is not currently feasible to place pharmacogenomic trained pharmacists at all Cleveland Clinic sites, our EHR guided pharmacogenomics service provides an efficient workflow for physicians to contact centralized pharmacogenomic pharmacists. This service is available to physicians at 9 hospitals and 16 outpatient centers across Ohio, with plans to expand to Cleveland Clinic Florida.
CONCLUSION: An EHR integrated pharmacogenomics consultation service enables the dissemination of clinical services by centralized pharmacogenomic pharmacists across a large healthcare system.

208. Development and implementation of pharmacist-led clinical pharmacogenetics services within a personalized medicine program *Kristin Weitzel, Pharm.D., CDE, FAPhA*[1], Larisa H. Cavallari, Pharm.D.[2], Amanda Elsey, MHA[3], Aniwaa Owusu Obeng, Pharm.D.[4], Benjamin Staley, Pharm.D., BCPS[5], Jennifer Ashton, Pharm.D.[5], Teresa Vo, Pharm.D.[6], Ben Kong, Pharm.D.[4], Tara Higgins, Pharm.D.[7], Rhonda Cooper-DeHoff, Pharm.D., MS, FAHA, FCCP[8], Julie Johnson, Pharm.D., BCPS, FCCP, FAHA[9]; (1) Department of Pharmacotherapy and Translational Research; Center for Pharmacogenomics, University of Florida, Gainesville, FL (2) Department of Pharmacotherapy and Translational Research, University of Florida, Gainesville, FL (3) Dept of Pharmacotherapy and Translational Research, University of Florida, Gainesville, FL (4) University of Florida, Gainesville, FL (5) University of Florida Health Shands Hospital, Gainesville, FL (6) University of Florida (7) UF Health Shands Children's Hospital, Gainesville, FL (8) Dept of Pharmacotherapy and Translational Research; Division of Cardiovascular Medicine; Center for Pharmacogenomics, University of Florida, Gainesville, FL (9) UF Health Personalized Medicine Program; Department of Pharmacotherapy and Translational Research, Center for Pharmacogenomics; University of Florida, Gainesville, FL

PURPOSE: We describe a novel pharmacist-led clinical pharmacogenetics service established within an academic health center-based Personalized Medicine Program (PMP).

METHODS: The UF Health PMP is a pharmacist-led, multidisciplinary initiative that launched in 2012 with a pilot *CYP2C19*-clopidogrel implementation aimed at tailoring antiplatelet therapies after coronary artery stent placement. Initial program efforts have focused on pharmacogenetics, with a long-term goal of expansion to disease-risk prediction and stratification. The pilot *CYP2C19*-clopidogrel implementation includes pharmacist collaboration with cardiologists, pathologists, geneticists, and technology experts in multiple areas (e.g., patient care processes, informatics, genotyping procedures, medication-use policies, education, and outcome assessment) and has served as a model for establishing additional pharmacist-led clinical pharmacogenetics services within our institution.

RESULTS: To date, the *CYP2C19*-clopidogrel service remains standard of care after stent placement, and additional drug-gene pairs have been implemented, including thiopurine methyltransferase (*TPMT*) testing in patients receiving thiopurine medications and interferon lambda 3 (*IFNL3*) testing in select hepatitis C patients. Approximately 1500 patients have been genotyped within the pharmacogenetics service, with pharmacist consultation and recommendations provided for patients with actionable genotype results. A pilot *CYP2D6*-opioid initiative is also underway in collaboration with community-based family medicine providers. In addition to providing comprehensive medication management services, initiatives include components for assessing implementation metrics; clinical outcomes, either retrospectively (for *CYP2C19* and *TPMT* testing) or prospectively (for *CYP2D6* testing); and provider attitudes towards clinical pharmacogenetics. A pharmacist-developed interdisciplinary, online continuing education program that offers personal genotyping with case-based application of test results is also being implemented and evaluated.

CONCLUSION: The pharmacist-led clinical pharmacogenetics services at our institution provide models for novel approaches to individualizing drug therapy, preparing clinicians to provide genotype-guided therapy, and measuring important outcomes with these efforts.

Psychiatry

210. Outpatient laboratory monitoring of lithium and calcium in lithium-treated patients with bipolar disorder – a drug utilization evaluation *Chui Ping Lee, Pharm.D*, Alan So, B Pharm., Emily Fung, B Pharm; School of Pharmacy, The Chinese University of Hong Kong, Hong Kong, Hong Kong

PURPOSE: Lithium is an effective mood stabilizer for treating bipolar disorder. However, considering its narrow therapeutic index and adverse effects, routine monitoring is required. As suggested by a number of clinical guidelines, patients taking lithium should at least have lithium test every 6 month along with renal function (RFT), thyroid function (TFT) and calcium level monitoring annually. This study was designed to investigate the rate of adequate monitoring for lithium therapy in outpatient setting and the impact of pharmacist intervention on improving the monitoring.

METHODS: The first part of this study was a retrospective review concerning the rate of adequate lithium monitoring in adult bipolar patients attending a psychiatric outpatient clinic of a teaching hospital in Hong Kong during 1/6/2013 to 30/9/2013. Data was retrieved retrospectively through computerized databases. Patients who received at least two lithium tests, or one RFT, TFT or calcium test annually were identified and recorded as having adequate laboratory monitoring. In the second part, a physician reminder note was placed in the chart of patients without adequate laboratory monitoring. The primary outcome was the rate of adequate monitoring and the percentage of patients having adequate monitoring after pharmacist intervention.

RESULTS: Among the 211 patients recruited, the rates of adequate monitoring for lithium test, RFT and TFT were 33.2%, 85.5% and 77.3%, respectively. Regarding the impact of pharmacist intervention, the rate of laboratory test ordering was higher in the intervened group compared with the control group (45.5% v.s. 29.3%). Calcium level was monitored in 29.4% of patients.

CONCLUSION: The rate of lithium level monitoring was low while the rates of adequate RFT and TFT monitoring were satisfactory. Findings from this study suggested that pharmacist intervention appeared to have improved the monitoring for lithium therapy. Long-term services specifically aim to improve the rate of monitoring should be explored.

Pulmonary

211. Pharmacist impact on inpatient drug therapy as part of the interdisciplinary cystic fibrosis team *Hanna Phan, Pharm.D.*[1], Mary Babico, Pharm.D.[2], Allison George, Pharm.D.[3], William Foxx-Lupo, Pharm.D.[4], Glenda Drake, RT[3], Benjamin Kleifgen, M.D., Cori Daines, M.D.[6]; (1) University of Arizona, Colleges of Pharmacy and Medicine, Tucson, AZ (2) University of California Davis Medical Center, CA (3) Banner University Medical Center – Tucson (4) University of Washington (5) University of Arizona, College of Medicine

PURPOSE: To assess the impact of clinical pharmacy services as part of an interdisciplinary team, on drug therapy delivery and patient outcomes as part of cystic fibrosis (CF) patient care.

METHODS: This was a retrospective study of adult and pediatric patients with CF admitted for an acute pulmonary exacerbation (APE) during either six-month pre- and post-intervention period. Pharmacist intervention included a detailed admission patient care plan including patientsÕ medical history, recommended therapies, and monitoring. Data collection included demographics, drug therapy, time to drug therapy and monitoring parameters, length of stay, and adverse drug events. Appropriate drug therapy was defined based on evidence-based practices during the time periods. Descriptive and inferential statistical analyses were completed with STATA v11.1.

RESULTS: A total of 94 and 58 patients were included pre- and post-intervention, respectively. Demographics were similar between groups, except greater F508del homozygous mutation in the post-period ($p < 0.001$). Selection of appropriate empiric (based on culture history and patient factors) and post-culture antimicrobial therapy in the 1st 24 hr ($p < 0.001$ and $p = 0.04$ respectively) was more frequent post-intervention. Time to appropriate empiric antimicrobial was not significantly different between periods; however, time to appropriate post-culture antimicrobial was shorter post-intervention ($p = 0.04$). Selection of appropriate other acute and chronic ($p < 0.001$) therapy in the 1st 24 hr was more frequent post-intervention. Appropriate

monitoring orders were more frequent post-intervention ($p < 0.001$). There was no difference in documented adverse drug events. In a multiple linear regression model, greater baseline FEV1 ($p = 0.028$) and interdisciplinary team intervention with a pharmacist ($p = 0.01$) were associated with lower length of stay.
CONCLUSION: As part of an interdisciplinary CF team, clinical pharmacists can help optimize drug therapy as part of APE admissions and improve delivery of appropriate acute and chronic treatment, which may affect patient outcomes such as length of stay.

Transplant/Immunology

212. Innovations through information technology a process for mycophenolate risk evaluation mitigation fulfillment. *Demetra Tsapepas, Pharm.D., BCPS*[1], Felicia Morales-Castro, BSc[2]; (1) Department of Pharmacy, NewYork-Presbyterian Hospital, Columbia University Medical Center, New York, NY (2) NewYork-Presbyterian Hospital, Columbia University Medical Center, New York, NY
PURPOSE: Risk Evaluation Mitigation Strategies (REMS), required by the FDA, were developed to ensure the benefits of a medication outweigh its risks. Currently, two immunosuppressive agents used in solid organ transplantation have FDA-mandated REMS programs: belatacept and mycophenolate. In 2012, REMS for mycophenolate was approved to ensure the safe use in women of childbearing potential. Fulfillment of intricate REMS can be complex, integration of requirements into the work-flow with novel and innovative solutions using healthcare information technology (HIT) may ensure institutional compliance and patient safety.
METHODS: Development of REMS-solutions involved a multidisciplinary collaboration between pharmacists, physicians, nurses, and members of quality and information technology divisions. A mycophenolate medication use guideline was developed to outline the REMS components and a five-step fulfillment process (fig 1). Step1: Prescriber enrollment; Step2: Pregnancy testing; Step3&4: Patient education and patient-prescriber acknowledgement form; Step5: mycophenolate pregnancy registry. The guideline served as the framework to customize our institution's computerized physician order entry (CPOE) system. Customized subfolders and order-entry forms with clinical decision support (CDS) algorithms guide prescribers through REMS components for female patients between 9–59 years of age, institution-specific interpretation of 'childbearing potential.'
RESULTS: Since 2013, 119 females of childbearing potential have been listed for transplantation at our center, 88% have completed the REMS process in full. Since implementation of our five-step process we have an overall increase in compliance to REMS fulfillment; education, patient-prescriber acknowledgement form, and pregnancy testing. Compliance rates on a monthly basis range from 60–100% and continuous education to providers is ongoing to optimize the process.
CONCLUSION: Healthcare organizations must be resourceful to ensure fulfillment and compliance with intricate REMS program requirements. Ongoing exchange and generalizable approaches of enhancements to CPOE systems and practical HIT customization for special patient populations is important to enhance standards in patient care. Innovative approaches improved mycophenolate REMS fulfillment at our organization.

INTERNATIONAL CLINICAL PHARMACY EDUCATION AND TRAINING

Ambulatory Care

213. Impact of a student-led HIV screening program in Ndejje, Uganda Kevin Rynn, BS, Pharm.D.[1], Paul Gaura, BS, Pharm.D. Candidate[1], RaeAnn Hirschy, BS, Pharm.D. Candidate[1], Alyssa Wenzel, Pharm.D.[1], Freddy E Kitutu, MSC, MPS[2], Moses Arinaitwe, MBChB-MUK, MScPublic Health-UMU[3], Jacqueline Namatovu, BS[3], Inis Bardella, M.D.[1]; (1) Rosalind Franklin University of Medicine and Science, North Chicago, IL (2) Makerere University College of Health Sciences, Kampala, Uganda (3) Ndejje HealthCentre IV, Ndejje, Uganda
PURPOSE: This study aimed to evaluate the effectiveness of a student-led HIV education and screening event held in the community by measuring participant satisfaction rates and whether HIV screenings increased the proportion of patients receiving testing.
METHODS: Adults participating in a HIV screening event held in October of 2014 at Hope of Women and Children Victims of Violence (HOCW) school for refugees living in Ndejje, Uganda were included in this investigation. The event was sponsored by Ndejje HealthCentre IV, a local government run clinic. Participant data collected included demographic information, overall satisfaction, HIV status, willingness to recommend the screening to others, and likelihood that they would have received testing if not present at HOCW that day. Participants rated their satisfaction on a five-point scale with a score of 5 being "very satisfied" to 1 being "very dissatisfied."
RESULTS: Forty-eight adults participated in the screening event with an average age of 28 (range 18–62) years. Twenty-three percent of these individuals were male. All participants tested negative for HIV. The mean satisfaction score was 4.69/5.0. 79.0% reported feeling "very satisfied" with the screening, 14.5% were "a little satisfied," and 4.2% reported "neutral" feelings about the screening. One patient (2.1%) was "very dissatisfied" with the experience. All patients reported that they would tell others if HOCW were to hold another HIV screening day in the future. 8.3% of patients reported that they would not have gotten tested if not for the screening held at HOCW on that day.
CONCLUSION: Student involvement in this event was well received with high satisfaction scores by the community. The event increased the proportion of individuals receiving testing in Ndejje, Uganda. Continued student involvement in these types of activities at HOCW is beneficial to participants and increases health awareness in the community.

Education/Training

216. Role of the American faculty preceptor during a new international advanced pharmacy practice experience *Jon Wietholter, Pharm.D., BCPS*[1], Jennifer Confer, Pharm.D., BCPS[1], Renier Coetzee, Pharm.D.[2]; (1) School of Pharmacy, Department of Clinical Pharmacy, West Virginia University, Morgantown, WV (2) University of the Western Cape, Cape Town, South Africa
PURPOSE: To describe the role of an American faculty preceptor during the initial five years of the West Virginia University School of Pharmacy (WVUSOP) international advanced pharmacy practice experience (APPE) in South Africa.
METHODS: In 2009, WVUSOP began an international collaboration providing students an opportunity to complete an APPE in the South African public healthcare sector. To date, fifteen students, one PGY-1 pharmacy practice resident, and three PGY-2 Internal Medicine pharmacy residents have completed the experience. In addition, a WVUSOP faculty member has accompanied the students to South Africa during the first week of the four week APPE for four of these five years.
RESULTS: Multiple strengths of having a faculty member travel abroad have been discovered, including providing the students a level of comfort as they are in an unfamiliar environment, allowing for the provision of lectures and/or topic discussions to South African pharmacy students and faculty on various topics, and providing oversight for extensive topic discussions, specifically on HIV and tuberculosis, followed by application of this material to actual patients. Noted limitations have included the inability to be present in South Africa for the entire four weeks and limited contact with the students upon returning to the United States during the final three weeks of the experience.

CONCLUSION: Overall, the strengths of having the ability to send a faculty member during the infancy of a new international APPE greatly outweighed the limitations. Due to the involvement of the faculty member, South African colleagues have been trained on appropriate precepting skills and beginning in 2015, a WVUSOP faculty preceptor will no longer be travelling to South Africa with the students. Additionally, the experience has allowed those who have participated the opportunity to promote an improved understanding of global health issues to fellow WVUSOP faculty members.

217. Perceived continuing educational and professional training needs for pharmacists in the United Arab Emirates: results of two surveys *Geoffrey Wall, Pharm.D.*[1], Nababrata Ghosh, BPharm[2], Mariam Galadari, Pharm.D.[3]; (1) Drake University College of Pharmacy, Des Moines, IA (2) WebRx, India (3) Emirates Medical Association, United Arab Emirates
PURPOSE: Programs to foster clinical pharmacy skills in the Middle East are relatively sparse compared to other areas of the world. Additionally, it is unknown what educational activities United Arab Emirate (UAE) pharmacists themselves would find valuable. With the endorsement of the Ministry of Health (MOH) of the UAE, two surveys were designed by the authors and sent to UAE pharmacists.
METHODS: Two surveys were designed to assess what areas of pharmacy and medicine that UAE pharmacists felt they needed more training in to advance their practices. The first survey was posted on a central website with a link to its address sent electronically to UAE pharmacists. The second survey was distributed electronically to a group of pharmacists who attended an all-day continuing education (CE) conference in Abu Dhabi, UAE.
RESULTS: In the first survey 109 completed surveys out of 160 sent. The majority of respondents had completed Bachelors or Doctor of Pharmacy training. 64% practiced in a community setting. 96% of respondents felt more advanced training would be helpful to advancing their clinical skills. The areas respondents felt would be most helpful to their practices included management of chronic kidney disease, antimicrobial stewardship, and chronic heart failure. Respondents felt most comfortable managing hypertension. Yearly symposia supplemented by online tools were the educational approach favored by respondents (53%). The second survey was sent electronically to 304 pharmacists from UAE and other areas of the Gulf region. Results from that survey and a comparison between the surveys will be presented at the Meeting.
CONCLUSION: UAE pharmacists feel that CE programs focusing on pharmaceutical care in several areas of medicine are important to advance their practices. A coordinated system of programs developed with the UAE MOE should be considered to meet these needs.

219. Development of a Pharm.D. degree program at the National University of Singapore *Grant Sklar, Pharm.D.*; Department of Pharmacy, National University of Singapore, Singapore, Singapore
PURPOSE: Pharmacy education in Singapore is provided by the Department of Pharmacy at the National University of Singapore. The entry to practice degree is a 4-year Bachelor of Science in Pharmacy. However, with the increasing complexity of drug therapy, it is critical that pharmacists have the opportunity to acquire advanced pharmacotherapy knowledge and clinical skills. In order to meet this need, in 2006, we embarked on the development of a Doctor of Pharmacy (Pharm.D.) degree program.
METHODS: We modelled our program after the 2-year, post-BS degree programs in Canada and the US. The first year of the program consists of coursework in advanced pharmacotherapy, research methodology, drug information, physical assessment, clinical pharmacokinetics and pharmacoeconomics. Higher level teaching strategies are utilized, including, case-based learning, self-directed learning and objective structured clinical examinations (OSCE's). The second year is comprised of eight 5-week clinical clerkships in areas such as adult general medicine, acute care medicine, critical care, ambulatory care and drug information. Clerkships may be done locally or at affiliated institutions in the US. Every student must also complete a research project. Applicants are required to be Singapore-registered, practicing pharmacists with 1–2 years of relevant work experience.
RESULTS: The first class was enrolled in August 2009. Class sizes range from 5 to 11 students. To date, 34 students have completed the program. Graduates have gone on to lead the development of clinical pharmacy services at many hospitals in Singapore, and several are in the process of attaining specialist pharmacist accreditation.
CONCLUSION: n/a.

220. Development of a PGY1 pharmacy residency program at the National University Hospital in Singapore Grant Sklar, Pharm.D.[1], Siew Woon Lim, MSc Clinical Pharmacy, BCOP[2], Tuck Seng Wu, BScPharm, MHSM[2], Simeon Tang, Pharm.D.[2], Patrick Wong, Pharm.D.[2]; (1) Department of Pharmacy, National University of Singapore, Singapore, Singapore (2) Department of Pharmacy, National University Hospital, Singapore, Singapore
PURPOSE: With the increasing complexity of drug therapy and patient populations, it is important that pharmacists acquire advanced pharmacotherapy knowledge and clinical skills in order to optimize the drug therapy and outcomes of patients. A residency program is one way to do this as it provides a structured, directed training program in a defined area of pharmacy practice. With this in mind, the Department of Pharmacy at the National University Hospital (NUH) developed the first post-graduate year 1 (PGY1) residency program in Singapore.
METHODS: The program was developed according to American Society of Health-System Pharmacists (ASHP) residency standards. Compulsory learning experiences in the 1-year program include: cardiology, critical care, nutrition support, oncology, adult general medicine, pediatrics, infectious diseases, ambulatory care, practice leadership and medication safety. Each resident must also complete a research project. Applicants must be Singapore-registered, practicing pharmacists with at least 1–2 years of relevant patient-care work experience. Preceptors for the various learning experiences are pharmacists with advanced degrees, and/or PGY1 or PGY2 residency training.
RESULTS: The first residents were enrolled into the program in April 2012. To date, 7 pharmacists have completed the program. So far all of the residents have been staff pharmacists from NUH.
CONCLUSION: Future plans include accepting applicants from other hospitals in Singapore, and applying for ASHP accreditation of the program.

221. Comparative systems global pharmacy fellowship *Trisha Seys Ranola, Pharm.D.*[1], Connie Kraus, Pharm.D.[1], Lori DiPrete Brown, MSPH, MTS[2], Jeanette Roberts, Ph.D., MPH[1]; (1) School of Pharmacy, University of Wisconsin-Madison, Madison, WI (2) Global Health Institute, University of Wisconsin-Madison, Madison, WI
PURPOSE: The University of Wisconsin (UW) School of Pharmacy, in collaboration with the University of the Western Cape (UWC), Cape Town, South Africa, recently developed a two-year *Comparative Health Systems Global Pharmacy Fellowship*. The purpose of this research fellowship is to advance the training of post-graduate pharmacists in global public health, systems strengthening, and quality improvement (QI) methods.
METHODS: Fellows from UW and UWC will spend time in each country to frame research questions of mutual benefit to both countries. The World Health Organization's (WHO) Monitoring the Building Blocks of Health Systems for low resourced settings will serve as a guide for data collection and a resource

for standardized indicators by which to measure outcomes and impact. Standard principles of QI will be used to conduct the research project. Overarching themes for the QI projects are as follows:

- Improving access to essential medications
- Improving the rational use of medications
- Improving patient adherence to therapies

RESULTS: Fellows will collect, analyze, and interpret objective data to determine the impact of the interventions and report these data to the Ministries of Health, university mentors, WHO, and invested stakeholders.
CONCLUSIONS: Graduates of this novel fellowship will be prepared to appreciate the assets and limitations of health systems in both countries in order to design interventions to address health disparities both locally in their practice settings, and globally, through research, advocacy, policy efforts, and ongoing international collaboration.

222. Expectations of professional students in a dental and pharmacy program Andrew Smith, Pharm.D., BCPS (AQ-CV)[1], Becky Smith, DDS[2], Betty Blackmon, JD[3]; (1) UMKC School of Pharmacy, Kansas City, MO (2) UMKC School of Dentistry, Kansas City, MO (3) UMKC School of Social Work, Kansas City, MO
PURPOSE: The proposed 2016 ACPE standards include an emphasis on interprofessional education (standard 11). Building an environment of mutual respect can be facilitated with knowledge of students' expectations and motivations for career paths. This study was undertaken to determine the similarities and differences in these parameters in the first year professional class of a school of pharmacy and dentistry.
METHODS: A 19 question survey was distributed to incoming Doctor of Dental Surgery (D.D.S) (n = 74) and Doctor of Pharmacy (Pharm.D.) (n = 138) students. The survey assessed demographic data, educational experience, and expected workload in their degree program. Responses were anonymous. Statistical analysis was performed using SPSS version 22. Chi squared test was used for categorical data and student's t-test for continuous data. A p value of < 0.05 was considered statistically significant.
RESULTS: The response rate was 90% (119/132). There was no statistical difference in number of fulltime students (Pharm.D. 99% versus D.D.S 100%; p=NS), married students (Pharm.D. 18% versus D.D.S. 27%; p=NS), or students with children (Pharm.D. 8% versus D.D.S. 14%; p=NS). There was a significant difference in the number of students with a previous college degree (D.D.S. 100% versus Pharm.D. 27%; $p < 0.0001$). Career motivations differed between specialties. Dental students were more likely to have a family member in the profession (46% versus 25%; $p = 0.002$) and have felt family pressure (69% versus 54%; $p = 0.039$). Dental students were also more likely to select control of time (66% versus 43%; $p = 0.002$), self-employment (74% versus 14%; $p < 0.0001$), and working with hands (68% versus 18%; $p < 0.001$).
CONCLUSION: Demographics did not differ significantly but there were differences in motivations for entering the career path. Developing rapport during interprofessional education activities is important. These results can be used to identify similarities and differences between dental and pharmacy students.

223. Creation and delivery of a clinical pharmacy practice and education program for international participants in the US *Nancy Shapiro, Pharm.D.*[1], Maika Patino, Pharm.D.[1], Hsiang-Wen Lin, M.S., Ph.D.[2], Alan Lau, Pharm.D.[1]; (1) Department of Pharmacy Practice, University of Illinois at Chicago College of Pharmacy, Chicago, IL (2) School of Pharmacy and Graduate Institute, China Medical University, Taichung, Taiwan
PURPOSE: To develop a short-term summer program on contemporary clinical pharmacy practice and education for pharmacy students and pharmacists from Taiwan.
METHODS: As part of our collaboration with China Medical University in Taiwan, we developed a month-long summer program in 2013 for 25 participants from 4 different universities. The purpose of this program was to nurture interest in clinical pharmacy practice and education. The program was conducted by 30 pharmacy faculty and included topics on common disease states in various inpatient and ambulatory settings, clinical skill enhancement, description of unique clinical pharmacy practice models, and patient case-based teaching. In 2014, the program was expanded to 42 students from 7 universities including students from Hong Kong and Macau.
RESULTS: The participants had a wide variety of pharmacy practice and education experiences. At baseline, the majority indicated that they had not taken a medication history or interviewed a patient before, but had some comfort with writing SOAP notes and taking blood pressure measurements. At the end of the program, the majority of them expressed a high level of interest in the clinical topics presented and felt their comfort in those areas improved. Most participants had a high interest in completing a PGY1 residency or a Ph.D. program afterwards, and many expressed an interest in receiving additional clinical pharmacy education in the US. One has already submitted her application for a Pharm.D. program in US. The majority of the participants gave the program a very high rating for overall quality, usefulness, organization, and would highly recommend this program to others.
CONCLUSION: The collaboration has created a novel clinical education program for international pharmacy students, allowing them to increase their clinical skills and knowledge. The increased understanding of clinical practice in the US may help shape their future academic and professional development.

224. iForumRx.org – using the world wide web to connect ambulatory care pharmacists around the globe *Katie Kiser, Pharm.D., BCACP*[1], Stuart Haines, Pharm.D., BCACP, BCPS, BC-ADM[2], Dave Dixon, Pharm.D., BCPS, CDE, CLS, AACC, FNLA[3], Allen Tran, Pharm.D.[4]; (1) Department of Pharmacy Practice, South College School of Pharmacy, Knoxville, TN (2) Department of Pharmacy Practice and Science, University of Maryland School of Pharmacy, Baltimore, M.D. (3) Department of Pharmacotherapy and Outcomes Science, Virginia Commonwealth University School of Pharmacy, Richmond, VA (4) MedStar Health, Baltimore, M.D.
PURPOSE: Develop an interactive, grassroots, non-commercial web-based community that connects ambulatory care pharmacists to discuss recently published research manuscripts and adopt evidence-based patient care practices.
METHODS: iForumRx.org was developed and implemented in April 2010 using Drupal – a free, open source content management system. iForumRx features the delivery of educational content with interactive elements that allow members to comment on content, participate in polls, "like" and "tweet" content, and initiate forum discussions on a variety of topics. The focus is on the application of evidenced-based medicine from landmark studies and recently published literature to clinical practice through the use of brief commentaries, video panel discussions, and practice-based resource collections. Key clinical trials and guidelines resource pages are maintained for several disease states (e.g., hypertension, heart failure) that have been used as educational tools by ambulatory care pharmacy practitioners with their students and residents.
RESULTS: iForumRx.org has more than 1600 registered members and 70 volunteer content contributors from around the world. Video panel discussions and commentaries have reached thousands of viewers. The most viewed content was a commentary on the 2013 ACC/AHA Lipid Guidelines (> 12,000 views) and a video panel discussion on Tiotropium for Uncontrolled Asthma (> 11,000 views). Twitter has increased exposure to iForumRx content with 55 tweets reaching over 2100 Twitter users. Twitter followers increased from 3 to 84 between May 2014 and February 2015.

CONCLUSION: iForumRx is an interactive, web-based, global community that connects practitioners and trainees. It serves as an important unbiased educational resource for improving the application of evidence-based medicine to clinical practice.

225. Pharmacy resident collaboration in global health initiative with clinical pharmacists in haiti to advance pharmacy services
Dominick Caselnova, III, BS, MHA, FASHP[1], *Julie McCoy, Pharm.D.*[1], Vidya Nair, Pharm.D.[1], Martin Elie, Pharm.D.[2], Samahel Joseph, Ph, MSc[3], Stellar Yi, Pharm.D.[1], Levi Lancaster, Pharm.D.[1], Naoto Oki, Pharm.D.[1], Eric Kastango, MBA, RPh, FASHP[4], Peter Cantor, B.S. Ed.[5]; (1) Providence St. Peter Hospital, Olympia, WA (2) Hopital Bernard Mevs, Port Au Prince, Haiti (3) Hopital Universitaire de Mirebalais/ZL/PIH, Mirebalais, Haiti (4) Clinical IQ, LLC and CriticalPoint, LLC, Madison, NJ (5) CriticalPoint, Gaithersburg, MD
PURPOSE: The objective of this quality improvement project is for pharmacists and pharmacy residents to work with pharmacist colleagues in Haiti to develop clinical and operational initiatives which will improve caregiver competencies in providing a higher level of care to their patients.
METHODS: This project has been determined to be quality improvement by IRB. Pharmacists in the Southwest Washington Region will collaborate with pharmacists in Haiti at Hopital Bernard Mevs/Project Medishare and Hopital Universitaire de Mirebalais with Partners in Health (HUM/PIH), to determine the highest value services to be implemented. We will evaluate the collaboration based on interventions made and effects realized in three phases: 1) Pre-implementation: pharmacy residents and team will devise an outline of the proposed program to be implemented in collaboration with pharmacists in Haiti, based on site visit and completing USP797 gap analysis and ASHP Pharmacy Practice Model Initiative (PPMI) self-assessment. 2) Onsite implementation: pharmacy residents will collaborate with Haitian pharmacy staff to provide education and implement sustainable services within the existing infrastructure. 3) Post-implementation evaluation: data collected from the learning experience will be analyzed and interpreted by residents upon return from Haiti. Outstanding action items may be completed after return from Haiti, via teleconference or webinar.
RESULTS: Data from the USP 797 gap analyses and the ASHP PPMI self-assessment will be presented. In addition, data will be collected to measure project outcomes relative to clinical and operational quality improvement initiatives.
CONCLUSIONS: We hope to demonstrate evidence of a sustainable, positive impact on pharmacy services via data collected through this international project.

227. The Asian Conference on Clinical Pharmacy (ACCP-Asia)
Roger Lander, BSPharm, Pharm.D., FCCP, FASHP, BCACP[1], Joseph Dean, BSPharm, Ph.D.[2], Mikio Nishida, BSPharm, Ph.D.[3], Hyun-Taek Shin, BSPharm, Pharm.D.[4], Robert Henderson, BSPharm, Pharm.D., FCCP, FASHP, BCPS[1], Michael Hogue, Pharm.D., FAPhA, FNAP[1], Paula Thompson, Pharm.D., MS, BCPS[1], Zhu Zhu, BSPharm[5], *Charles Sands, III, BSPharm, Pharm.D.*[1]; (1) Pharmacy Practice Department, McWhorter School of Pharmacy, Samford University, Birmingham, AL (2) McWhorter School of Pharmacy, Samford Univesity, Birmingham, AL (3) Department of Pharmacy Practice, College of Pharmacy, Meijo University, Nagoya, Japan (4) College of Pharmacy, Sookmyung University, Seoul, South Korea (5) Department of Clinical Pharmacy, Peking Union Medical College Hospital, Beijing, China
PURPOSE: The idea for the ACCP-Asia was developed in 1995 when two simultaneous study tours for pharmacists from Korea and Japan were being held at Samford University: the need for a practical conference where Asian pharmacists could exchange ideas on clinical pharmacy. In 1996 representatives from China, Korea, Japan and the USA met in Seoul, Korea to plan for the first conference. The first conference was held at Samford University in Birmingham, Alabama in 1997.
METHODS: The vision of ACCP-Asia is to be the leading force in Asia in initiating and promoting clinical pharmacy practice, education, and research. ACCP-Asia is composed of clinical pharmacy practitioners, educators, researchers, administrators and other interested individuals who provide leadership, direction, advocacy, and a place for idea exchange in order to promote excellence in clinical pharmacy.
RESULTS: Many Asian countries have developed national policies mandating clinical pharmacy services. ACCP-Asia was established to facilitate compliance with these mandates and provide opportunities for clinical pharmacy education and training in modern clinical pharmacy services that ensure optimal medication therapy outcomes for Asian patients. Samford faculty helped establish and have contributed to the development of ACCP-Asia with 12 faculty making 20 trips to Asia to attend the meetings. Since the first conference, subsequent meetings were initially held every two years and then annually in major cities in Asia: Shanghai and Hong Kong, China; Seoul, Korea; Nagoya, Japan; Penang and Terengganu, Malaysia; Bangkok, Thailand; Surabaya, Indonesia; Manila, Philippines; Singapore; and Haiphong, Viet Nam. There has been great attendance at these meetings with 1200 participants at the 2012 meeting in Hong Kong.
CONCLUSION: ACCP-Asia has had a large impact on the development of clinical pharmacy education and training in Asia and continues to grow yearly in significance.

228. Development of a Chinese-American clinical pharmacy clerkship and exchange collaborative
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PURPOSE: Goals of this collaborative are to increase awareness of cultural diversity in the delivery of health care and pharmacy services, to assist in clinical training of Chinese pharmacists and faculty, and enhance clinical pharmacy services through a bidirectional faculty and student exchange program.
METHODS: In 2012, a planning visit occurred between U.S. and Chinese University leaders in Chengdu, China, and a professional exchange program was established. During the inaugural exchange, the Director of Pharmacy at West China Second University Hospital of Sichuan University (WCSUH) (West China Women's and Children's Hospital)] spent six months at the University of Nebraska Medical Center (UNMC) to learn about U.S. healthcare and pharmacy education. During this visit, an experiential clerkship was developed to expose fourth-year pharmacy students to the practice of pharmacy at WCSUH.
RESULTS: To date a total of six pharmacy students have completed the rotation. The rotation is approximately three weeks in duration and consists of shadowing Chinese clinical pharmacists practicing in pediatric neurology, gastroenterology, neonatology, hematology, obstetrics and gynecology specialties. Students also experience preparation of traditional Chinese medicines. Students attend weekly clinical conferences, give case presentations and lead therapeutic discussions with WCSUH pharmacists. Upon returning, students present their experiences at pharmacy student organizational meetings to increase the impact of the experience across campus. The bidirectional faculty exchange also continues with seven faculty participating to date. UNMC faculty members presented at regional Chinese clinical pharmacy symposia on pharmacy education, clinical pharmacist and resident training, and advanced health care delivery specialty clinics.

CONCLUSION: Through the cooperation of two Universities, a successful international clinical pharmacy clerkship and exchange program was implemented. Participating students report a greater appreciation for the delivery of healthcare in diverse settings through this experience. Faculty members develop collaborative professional relationships, built upon individual strengths.

229. Cooperative programming leading to enhanced clinical skills of Indonesian pharmacists *Roger Lander, BSPharm, Pharm.D., FCCP, FASHP, BCACP*[1], Yulia Trisna, M.Pharm[2], Robert Henderson, BSPharm, Pharm.D., FCCP, FASHP, BCPS[1], Steve Stricker, Pharm.D., MS, BCOP[3], Paula Thompson, Pharm.D., MS, BCPS[1], Endang Budiarti, M.Pharm[4]; (1) Pharmacy Practice Department, McWhorter School of Pharmacy, Samford University, Birmingham, AL (2) Department of Pharmacy, Cipto Mangunkusumo Hospital, Jakarta, Indonesia (3) US Medical Affairs Oncology, Takeda Oncology, Cambridge, MA (4) Department of Pharmacy, Bethesda Hospital Yogyakarta, Yogyakarta, Indonesia
PURPOSE: Demonstrate how cooperative programming has enhanced the skills of Indonesian pharmacists over the last 15 years.
METHODS: Since 2000, faculty members from Samford University's McWhorter School of Pharmacy (MSOP) have made a concerted effort to enhance the education and training of Indonesian pharmacists. From contacts initially made in 2000, MSOP has sent one to four practice faculty members to Jakarta and Yogyakarta to conduct interactive workshops and case-based symposia for pharmacists and pharmacy educators gathered from throughout the country. The program consists of MSOP faculty and key leaders in Indonesia working together to develop needs-based workshops for Indonesian pharmacists and faculty. Key to this effort has been the use of interactive, Socratic methods to teach clinical reasoning and precepting skills in a participatory, open environment. Following the development of these base areas, subsequent workshops have focused on disease and drug therapy topics.
RESULTS: The first workshop in 2000 was held in Yogyakarta where four faculty from the USA provided basic material applicable to hospital and community pharmacy practitioners. Since then, six trips by MSOP faculty to Jakarta, Yogyakarta, and University of Indonesia have provided 8 workshops encompassing 72 topical areas, 3 interdisciplinary pharmacist-led case discussions, and presentations regarding academic standardization of APPEs and pharmacist continuing professional development standards. Indonesian clinical pharmacy practice has progressed in several institutions through this cooperative training. Pharmacy schools in Indonesia are now trying to enhance practical training for their students because of the transition that is occurring in the practice of pharmacy.
CONCLUSION: The provision of basic and, more recently, advanced topical workshops using the Socratic Method in the areas of clinical service development and implementation, preceptor development, and pharmacotherapy optimization and monitoring have enabled the pharmacy profession in Indonesia to move rapidly forward over the last 15 years.

230. Impact of an international introductory pharmacy practice experience rotation in Uganda, Africa *Darowan Akajagbor, Pharm.D.*, Nicole Cieri, Pharm.D., BCPS, Jamie Fery, Pharm.D. Candidate; School of Pharmacy, D'Youville College, Buffalo, NY
PURPOSE: To evaluate student perceptions of the value and impact of an international introductory pharmacy practice experience (IPPE) rotation
METHODS: Students at D'Youville College School of Pharmacy (DYCSoP) are annually selected to participate in a two-week IPPE with DYCSoP faculty members in Kampala, Uganda. Students participating during the 2012–2014 academic years were asked to complete an anonymous survey. Using a 5-point Likert scale, the survey questions assessed student perceptions of pharmaceutical care provision, communication, collaboration, and cultural sensitivity developed during this experience. Students were also asked about surprising, positive, and negative aspects of completing an IPPE in Uganda. This study was granted exempt status by the affiliated institutional review board.
RESULTS: A total of 13 students completed an IPPE in Uganda, and 14 complete responses were gathered. 93.3% of students reported they agreed ("strongly agree" or "agree") that the international IPPE allowed them to demonstrate the ability to communicate with health-care providers and provide patient education. Students agreed 93.3% of the time that they were able to collaborate with Ugandan Pharmacy Interns, and 100% of the time able to interact professionally with culturally diverse teams. The experience elicited agreement 100% of the time that students were able to demonstrate cultural sensitivity and understanding of diverse patient populations. Students reported agreement 50% of the time that they recognized alternative/indigenous therapies that may be incorporated into patient care. Conversely, 100% of students agreed that they were able to identify disease stated endemic to Ugandans.
CONCLUSION: Based on these results, participation in an international IPPE in Uganda appears to have a positive impact on students' perceptions of pharmaceutical care provision, communication, collaboration, and cultural sensitivity. Students reported they were not always able to recognize alternative and indigenous therapies that may be incorporated into patient care and this may be an area for improvement for future rotations.

231. Assessing and supporting pharmaceutical management training and education in low and middle income countries Dawn Zarembski, Pharm.D., BCPS[1], Michael Rouse, BPharm (Hons)[1], Peter Vlasses, Pharm.D., DSc Hon, BCPS, FCCP[1], Sameh Saleeb, M.D., MSc[2], David Mabirizi, M.D., MBA, MPH[2], Mohan Joshi, M.D., MSc, MBBS[2]; (1) Accreditation Council for Pharmacy Education, Chicago, IL (2) Systems for Improved Access to Pharmaceuticals and Services (SIAPS) Program Center for Pharmaceutical Management | Management Sciences for Health, Arlington, VA
PURPOSE: The USAID-funded Systems for Improved Access to Pharmaceuticals and Services (SIAPS) Program aims to support pre- and in-service education programs as a key approach to strengthening pharmaceutical management capacity in low and middle income countries (LMICs). SIAPS and its predecessor (Strengthening Pharmaceutical Systems, SPS) collaborated with the Accreditation Council for Pharmacy Education (ACPE) to survey the existing systems for education/training of pharmacists and pharmacy support personnel (PSP) in selected LMICs, and to design strategies for improving the quality of pharmacy education.
METHODS: A survey template was developed by ACPE and SPS. Interviews with key informants were conducted by SPS representatives in: Bangladesh, Democratic Republic of Congo, Dominican Republic, Ethiopia, Kenya, Lesotho, Namibia, Swaziland, Philippines, and Ukraine.
RESULTS: Key findings of the survey included:

- Only four countries require pre-registration/licensure examinations for pharmacists;
- Maintenance of registration is required in 8 countries, with variable renewal periods and requirements;
- Neither mandatory practice experiences nor continuing education after the formal education/training programs are typically required;
- Key pre-service and continuing education topics (rational use of medicine, antimicrobial resistance, pharmaceutical care, pharmacovigilance, and supply chain management) are covered "infrequently" or "not at all";
- The Ministry of Education is usually the entity providing oversight of pharmacist education and training.The findings of the survey guided the development of a framework and a practical guidance document for assuring the quality of continuing pharmacy education.

CONCLUSIONS: Countries studied varied widely with regards to most survey items. The findings indicated the need for strengthening national/local capacity to support structured, high quality continuing education for pharmacists and PSP. The newly developed SIAPS-ACPE quality assurance framework, along with the guidance document, is designed to address this need, and to advance excellence in the pharmacy profession through the establishment of standards and criteria for accreditation of continuing education and professional development programs.

232. An international medicine rotation in South Africa as part of the West Virginia University Healthcare post-graduate year two internal medicine residency program *Carmen B. Smith, Pharm.D., BCPS*[1], Micaela Carroll, Pharm.D.[2], Kelsey Lyon, Pharm.D.[3]; (1) St. Louis College of Pharmacy, St. Louis, MO (2) Georgia Regents Medical Center, Augusta, GA (3) West Virginia University Healthcare, Morgantown, WV

PURPOSE: To describe an international post-graduate year two (PGY-2) internal medicine (IM) practice experience through West Virginia University School of Pharmacy (WVUSOP) in collaboration with Rhodes University, Grahamstown, South Africa (SA), Nelson Mandela Metropolitan University, Port Elizabeth, SA, and the University of the Western Cape, Cape Town, SA.

METHODS: Over the past three years, PGY-2 IM residents from West Virginia University Healthcare (n = 3) have participated in a 4-week international medicine rotation while informally precepting final year Pharm.D. students from WVUSOP (n = 3 per year). This experience has been principally performed with pharmacists and pharmacy students throughout SA and has consisted of daily patient rounds, delivery of formal case presentations and journal clubs, and completion of medication use evaluations (MUE). Emphasis has lied on adult medicine specialties, emergency/critical care medicine, and pharmacy education while offering a broad exposure to the SA health care system. Pre- and post-experience evaluations were performed.

RESULTS: This international rotation has been well received by all residents. Evaluations have demonstrated an increased knowledge base (specifically HIV/AIDS and tuberculosis), increased comfort level with and exposure to cultural differences as well as positive benefits on future career development. Informal precepting of students by facilitation of ward rounds, topic discussions and review of case presentations prior to delivery fostered mentorship, leadership, and teaching skills. Formal case presentations have since been implemented into the SA curriculum and MUE results presented at national pharmacy meetings.

CONCLUSION: The experience has produced several positive outcomes: enhancement and development of clinical pharmacy practice and education in SA, broadening of cultural and professional awareness among participants, enhancement of collaborative opportunities among U.S. and SA Pharm.D. programs, and improved understanding and implementation of practice and teaching models due to significant interaction between pharmacy residents, pharmacy students, and pharmacists from these two countries.

233. Clinical pharmacy education in Japan; The education for developing communication skill and problem solving ability learning by lab preliminary education and pharmacy experience training *Rie Kubota, Pharm.D.*, Kiyoshi Shibuya, Ph.D., Manahito Aoki, Ph.D., Yoichi Tanaka, Ph.D., Megumi Shiomi, M.S., Wataru Ando, M.S., Takako Komiyama, Pharm.D.; School of Pharmacy, Center for Clinical Pharmacy and Sciences, Department of Clinical Pharmacy, Kitasato University, Tokyo, Japan

PURPOSE: Japanese pharmaceutical education was moved from 4 years to 6 years curriculum in 2006. The students receive the preliminary education for practical training as a laboratory work in the 4th year. They take a training at a hospital and a community pharmacy for each eleven weeks in the 5th year after evaluation of knowledge, skill and attitude with the common achievement tests, CBT (Computer Based Testing) and OSCE (Objective Structured Clinical ability Examination). Kitasato University School of Pharmacy is a private school in Tokyo and has early established clinical pharmacy education as well as fundamental pharmacy education. We will introduce the advanced points of education for developing communication skill and problem solving ability.

METHODS: ***Preliminary education for practical training*** Students gain the patient data from the model medical chart, then simulate a patient interview on hospital admission and patient counseling to simulated patient (SP). These simulations are repeated in a small group, and both faculty and SP feedback to the students after each presentation. ***Pharmacy practice experience training at the Kitasato University Medical Center(KMC)*** KMC is one of the Kitasato University hospitals, and faculty members of school of pharmacy are assigned as teaching stuff members. Students practice patients counseling at bed side, and participate in the team conferences and rounds. Case study is also an important duty for the students. The observations in various sites, such as ambulatory care, surgery and dialysis are included in this training.

RESULTS: The simulations in preliminary education were improved at step-by-step within a group for the student to build their communication skill. Subsequently, students experienced hospital pharmacy practices through on the job training, and understand the medical collaborative activities.

CONCLUSION: A gradual and continuous educational system was developed for students to acquire clinical and practical skills in this new curriculum.

234. Demystifying pharmacists' perceptions of palliative care: an innovative tool for educational development *Ebtesam Ahmed, Pharm.D, M.S.*[1], Jenna Butner, M.D.[2], Samar Mansour, Ph.D.[3]; (1) Clinical Health Professions, St. John's University College of Pharmacy and Health Sciences, Queens, NY (2) Internal Medicine, Yale University School of Medicine, New Haven, CT (3) Faculty of Pharmacy, The German University in Cairo and Ain Shams University, Cairo, Egypt

PURPOSE: Pharmacists play a vital role in providing pharmacotherapy recommendations for palliative care (PC) patients, however very little has been done to improve their education, specifically within Egypt.

OBJECTIVES:

1. To understand Egyptian pharmacists' perceptions and understandings of PC.
2. To educate pharmacists within Egypt about the importance of their role in the care of cancer patients with PC needs.
3. To highlight the misconceptions and stigma associated with PC in the general community population of pharmacists.

METHODS:

1. An educational symposium was developed to share the latest update of clinical knowledge in cancer and PC for pharmacist in Egypt.
2. A presentation entitled, "Optimal Oncology Care: What's PC Got to do with it?" was presented at the symposium.
3. Five questions regarding PC were asked at the beginning of the presentation. Questions ranged from definitions of PC to who comprises the PC team.
4. Respondents used Turning Point technologies to answer these questions, pre and post-presentation. Data was collected and further evaluated.

RESULTS: Over 150 pharmacists participated in the symposium. Data collected indicated that prior to the presentation, there was a large discrepancy in what pharmacists' general understanding of PC is. After the presentation response rates reached nearly 100% across all five questions. Additionally, subjective commentary offered from the pharmacists further proved the point of this symposium's importance.

CONCLUSION: The recent World Health Assembly's legislative adoption of the PC resolution recommends that the Ministry of Education take steps to ensure that health professionals have the knowledge, skills and attitudes needed to meet the PC needs of patients and their loved ones. As international organizations are promoting improved access to PC, it is equally important to recognize the role of the pharmacist in the PC setting. Development of more educational PC training programs for pharmacists is vital in the overall care of patients and will thus improve outcomes.

236. Development of elective interprofessional pharmacy practice experiences in Ndejje Uganda Kevin Rynn, BS, Pharm.D.[1], Moses Arinaitwe, MBChB-MUK, MScPublic Health-UMU[2], Bradley Cannon, Pharm.D.[1], Lisa Michener, Pharm.D., MS[1], Redi Dema, AA, Pharm.D. Candidate[1], Helen Ubabuike, Pharm.D. Candidate[1], Haley Spaulding, BS, Pharm.D. Candidate[1], Carrie Spindler, BS, Pharm.D. Candidate[1], Alyssa Wenzel, Pharm.D.[1], Freddy Kitutu, MSC, MPS[3], Jacqueline Namatovu, BS[2], Inis Bardella, M.D.[1]; (1) Rosalind Franklin University of Medicine and Science, North Chicago, IL (2) Ndejje HealthCentre IV, Ndejje, Uganda (3) Makerere University College of Health Sciences, Kampala, Uganda
PURPOSE: To describe positive aspects and challenges in the development and implementation of interprofessional global health student rotations with a road map for other programs to follow.
METHODS: Rosalind Franklin University of Medicine and Science is an interprofessional University with students interested in global health experiences. Student rotations in Ndejje Uganda have been developed for pharmacy, medical, and psychology students at a school for refugees, Hope of Children and Women Victims of Violence (HOCW), and a government sponsored clinic (Ndejje HealthCentre IV). Faculty have worked to ensure proper preparation of traveling students and faculty including attendance at pre and post travel workshops and reflections. A memorandum of understanding is established between partner organizations and introductory and advance pharmacy practice experience goals and objectives are established.
RESULTS: Forty students and three faculty from pharmacy, medicine, and psychology have taken part since 2011. Rotation responsibilities at HOCW include development and delivery of educational classes in family planning, sexually transmitted infections, HIV, malaria, and staying healthy. HIV and blood pressure screenings have been provided to residents. Education on donated water filtration devices has been delivered. Direct patient care alongside local healthcare providers in the pharmacy and various clinics such as HIV, hypertension, immunizations, diabetes, and mental health has been provided at Ndejje HealthCentre IV. Recent trips have involved meetings with Faculty of Pharmacy and students at Makerere University. Challenges overcome have included, immunizations, insurance, financing, cultural differences, language barriers, and illnesses.
CONCLUSION: Proper training and preparation of travelers has resulted in continued student interest in rotation opportunities in Uganda, with trips occurring throughout the year for continual and sustainable efforts. Additional collaboration has developed with Makerere University's Department of Pharmacy and related institutions to expand student opportunities and potentially provide additional resources, education, and care to individuals at HOCW and Ndejje HealthCentre IV.

237. Cross cultural teaching of patient care and clinical reasoning in Asia *Robert Henderson, BSPharm, Pharm.D., FCCP, FASHP, BCPS*, Roger Lander, BSPharm, Pharm.D., FCCP, FASHP, BCACP, Michael Hogue, Pharm.D., FAPhA, FNAP, Charles Sands, III, BSPharm, Pharm.D.; Pharmacy Practice Department, McWhorter School of Pharmacy, Samford University, Birmingham, AL
PURPOSE: Samford University's McWhorter School of Pharmacy has a significant history of involvement in the training of Asian pharmacists and students. Significant variations can exist between and within countries with regards to educational backgrounds and experience in patient care. Varied cultural expectations can impact permissible practice and how learners perceive educational material and methods. Cross cultural differences should be recognized in developing training programs.
METHODS: vTraditional lecture and laboratory formats dominate pharmacy education in Asia. Workshop and active learning strategies are not frequently used, but become necessary when teaching approaches to patient care, clinical thinking and developing critical thinking skills. The medical "morning report" model is a useful active learning strategy to demonstrate use of deductive, inductive and inferential reasoning during progressive disclosure of patient cases to develop clinical reasoning and problem solving skills. In developing educational programs, issues to consider can include: insufficient training in physiology, pharmacotherapy, and patient care; operating within a traditionally rigid inter-professional hierarchy, lack of experiential training in patient care, and prohibition of pharmacists to physically touch or examine patients.
RESULTS: Workshops using active strategies including Socratic methods and novel formats similar to medical morning report models have been used successfully to introduce clinical reasoning skills and problem solving. Experience with these workshops include several Asian countries, including meetings of the Asian Conference of Clinical Pharmacy.
CONCLUSION: The use of active learning methods in focused workshop formats is useful in training to develop critical thinking and clinical reasoning skills. Reinforcement of reasonable patient care within cultural standards is vital for the success of these educational strategies, whether done abroad or with visiting scholars in programs based in the USA.

238. Pharmacy student medical mission trip global health elective *Gina M. Prescott, Pharm.D., BCPS*[1], Carolyn Hempel, Pharm.D., BCPS[2]; (1) School of Pharmacy and Pharmaceutical Sciences, University at Buffalo, Buffalo, NY (2) State University of New York at Buffalo School of Pharmacy and Pharmaceutical Sciences, Buffalo, NY
PURPOSE: To describe a medical mission trip global health elective offered to pharmacy students through content, coursework, and assessment of the course.
METHODS: In 2013–2014, pharmacy students (P1 through P4) were offered an opportunity to attend an interprofessional medical mission trip. Students selected to attend the trip were able to complete additional coursework for elective credit. All students were required to attend monthly trip meetings, a medication packing event, and all in-country medical mission trip activities (20% of the grade). Additional coursework included a daily reflective journal utilizing discussion questions (40%), one patient specific SOAP note (15%), one retrieval and analysis of a primary literature article in global health (15%), and a 5-point Likert scale post-trip survey (10%). Each assignment was graded using standardized rubrics.
RESULTS: Twenty-one students were selected to attend the medical mission trip. Twelve students (all P2 students) requested elective credit. One student was a P4 student and not eligible for elective credit. All students attended the monthly meetings and in-country mission trip activities. The mean grades for the reflective journal, SOAP note, and journal article review were 26.5/29, 11.6/15, and 10.6/15, respectively. All students agreed that the medical mission trip enhanced their patient care abilities (mean=4.9), equipped them for future medical mission trips (mean=4.6), and allowed them to gain other skills not traditionally found in pharmacy school (mean=4.8).
CONCLUSION: Overall students did well within the context of the medical mission trip elective, based on their year in pharmacy school. The elective coursework likely allowed students to reflect on their experiences, educate themselves on global health, and consider differences from patients in the United States. Elective coursework should be considered a requirement for all students attending a medical mission trip experience.

239. Collaborative learning through international advanced pharmacy practice experiences *Patricia Naro, BSPharm, Pharm.D., FASCP, CGP*, Michael Hogue, Pharm.D., FAPhA, FNAP, Robert Henderson, BSPharm, Pharm.D., FCCP, FASHP, BCPS, Charles Sands, III, BSPharm, Pharm.D., Paula Thompson, Pharm.D., MS, BCPS; Pharmacy Practice Department, McWhorter School of Pharmacy, Samford University, Birmingham, AL

PURPOSE: The McWhorter School of Pharmacy (MSOP) at Samford University provided opportunities to complete advanced practice experiences (APPEs) abroad for over 20 years. Our first international affiliation was with Meijo University, Nagoya, Japan (1994). Since then MSOP has affiliated with 17 sites located in Asia, Europe and Africa. Our school has a global education mission, and a vision for every pharmacy student to complete an experience abroad prior to graduation. Our experiential program is a cornerstone to this strategy. We have established a robust process to prepare pharmacy students to complete APPEs and other coursework abroad.

METHODS: While on the international experiential students participate in case presentations, journal clubs, lectures, pharmacokinetic dosing, and patient counseling. In addition the student learns about the culture and the international health care system. The students follow a syllabus designed by faculty of the MSOP. In addition, the international preceptors will require specific goals and objectives to be met. The experientials are electives and have ranged from 4 to 6 weeks.

RESULTS: Many of the international governments have mandated clinical pharmacy services. To comply, these sites have agreed to affiliate with MSOP to develop a clinical pharmacy training and exchange program. We've discovered that our students are engaged in teaching clinical pharmacy (both pharmacotherapy and patient care processes) as part of their APPE. We believe that this robust, dually beneficial engagement can improve patient care and enhances the knowledge of both our students and our partners.

CONCLUSIONS: Since 2003, 95 students have participated in APPEs abroad. This is a strong response, and based upon this positive history, alumni have established a $1 million endowment to help provide resources to enable more of our students to study abroad. The development and affiliation with these sites has strengthened the experiential program by broadening the students' perspectives in global pharmacy.

240. Design, development, and early implementation of the professional pharmacy curriculum in Iraqi Kurdistan *Cathy Ficzere, Pharm.D., BCPS*[1], Andrew Webster, Ph.D.[2]; (1) Department of Pharmacy Practice, Belmont University College of Pharmacy, Nashville, TN (2) Pharmaceutical, Social, and Administrative Sciences, Belmont University College of Pharmacy, Nashville, TN

PURPOSE: Due to 30 years of war and trade sanctions, critical gaps in the higher education system in Iraqi Kurdistan have developed. In recognition of the need for curricular change, the Kurdistan Ministry of Higher Education (KMoHE) worked with U.S. universities in 2008 to update various curricula including pharmacy.

METHODS: A pharmacy curriculum reform committee was formed and charged with identifying current and future needs of pharmacy practice and education, evaluating the current curriculum, recommending curricular change, and identifying needs to implement the new curriculum.

RESULTS: The curricular changes recommended by the committee were accepted by the Minister of Higher Education and have been implemented in all three pharmacy programs in Iraqi Kurdistan. In 2014, the following number of students graduated with the modified Bachelor of Science in Pharmacy: Duhok, 34; Hawler, 70; Sulaimania, 45. A parallel Doctor of Pharmacy track was developed but the current hostilities with ISIS have lead to a delay in implementation. Faculty development to assist with delivery of the curriculum has been successful and continued support has been provided.

CONCLUSION: It is hoped that the curricular revisions will prepare students to become pharmacists that are prepared for the future of pharmacy practice in the Kurdistan region

241. A feasibility analysis for the development of an international introductory/advanced pharmacy practice experience program in Taiwan *Sara DiTursi, B.A.*[1], Qing Ma, Ph.D.[2], Yea-Huei Kao Yang, B.S.Pharm.[3], Wen-Liang Lin, M.S.Pharm.[3], Jackson Chieh-Hsi Wu, Ph.D.[4], Gina M. Prescott, Pharm.D., BCPS[1], Edward M. Bednarczyk, Pharm.D.[1]; (1) School of Pharmacy and Pharmaceutical Sciences, University at Buffalo, Buffalo, NY (2) Translational Pharmacology Core, Center of Excellence in Bioinformatics and Life Sciences, School of Pharmacy and Pharmaceutical Sciences, University at Buffalo, Buffalo, NY (3) Institute of Clinical Pharmacy and Pharmaceutical Sciences, National Cheng Kung University, Tainan, Taiwan (4) College of Pharmacy, Taipei Medical University, Taipei, Taiwan

PURPOSE: To assess the feasibility of and develop an international introductory/advanced pharmacy practice experience (IPPE/APPE) program in Taiwan.

METHODS: A comparison of pharmacy education systems in Taiwan and the United States (US) was performed and included assessments of pharmacy curriculum, relevant practice settings, experiential education requirements and preceptor training. To determine the feasibility of potential programs and collaborations between the universities in Taiwan and the US, a preliminary meeting with faculty and students at National Cheng Kung University took place. This was followed by a six-week rotation in a community pharmacy affiliated with Taipei Medical University.

RESULTS: The US and Taiwan shared 65% of curricular topics, experimental education requirements, preceptor training requirements, the role of clinical pharmacy and student interest in international experiences. The development of an IPPE/APPE experience was well received by both faculty and students in Taiwan and has continued through correspondence. However, significant differences in pharmacy practice settings (US versus Taiwan) in community (61% versus 20%), hospital (23% versus 70%) and industry/other (16% versus 10%) have been identified. Differences also include the degree requirements for licensure, length of training, and the influence of traditional Chinese medicine.

CONCLUSION: Establishment of an international IPPE/APPE program is feasible and well received by the faculty and students in Taiwan and the US. However, there will be potential barriers to consider and overcome such as language, the role of Chinese medicine in practice, degree requirements for licensure and differences in the pharmacy workforce.

243. Implementation of a pharmacy student-led hypertension and diabetes screening program for a low-income population in Macao S.A.R., China *Cheng-Kin Lao, Pharm.D.*[1], Yok-Man Chan, Ph.D.[1], Henry H.Y. Tong, Ph.D., MPH[1], Alexandre Chan, Pharm.D., MPH, FCCP, BCPS, BCOP[2]; (1) School of Health Sciences, Macao Polytechnic Institute, Macao (2) Department of Pharmacy, National University of Singapore, Singapore, Singapore

PURPOSE: There has been a lack of health screening services provided by pharmacists or pharmacy students in Macao. The objectives of this study were: (1) to describe the implementation of a pharmacy student-led hypertension and diabetes screening program for low-income residents and (2) to evaluate local pharmacy students' perceptions of public health services.

METHODS: The screening program targeted the adult beneficiaries of a food bank, which was established to support low-income residents who do not qualify for government financial assistance. Pharmacy students were recruited to volunteer at eleven screening events from October 2012 to August 2013. Under the supervision of a pharmacist, the students collected medical history, performed blood pressure (BP) and blood glucose (BG) measurement, and provided education on managing hypertension and diabetes. Students' perceptions of the screening program were assessed by a structured, self-administered questionnaire.

RESULTS: Among 252 food bank beneficiaries (mean age: 62.2 ± 12.7 years) included in the analysis, 48.4% and 21.4% screened positive for hypertension and diabetes, respectively. Among those who were receiving drug treatment, 57.3% and

48.6% achieved adequate BP and glycemic control, respectively. Following the volunteer experience, the majority of the pharmacy students felt more confident in performing BP (100%) and BG (95%) testing. In addition, they reported more confidence in providing education on the management of hypertension (100%) and diabetes (95%). The students also agreed that involvement in health promotion would enhance work satisfaction (100%) and improve the image of pharmacy profession among patients (80%) and other healthcare workers (90%).
CONCLUSION: Through the implementation of a pharmacy student-led screening program in Macao, subjects at high risk for hypertension and diabetes were identified. Students favored the implementation of this program, and they appreciated the opportunities to improve their skills in disease assessment and patient education.

244. International advanced pharmacy practice experience in traditional Chinese medicine *Timothy Hutcherson, Pharm.D.*[1], Robert Leopold, M.D., Pharm.D.[1], Xie Zhen, Ph.D.[2]; (1) School of Pharmacy, D'Youville College, Buffalo, NY (2) School of Pharmacy, Guangxi University of Chinese Medicine, Nanning, China
PURPOSE: An advanced pharmacy practice experience (APPE) was developed to introduce Pharm.D. students to the practice of traditional Chinese medicine (TCM), demonstrate its relationship to pharmacy practice in the US, and foster cultural awareness and respect for patient preferences when seeking health care.
METHODS: A six credit hour elective APPE was developed at D'Youville College in collaboration with Guangxi University of Chinese Medicine, located in the autonomous region of Guangxi Zhaung. Students were recruited for the APPE and then required to complete a two credit hour prerequisite pharmacy elective in natural product therapeutics the semester prior to the APPE. Logistics and curriculum were co-coordinated by US and Chinese faculty.
RESULTS: Participants included six US Pharm.D. students; two US pharmacy faculty; 10 Chinese international education and TCM faculty; eight Chinese TCM students; 15 TCM pharmacists; and six TCM physicians. After completing the prerequisite coursework, students completed a three credit hour introductory foreign language course in Mandarin and attended 13 US-based introductory TCM topic sessions taught by two visiting Chinese TCM professors. Upon arrival in Guangxi, APPE students attended nine advanced TCM topic sessions; delivered a two-hour podium presentation to 200 TCM students and faculty; studied specimens in the Guangxi University TCM Exhibit Center; toured the world's largest medicinal garden; foraged in local forests for wildcraft herbs; processed crude herbal agents; toured a patent herbal medicine processing facility; prepared TCM prescriptions; toured multiple TCM pharmacy settings; and, collaborated with TCM physicians conducting patient interviews and diagnostic assessments common to TCM.
CONCLUSIONS: The APPE was successful at achieving its curricular goals and cultural objectives in a safe and effective manner as per faculty and student reflections. The faculty of both academic institutions intend to offer the elective TCM APPE annually. Further development of interprofesional practice opportunities and traditional medicine research activities are anticipated.

245. Provision of therapeutics case conferences through a virtual classroom to facilitate clinical pharmacy learning in Taiwan Felix K. Yam, Pharm.D., M.A.S., BCPS[1], *Hsiang-Wen Lin, M.S., Ph.D.*[2], Chin-Chuan Hung, M.S., Ph.D.[2], Grace M. Kuo, Pharm.D., M.P.H., Ph.D., FCCP[1], Shin-Hun Juang, M.S., Ph.D.[2], Ching-Yao Cheng, MS[2], Fei-Ka Syu, M.S.[2], Jaw-Horng Liou, M.S.[2]; (1) Skaggs School of Pharmacy and Pharmaceutical Sciences, University of California, San Diego,, La Jolla, CA (2) School of Pharmacy and Graduate Institute, China Medical University, Taichung, Taiwan
PURPOSE: To enhance clinical pharmacy training at China Medical University College of Pharmacy (CMU COP), a virtual course was developed to increase faculty and student exposure to clinical patient case discussions.
METHODS: In 2012, UC San Diego Skaggs School of Pharmacy and Pharmaceutical Sciences (SSPPS) partnered with CMU COP to develop a clinical pharmacy training program for CMU clinical pharmacy students, pharmacists and clinical faculty. In addition to student and faculty exchange programs, a therapeutics course was developed using a virtual case conference format. In parallel with a SSPPS third-year therapeutics course, CMU faculty and students were provided the same lecture and case materials and participated virtually in weekly SSPPS-facilitated small group case discussions. Participants were encouraged to briefly summarize the case, actively discuss disease and medication-related problems and to write clinical encounter notes. All sessions were conducted using the English language. A pre-evaluation online survey was conducted to understand participants¡¦ clinical practice experience, level of perceived understanding and motivation about clinical pharmacy-related subjects.
RESULTS: Eight participants with various pharmacy practice and education experience from CMU have participated in three virtual case conferences since January 2015. Before training, the majority perceived having average or less knowledge, familiarity, confidence and ability to be involved in clinical case discussions. A post-training survey will be conducted to determine if this training program increases perceived knowledge level and confidence among participants.
CONCLUSION: This is a novel clinical pharmacy training program using a virtual classroom to help participants improve their clinical pharmacy related knowledge and skills. Further evaluations for the continuous plans and resource utilization are necessary.

246. Development and implementation of international pharmacotherapy training workshops in Benin City, Nigeria *Pamela M. Moye, Pharm.D., BCPS, AAHIVP*[1], Angela O. Shogbon, Pharm.D., BCPS[1], Uche Ndefo, Pharm.D., BCPS[2], Michell Butler, Pharm.D.[1], Ashish Advani, Pharm.D.[1], Ehis Enato, Ph.D.[3], Teresa Pounds, Pharm.D., BCNSP[4]; (1) Mercer University College of Pharmacy, Atlanta, GA (2) Texas Southern University, Houston, TX (3) University of Benin (4) Atlanta Medical Center, Atlanta, GA
PURPOSE: There is a tremendous need for appropriate medication use in Nigeria. There is also the need to contribute towards strengthening the nation's health systems. In response to these needs, training workshops for pharmacists were organized. Exploratory surveys of pharmacists attending these national clinical pharmacy training workshops from all over the country were conducted to assess their evaluation of the program and involvement in and attitudes towards being part of a multidisciplinary medical team.
METHODS: The workshops were developed by clinical pharmacists in both the United States (US) and Nigeria. The facilitators included pharmacists and physicians from several different countries including the US, Nigeria, and Sweden. The workshops were case based training on pharmacotherapy of several diseases in various clinical specialties, including internal medicine, pediatrics, critical care therapeutics, etc. Pharmacists' perceptions of preparedness and involvement on multi-disciplinary teams were assessed and compared using a 16 question survey. The participants were also given an evaluation at the end of the workshop to assess their satisfaction of the workshops and facilitators. Participants of the workshop included pharmacists in hospital, community, academic, industry and "other" settings.
RESULTS: Eighty (79% response rate) pharmacists completed the preparedness survey and 44 (55% response rate) evaluated the programs. The majority of respondents agreed (94%) that pharmacists should be part of a multidisciplinary medical team. Despite this belief, 40% of hospital pharmacists surveyed stated

that they were not currently part of a multidisciplinary team. One-hundred percent of the participants were either satisfied or very satisfied with the training workshops and facilitators.
CONCLUSION: Although some pharmacists in Nigeria currently function as part of a multidisciplinary medical team, opportunities exist to increase participation in hospitals and to empower pharmacists to take on a stronger role on interdisciplinary teams. Overall the implementation of these training workshops were successful.

247. Development of advanced pharmacy practice experiences in global health *Lauren J. Jonkman, Pharm.D., MPH, BCPS*, Sharon E. Connor, Pharm.D.; School of Pharmacy, University of Pittsburgh, Pittsburgh, PA
PURPOSE: Since 2005, the University of Pittsburgh has been developing and expanding opportunities for students to complete rotations in other countries. Global health is an area for study, research, and practice that places a priority on improving health and achieving equity in health for all people worldwide. While the University supports advanced pharmacy practice experiences (APPEs) in many international settings, this abstract describes the development of three APPEs in global health.
METHODS: Effort is made to create diverse global health APPE experiences for students, meaning that sites are identified in different regions of the world, in both low-income and middle-income countries, in both rural and urban settings, and providing outpatient versus impatient care. Partners are identified through relationships with other colleagues on campus to allow for pharmacy involvement to augment and improve care and services already provided, and to ensure that relationships are sustainable long-term.
RESULTS: Rotations have been established with: Shoulder to Shoulder Pittsburgh-San José in rural Honduras; Kamuzu Central Hospital in Lilongwe, Malawi; and Philippine General Hospital in Manila, Philippines. A total of 36 students have completed an APPE in global health since 2005 with the numbers increasing from 1 student per year to 10 students per year during that time period.
CONCLUSION: Interest in international pharmacy practice experiences is increasing and a need for high quality, sustainable, global health rotations is clear. The model used to identify and support sites is a model that other schools and colleges of pharmacy can use to develop experiences for students and support the provision of pharmacy services globally.

248. Development of Master of Science Degree (MSc) Program in Clinical Pharmacy at Postgraduate level at School of Pharmacy Jimma University in Ethiopia *Tesfahun Chanie, B.Pharm, MSc*; School of Pharmacy, Jimma University, Jimma, Ethiopia
PURPOSE: Prior to 2009, in Ethiopia, pharmacy practice and education has long been product-focused with pharmacists having almost no involvement in direct patient care. School of Pharmacy Jimma University in collaboration with partners designed Master's program in Clinical Pharmacy and the goal of the program was to educate pharmacists in clinical pharmacy so as to establish patient centered pharmaceutical care service in Ethiopia.
METHODS: The training program constituted 2 years full time study divided in to four semesters. The program constituted 30 credit hours (Cr.hrs) of course work for year one, i.e. 12 Cr.hrs for series of courses on Integrated Therapeutics I – III, 3 Cr.hrs course each on Drug Information and Literature Evaluation as well as Advanced Bio pharmaceutics and Clinical pharmacokinetics, 4 Cr.hrs course on Pharmaceutical Care, 2 Cr.hrs course each for Pharmacoepidemiology and Pharmacoeconomics, 3 Cr.hrs course on advanced Biostatistics, 1 Cr.hrs course on clinical toxicology and non-credit course on physical diagnosis; for year two, 32 weeks of clinical attachment [for 8 months], and 6 Cr.hrs of independent research in the area of clinical pharmacy. The program was designed to be delivered by mix of medical specialists and clinical pharmacologists/pharmacists.
RESULTS: To date a total of 55 clinical pharmacists have graduated in four cohorts. The fifth and sixth cohort, 12 & 9, students are undertaking their clinical attachment & thesis work and doing first year course work respectively. The graduates were very instrumental to the newly devised undergraduate B.Pharm program curriculum to be patient centered fulfilling global standards and to initiate clinical pharmacy service in hospitals in Ethiopia.
CONCLUSION: School of Pharmacy JU has successfully launched the first graduate program in Clinical Pharmacy in the history of pharmacy education in all universities in Ethiopia on March 2009. This Master's program has heralded the initiation of clinical pharmacy service, education and research in Ethiopia.

249. An innovative in-service training course on clinical pharmacy for hospital pharmacists in Ethiopia Tesfahun Chanie, B.Pharm, MSc[1], Negussu Mekonnen, MPharm, Ph.D.[2], Yared Yiegezu, BPharm, BA, MPH, MA[3], Hailu Tadeg, BPharm, MSc, MPH[4]; (1) School of Pharmacy, Jimma University, Jimma, Ethiopia (2) Management Sciences for Health (MSH)-Ethiopia, Addis Ababa, Ethiopia (3) FDRE Pharmaceuticals Fund and Supply Agency (PFSA), Addis Ababa, Ethiopia (4) Systems for Improved Access to Pharmaceuticals and Services (SIAPS), MSH, Addis Ababa, Ethiopia
PURPOSE: Pharmacists practicing in hospitals in Ethiopia do have knowledge and skill gap to provide clinical pharmacy services (CPS) because pharmacy education has long been product-focused. To this end, an innovative short-term in-service training on clinical pharmacy was designed to train hospital pharmacists.
METHODS: A one month 167 hours in-service training on clinical pharmacy was developed consisting didactic class based training for a week, composed of lecture on laboratory data interpretation, pharmacotherapy of selected chronic diseases, pharmaceutical care principles, and medication safety & medication use evaluation, and an intensive ward based practical training for three weeks at medical, pediatric and surgical wards and activities were attending multidisciplinary (M.D.T) and pharmacy only morning sessions as well as rounds together with conducting patient chart review. Moreover, post in-service training follow-up and supportive supervision was designed to support trainees at work place. A consultative meeting consisting of clinical directors, stakeholders and policy makers on implementation of CPS in the selected hospitals was conducted. Documentation tools and instructional guides for documenting CPS at health facilities was also developed. The trainer team also developed standards of practice for CPS for clinically trained hospital pharmacists in Ethiopia.
RESULTS: A total of 202 pharmacists representing 65 public hospitals in Ethiopia were trained through eight rounds of a one-month clinical pharmacy in-service training for the last three years at Jimma [6 rounds], Gondar and Mekelle [1 round each] University Specialized Hospitals. Following the training, more than 89% of participating hospitals have initiated clinical pharmacy services depending on their practice set up.
CONCLUSION: This innovative training program has enabled clinical pharmacy to be a recognized practice throughout the nation. The pharmacists are considered as an important member of the multidisciplinary team. This training program has also contributed for seamless integration of new patient oriented pharmacy graduates into hospital clinical services.

252. Assessing student pharmacist preparedness for a global health APPE *Ellen Schellhase, Pharm.D.*[1], Monica L. Miller, Pharm.D.[2], Rakhi Karwa, Pharm.D.[3], Susie Crowe, Pharm.D.[4], Dennis Thirix, BPharm[5]; (1) Department of Pharmacy Practice, Purdue University, West Lafayette (2) Department of Pharmacy Practice, Purdue University College of Pharmacy (3) Department of Pharmacology, Moi University, Eldoret, Kenya (4) Purdue

University College of Pharmacy, West Lafayette, IN (5) Moi Teaching and Referral Hospital
PURPOSE: The Purdue Kenya Partnership is an elective global health Advance Pharmacy Practice Experience (APPE) offered in affiliation with the Academic Model Providing Access to Healthcare (AMPATH), Moi University, and Moi Teaching and Referral Hospital in Eldoret, Kenya. Since establishing this APPE in 2003, the increased demand for participation has necessitated the development of a strategic process to evaluate the competency of interested students. Interested students are required to attend an orientation meeting, submit a written application and complete an interview. Selected students are then required to enroll in a two-credit preparation course. The intent of this initiative was to establish an assessment process to ensure that qualified students are prepared for the APPE.
METHODS: A 36-question assessment was administered at the beginning and end of the preparation course. Questions were created based on the course learning objectives and were focused in three content areas: culture, travel preparation, and disease state management. An 80% pass rate was required to participate in the APPE. Remediation was available for students who did not meet this criterion.
RESULTS: From 2011–2014, 95 students were enrolled in the course. The average grade for the initial assessment was 54%. The average grade for the final assessment was 88%. The content area with the most improvement was disease state management (45% improvement). Six students required remediation after the final assessment. There was a 34% improvement from initial to final assessment. All students were able to participate in the APPE.
CONCLUSION: This innovation has provided a strategic way to assess student pharmacist readiness for this highly demanded APPE. In the future, the knowledge-based assessment will be utilized at the end of the APPE to further understand the learning process and areas for improvement. This assessment process could be replicated when preparing candidates for APPEs in other disciplines.

253. Impacts of a community practice experiences course on undergraduate pharmacy students *Yunn-Fang Ho, Ph.D.*[1], Yun-Wen Tang, MS[2], Yu-Hsin Lo, BS[1], Ling-Ling Hsieh, MS[1]; (1) School of Pharmacy, National Taiwan University, Taipei, Taiwan (2) Graduate Institute of Clinical Pharmacy, National Taiwan University, Taipei, Taiwan
PURPOSE: The Community Pharmacy Practice Experiences (CPPE; elective, 5-week, two credits) course at National Taiwan University has been developed and implemented without interruption for each academic year since 1992. The contents and curricular impacts on pharmacy students awaited investigation.
METHODS: A retrospective analysis of survey data collected during academic year 2012. The survey was performed using a 22-item questionnaire (5-point Likert scale) for students to report their views on learning outcomes, both prior to and right after the course. Statistical analyses were performed using R software. The study received Institutional Review Board approval.
RESULTS: A total of 37 students (4th-year-to-be; response rate 90.2%) participated in the study. Upon completion of the course, students were confident in items such as understanding of general non-prescription (4.1) and prescription (4.0) medications, understanding of guidelines for good dispensing practice (4.4), and being able to exercise accurate and efficient dispensing processes (4.3). However, skills for prescription verification (3.7), human resource (3.4), and fiscal management (3.4) were relatively dissatisfied. Differences in pre- and post-course self-evaluations also revealed that students perceived higher learning gains in areas such as products recognition (3.5 versus 4.1; $p = 0.001$), applications of pharmacoinformatics in dispensing processes (3.5 versus 4.2; $p = 0.001$), and understanding of laws and regulations on management of controlled substances (3.5 versus 4.1; $p = 0.004$). Further multivariate analysis demonstrated pharmacy type (independent, small chain), certified preceptor, and precepting experiences were correlated positively to learning outcomes.
CONCLUSIONS: The CPPE course provided students with opportunities to acquaint themselves in applying knowledge and skills in real practice settings. The effective pedagogical foci will be sustained and those inferior ones could be transformed into initiatives for future improvements.

255. Utilizing service learning initiatives to enhance opportunities for street children in western Kenya *Chelsea Pekny, Pharm.D.*[1], Ellen Schellhase, Pharm.D.[1], Sonak Pastakia, Pharm.D., MPH[1], Samuel Kimani, BEd[2], Monica Miller, Pharm.D.; (1) Department of Pharmacy Practice, Purdue University College of Pharmacy (2) Tumaini Children's Center
PURPOSE: To highlight the impact of Purdue University College of Pharmacy (PUCOP) service learning initiatives at a street children's center in western Kenya.
METHODS: PUCOP offers fourth year professional student pharmacists an 8-week APPE and pharmacists a yearlong global health residency in Eldoret, Kenya. Eldoret is Kenya's fifth largest city and home to approximately 3,000 street children. These children leave their rural homes to seek opportunities in the city and frequently are unable to secure employment. Without money for shelter or transportation home, these children live on the street where they lack education, food, and basic rights. Since the Tumaini Children's Center (TCC) opened in 2010, PUCOP's service learning initiatives have supported the TCC mission "to improve the lives of street children by empowering them with hope, knowledge, skills, opportunities and resources necessary to find their healthy alternative to street life".
RESULTS: Over 130 pharmacy trainees have participated in activities at the TCC, including tuberculosis and diabetes screenings, teaching children to make handicrafts for financial security, and raising funds to allow for the opening of a new building for the center. PUCOP trainees have raised more than $15,000 through grants and the sale of handicrafts made by TCC children.
CONCLUSION: As of 2013, the TCC has served over 600 street children. Experiences with pharmacy trainees give street children the chance to develop relationships with healthcare professionals, become more confident seeking help when necessary, and meets the TCC objective of "providing street children and youths with health care and integrating them into a system of care". Involvement with the TCC gives PUCOP trainees opportunities to develop empathy and teaches the responsibility of healthcare providers to reach out and address community needs.

256. Building capacity to improve medication use in Uganda through a short-term, experiential pharmaceutical care skills training program in the USA for Ugandan pharmacists *KarenBeth Bohan, Pharm.D.*[1], Darowan Akajagbor, Pharm.D.[2], Richard Odoi Adome, Ph.D.[3]; (1) Department of Pharmacy Practice, Wilkes University, Wilkes-Barre, PA (2) School of Pharmacy, D'Youville College, Buffalo, NY (3) Department of Pharmacy, Makerere University, Kampala, Uganda
PURPOSE: Most Ugandan pharmacists don't participate in direct patient care or work with other healthcare providers (HCP) to improve medication use because pharmaceutical care (PC) training in their Bachelors of Pharmacy programs is lacking. Literature has shown interprofessional practice (IPP) can improve quality of care. Such collaboration could produce positive outcomes in Uganda but advanced training isn't available in-country. Since it is very difficult for internationally trained pharmacists to qualify for advanced clinical training in the USA, a short-term experiential course in the USA was developed to teach PC skills, instill confidence, and provide direction for improving medication use.
METHODS: Two USA schools of pharmacy collaborated with Makerere University Department of Pharmacy in Kampala and the Pharmaceutical Society of Uganda to develop an 8-week experiential training program in the USA. It focused on teaching

medical information literacy, improving oral communication with both patients and HCP, and resolving drug therapy problems. Participants funded their J-1 visa and international flight but the American pharmacy schools jointly funded all expenses once in the USA.
RESULTS: Two pharmacists were chosen based on their motivation, clinical aptitude, and prior initiatives in starting new programs at their institutions in Uganda. The PC training was similar to Advanced Pharmacy Practice Experiential rotations and included exposure to community, hospital, ambulatory care, and administrative pharmacy practice. Since returning, the participants have become involved in multidisciplinary ward rounds for improving patient care and training pharmacy students and interns in Uganda. They agreed the program not only improved their skills but also increased their confidence to participate in direct patient care.
CONCLUSIONS: This opportunity for pharmacists to observe, participate and be mentored in the provision of PC to patients in the USA is unique approach to building capacity to improve medication use in Uganda. It will be repeated in 2015.

257. Intensive education and training for international pharmacy scholars *Roger Lander, BSPharm, Pharm.D., FCCP, FASHP, BCACP*[1], Paula Thompson, Pharm.D., MS, BCPS[1], Charles Sands, III, BSPharm, Pharm.D.[1], Michael Hogue, Pharm.D., FAPhA, FNAP[1], Robert Henderson, BSPharm, Pharm.D., FCCP, FASHP, BCPS[1], Hiroyuki Kamei, Ph.D.[2]; (1) Pharmacy Practice Department, McWhorter School of Pharmacy, Samford University, Birmingham, AL (2) Department of Pharmacy Practice, College of Pharmacy, Meijo University, Nagoya, Japan
PURPOSE: Since 1994, Samford University McWhorter School of Pharmacy (MSOP) has hosted numerous international scholars. Groups of approximately 12–15 Japanese pharmacy students and faculty have visited for two weeks each summer for 20 years. Two groups of Korean pharmacists (26 total) also visited in 1995–96. In addition, we have hosted individual scholars, usually for 3–6 months each, from China (13), Japan (2), Indonesia (1), Malaysia (1), and Vietnam (1). In 2012, MSOP began to explore the possibility of a two-week summer course in which we could bring together pharmacists and students from a wide range of backgrounds to participate in integrated didactic and experiential coursework designed to improve pharmacy education and practice worldwide.
METHODS: Two-week summer institutes have been held in 2013 and 2014, with participants sharing best practices in patient care and pharmacy education. These institutes have concentrated on the development of clinical reasoning skills and interprofessional clinical practice. Integral to the experience has been the examination of advanced pharmacy practice sites located in Birmingham, Alabama. During these visits, international scholars have participated in guided discussions; interactive, student-led patient case presentations; and small group visits with MSOP faculty at their practice sites.
RESULTS: During the first two summer institutes, there have been 40 participants from China, Japan, and Zambia. Since several diverse healthcare systems are represented, all participants are involved in both teaching and learning. Feedback has been very positive from the visiting scholars and MSOP faculty, and plans are in place for the 2015 institute.
CONCLUSION: The summer institute has allowed for broader participation by international pharmacists, pharmacy students, and pharmacy educators than can be accomplished with individual visits. It has also enhanced the exchange of ideas and approaches to implementation of clinical practice into the pharmacy curricula of these international partners.

258. Impact of a global health pharmacy residency in western Kenya *Chelsea Pekny, Pharm.D.*[1], Rakhi Karwa, Pharm.D.[1], Monica L. Miller, Pharm.D.[1], Ellen Schellhase, Pharm.D.[1], Sonak Pastakia, Pharm.D., MPH[1], Mercy Maina, BPharm[2], Susie Crowe, Pharm.D., BCPS[3]; (1) Department of Pharmacy Practice, Purdue University College of Pharmacy (2) IIGH, AMPATH, Eldoret, Kenya (3) Department of Pharmacy Practice, Purdue University College of Pharmacy, West Lafayette
PURPOSE: To describe the impact of a global health pharmacy residency in a resource-constrained setting.
METHODS: In 2011, the Purdue University College of Pharmacy established a unique Global Health Residency based in Eldoret, Kenya in collaboration with Moi Teaching and Referral Hospital and the Academic Model Providing Access to Healthcare (AMPATH). This residency, the first of its kind, has a class comprised of pharmacists from both Kenya and America. Presently in Kenya there is a significant shortage of pharmacists with a ratio of 1:19,000 people and >200 open clinical pharmacist positions. In addition to the shortage of pharmacists and other healthcare providers, there is a lack of clinical programs managing chronic disease, acute and critical care services and medication supply chain among others. The residency's global aim is to build pharmacy leaders with the knowledge and skills to build sustainable programs focused on addressing healthcare barriers in both resource-poor and -rich settings.
RESULTS: To date, there have been 6 American and 8 Kenyan residents who have completed the residency. These residents have developed eleven sustainable pharmacy led patient care services. Each service/program was new to the site and is still in operation. These services are: an inpatient anticoagulation program, self-sustaining dispensing pharmacies, rural outpatient diabetes and hypertension programs, a gestational diabetes service, peer-based patient education, counterfeit medication detection, WHO supported pharmacovigilance program, a drug information center, and oncology and cardiac intensive care unit services. Additionally, the residents have been instrumental in the development and updating of a pharmacy patient care database.
CONCLUSION: The PUCOP global health residency has developed clinically trained pharmacists who create innovative, sustainable solutions to patient care challenges in resource-poor settings and has trained pharmacists to fill the open positions in Kenya.

259. Development and Implementation of a pharmaceutical care skills course in Uganda through the Fulbright specialist program *KarenBeth Bohan, Pharm.D.*[1], Richard Odoi Adome, Ph.D.[2]; (1) Department of Pharmacy Practice, Wilkes University, Wilkes-Barre, PA (2) Department of Pharmacy, Makerere University, Kampala, Uganda
PURPOSE: The curriculum of the Bachelors of Pharmacy program at Makerere University (MU) in Kampala, Uganda is primarily didactic and knowledge-based. Although students learn therapeutics in the classroom setting, there is little skills or experiential training provided. The goal of this project was to develop and implement curriculum to train undergraduate pharmacy students in the skills required to perform Pharmaceutical Care (PC) during patient interactions to improve medication use.
METHODS: A collaboration between MU and the Fulbright Specialist Program provided support for three trips to Uganda. A needs assessment to inventory the current curriculum and identify gaps in the teaching of knowledge and skills was conducted in trip 1. Findings were used to write learning outcomes and a PC Clinical Skills Lab (PCSL) was developed to meet theses outcomes. It was taught during trip 2 using a train-the-teacher model for faculty development. The PCSL also included an experiential component at the university teaching hospital. Preceptor training materials were developed. During trip 3, the learning outcomes were assessed using OSCEs and reflective writing.
RESULTS: In fall 2014, nine classes of the PCSL were taught to both 3rd and 4th year Bachelors of Pharmacy students. Topics included patient interview skills, counseling, communicating with healthcare providers, and drug therapy problem identification and management. During the OSCE, 3rd year students outperformed 4th year students. Reflective writing demonstrated stu-

dents were using the new skills to care for patients and improved throughout the term.
CONCLUSION: The PCSL successfully taught Ugandan pharmacy students how to interact with patients and collaborate with other healthcare providers to improve medication use. It was well accepted by both students and faculty and will be taught again in Fall 2015.

260. Master of science in clinical pharmacy for international pharmacists *Karen Whalen, Pharm.D.*[1], Sven Normann, Pharm.D.[2]; (1) Pharmacotherapy & Translational Research, University of Florida College of Pharmacy, Gainesville, FL (2) College of Pharmacy, University of Florida, Gainesville, FL
PURPOSE: Many European, Asian, and African countries offer only the Bachelor of Science in Pharmacy degree for pharmacist education and training. As a result there is an unfulfilled demand for advanced clinical pharmacy training in these countries. Unfortunately, current accreditation guidelines do not allow US institutions to offer the Doctor of Pharmacy degree outside the United States or Canada due to licensure issues. However, the Master of Science in Pharmacy is an internationally recognized degree that offers greater flexibility in tailoring the curricular content for various countries and regions of the world. The purpose of this project is to describe the implementation of a Master of Science in Clinical Pharmacy (MS Clinical Pharmacy) for international students.
METHODS: The University of Florida College of Pharmacy will launch the MS Clinical Pharmacy degree program designed specifically for international pharmacists in 2015. The MS Clinical Pharmacy degree program will be offered via a blended learning model through distance education. The part-time degree program requires 36 semester credit hours of coursework and takes a minimum of six semesters to complete. The curriculum involves successful completion of three core clinical pharmacy courses, six body system-based pharmacy care courses, two clinical practice experiences, a clinical practice project, and a comprehensive examination.
RESULTS: To date, the program has received interest from more than 700 pharmacists in over 30 countries. The initial launch will be geared toward pharmacists practicing primarily in Germany and Austria. Based on the level of interest, the program will expand to other regions in the future. Demographics of initial enrollees, program goals, and challenges in implementation will be described.
CONCLUSION: International pharmacists have a desire for enhanced clinical training to advance the standard of pharmacy practice. The MS Clinical Pharmacy degree program helps to meet an unfulfilled need for clinical pharmacy training for international pharmacists.

261. Introducing patient-centered pharmacy education in Turkey *Akgul Yesilada, Ph.D.*[1], Jodie Malhotra, Pharm.D.[2], Kari Franson, Pharm.D., Ph.D.[3]; (1) Faculty of Pharmacy, Istanbul Kemerburgaz University, Bagcilar, Istanbul, Turkey (2) Distance Degrees and Programs, University of Colorado Skaggs School of Pharmacy, Aurora, CO (3) Department of Clinical Pharmacy, University of Colorado Skaggs School of Pharmacy, Aurora, CO
PURPOSE: In 2012, 93% of Turkish pharmacists worked in community pharmacies1. Pharmacy practice in Turkey recently modernized by implementing track and trace systems to reduce medical fraud and substituting generics to decrease cost. However, pharmacists are under threat by drug stores (i.e. OTC-only stores without pharmacists), pricing pressures, and regulatory restrictions to open pharmacies. Strategies to improve rational drug use, a cost-effective and preventive healthcare system, and governmental policies to direct the pharmacy work-force are needed. These threats and needs have urged the Turkish pharmacy community to 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.
METHODS: Istanbul Kemerburgaz University (IKU) opened in 2012 to address the call.
RESULTS: The Bachelor of Pharmacy curricular sequence was created after meeting with members of the academic section at FIP meetings and visiting the University of Colorado (CU). The visit to CU led to a memorandum of understanding to aid IKU's development of curriculum and faculty. Our collaboration has started with two courses in the 6th semester (Oral Communication in Health Sciences Practice and Pharmacotherapy I) and the Core Apprenticeship experience in the following summer term. The collaboration includes faculty from both programs jointly creating syllabi, co-teaching courses, CU faculty providing train-the trainer development sessions while teaching classes to IKU students to enable IKU faculty to independently deliver future courses independantly, and CU faculty aiding in the training of healthcare providers in the community that will serve as preceptors.
CONCLUSION: The newly developed patient-centered curriculum requires new knowledge and skills of our pharmacy trainees which we hope will take our Turkish pharmacists into the future.1 Tekiner H. Pharmacy in Turkey: past, present, and future. Pharmazie 69: 477–480, 2014.

262. Development and implementation of a pharmacotherapy course for a new school of pharmacy in Turkey *Jennifer Trujillo, Pharm.D.*[1], Joseph Saseen, Pharm.D.[2], Jodie Malhotra, Pharm.D.[3], Kari Franson, Pharm.D., Ph.D.[4]; (1) Skaggs School of Pharmacy and Pharmaceutical Sciences, University of Colorado, Aurora, CO (2) Department of Clinical Pharmacy, University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO (3) Distance Degrees and Programs, University of Colorado Skaggs School of Pharmacy, Aurora, CO (4) Department of Clinical Pharmacy, University of Colorado Skaggs School of Pharmacy, Aurora, CO
PURPOSE: To develop and deliver an introductory Pharmacotherapy course that addresses the call for re-professionalization of pharmacists to be more patient-centered in Turkey.
METHODS: Istanbul Kemerburgaz University (IKU) was established in Istanbul, Turkey and admitted its first students into the Bachelor of Pharmacy program in 2011. The program is 10 semesters and was partially modeled on the curriculum at the University of Colorado (CU) through programmatic collaborations. CU faculty developed the first pharmacotherapy course and will travel to Istanbul to teach the course live in Spring 2015. Three CU faculty members developed the course content, structure, learning methods, assessments, and evaluations that are patient-centered and incorporate contemporary educational approaches that are not common in Turkey. Faculty at IKU will participate in all course preparations, sessions, and activities to enable them to independently deliver future pharmacotherapy courses at IKU.
RESULTS: This six-credit course, Pharmacotherapy 1, is offered in the sixth semester of the program as the first of a course series covering pathophysiology, pharmacology, and therapeutics. Topics include self-care conditions and common chronic diseases (e.g., diabetes, hypertension, dyslipidemia, arthritis, depression). Standards of care, controversial issues, pharmacotherapy advances, and patient-centered management are included consistent with contemporary clinical care in the U.S. The course is integrated with a four credit communication course, similar to the approach utilized at CU. The weekly structure includes 4 hours of knowledge acquisition and application including didactic lectures, case discussions, and student-directed learning activities and two hours of communication-based activities. Evaluations include eleven quizzes, three assessments of communication skills, and one final examination.
CONCLUSION: This progressive international collaboration is designed to increase the knowledge, skills and abilities of graduating pharmacists in Turkey, consistent with IKU's aim to graduate patient-centered pharmacists. Educational innovations should continue to achieve re-professionalization of pharmacists in Turkey.

263. International rubric norming for patient-centered communication skills *Jodie Malhotra, Pharm.D.*[1], Jennifer Trujillo, Pharm.D.[2], Kari Franson, Pharm.D., Ph.D.[3]; (1) Distance Degrees and Programs, University of Colorado Skaggs School of Pharmacy, Aurora, CO (2) Skaggs School of Pharmacy and Pharmaceutical Sciences, University of Colorado, Aurora, CO (3) Department of Clinical Pharmacy, University of Colorado Skaggs School of Pharmacy, Aurora, CO

PURPOSE: To train international faculty on patient-centered communication rubrics and complete a rubric norming process for faculty to apply consistently across students.

METHODS: Istanbul Kemerburgaz University (IKU) admitted its first students into the Bachelor of Pharmacy program in 2012. The curriculum was modeled on the University of Colorado (CU) curriculum through collaborations between administrators. The IKU curriculum includes six English courses taught by faculty within the IKU foreign language department. The first five are focused on English written and verbal communication skills. The last course in this series was developed in collaboration with CU to focus on patient-centered health care communication skills. The course was modeled after communication courses taught in the CU traditional and International trained Pharm.D. programs. CU faculty developed and discussed the course content, structure, learning methods, and assessments with IKU faculty via video conferences. The major course activities are mock patient encounters assessed using standardized, valid grading rubrics used in the CU Pharm.D. programs. To improve reliability, two video-conferenced training sessions were used to lead a group of IKU faculty through a standard rubric norming process. The first session included a thorough review of rubric criteria and levels of competency. Examples of varying levels of achievement were provided. Afterwards, IKU faculty independently viewed and scored twelve sample videos. In the second session, CU faculty facilitated discussion among IKU faculty with intent to discuss and reconcile inconsistent scores.

RESULTS: In Spring 2015, IKU faculty will conduct assessments utilizing these grading rubrics. Assessments will be recorded and reviewed by CU faculty followed by a video conference to further reconcile inconsistent scores. Inter-rater reliability will be analyzed.

CONCLUSION: Completing the rubric norming process will allow IKU to assess student communication skills using valid and reliable assessments. This progressive international collaboration is designed to increase patient-centered communication skills of graduating pharmacists in Turkey.

264. Influence of interprofessional medical service brigades on students' educational growth and impact on community health advancement in two regions of Ecuador Kirsten Butterfoss, Pharm.D.[1], *Michelle Lewis, Pharm.D., MHA*[2]; (1) School of Pharmacy, D'Youville College, Buffalo, NY (2) Pharmacy, Niagara Falls Memorial Medical Center, Niagara Falls, NY

PURPOSE: To determine the benefit of participation on students' professional growth and to assess the effect of direct medical and healthcare services to underserved communities during Timmy Global Health (TGH) medical brigades.

METHODS: Second and third professional year applicants selected completed pre-trip meetings and assignments prior to the brigade. During daily excursions to remote communities, brigade volunteers set up mobile clinic stations which have access to the electronic medical record. Students work with the assigned professionals at history/intake, triage, laboratory, provider care, and pharmacy. A post-brigade survey assessed the perceived benefit on their education and professional development. Data on the number of patients treated per day, referrals, prescriptions dispensed and the types of disease states treated was collected.

RESULTS: At least 90% of students strongly agreed/agreed that the learning experiences could not have been duplicated in a didactic setting; were able to increase their medication knowledge through utilization of pharmacy resources; gained a better appreciation of the pharmacist's role in the healthcare team; and would recommend this experience for professional and educational development. Over the course of two brigades, 1,106 patients from 10 different communities were served. 62% of patients were previously cared for at other TGH brigades, showing the continuity of care. The top overall diagnoses were parasites, gastritis, allergies, headaches, and general pain. The most commonly prescribed medications were analgesics, antibiotics/antiparasitics, and respiratory agents. Of the total patients seen, 187 patients were referred to area hospitals for more advanced care.

CONCLUSION: Given the results obtained from two different medical service brigades, it is apparent that pharmacy students have a large impact on the communities that are served by TGH. International brigades help foster a passion for global health and provide students with unique interprofessional opportunities which make them worthwhile experiences and an integral part of the pharmacy experiential curriculum.

265. Clinical pharmacy education for German pharmacists *Sven Normann, Pharm.D.*, Monika Trojan, Pharm.D., Gregory Zuest, Ph.D.; College of Pharmacy, University of Florida, Gainesville, FL

PURPOSE: In 1994, the University of Florida's College of Pharmacy launched the Working Professional Doctor of Pharmacy program (WPPD) which allows licensed pharmacists holding a Bachelor of Science in Pharmacy degree to earn the Doctor of Pharmacy degree while maintaining their employment. This ACPE-accredited pathway is a three year, part-time, blended distance education program consisting of nine foundational and body-system based pharmacy care courses, outcomes-based clinical activities, and a capstone paper. In 2002, the program expanded internationally to include licensed pharmacists in Germany. This expansion was the result of a cooperative agreement with the Chambers of Pharmacy in the Bavarian and Nordrhein regions of Germany and was designed to provide a means for German pharmacists to improve both their clinical knowledge and ability to provide patient-centered pharmacy care. German students completed the same curricular requirements as US-based students with the addition of topics such as the US healthcare system, professional pharmacy practice, and a course in pharmacy law.

METHODS: n/a.

RESULTS: Over eight years, 33 German pharmacists graduated from the program. These alumni have helped improve the practice of pharmacy in Germany in a variety of ways such as promoting medication management in outpatient settings, expanding clinical services in hospital settings, working with insurance companies to estimate the financial risk of new drugs, and participating in educational projects to improve clinical pharmacy practice throughout the country. Due to the successful outcomes in Germany, the WPPD program further expanded into Asia in 2004 and South America in 2005. In 2010 the international groups were discontinued due to an ACPE moratorium on international Pharm.D. programs.

CONCLUSION: However, international pharmacists' desire to learn clinical skills continues. In response, the University of Florida's College of Pharmacy anticipates enrollment of students into a new Master of Science in Clinical Pharmacy degree designed for international pharmacists shortly.

266. Reform of pharmacy education in Taiwan: establishment of the first Pharm.D. program at National Taiwan University *Shu-Wen Lin, Pharm.D., M.S.*, Li-Jiuan Shen, Ph.D., Fe-Lin Lin Wu, Ph.D., Shoei-Sheng Lee, Ph.D., Ji-Wang Chern, Ph.D., Yunn-Fang Ho, Ph.D., Jih-Hwa Guh, Ph.D.; School of Pharmacy, National Taiwan University, Taipei, Taiwan

PURPOSE: With the transition from product-orientated to patient-centered pharmacy services, advanced pharmacy education is acknowledged in Taiwan. National Taiwan University

(NTU) School of Pharmacy (SP) has implemented the first 6-year Doctor of Pharmacy (Pharm.D.) program in September, 2009.
METHODS: A faculty and preceptor development is the key to success of the professional program. Therefore, reform of pharmacy services (e.g., computerized physician¡¦s order entry and clinical decision support system, 24–7 coverage of inpatient services, order verification before the first dose, dispensing automation, international collaboration in preceptor training, clinical pharmacists in every ICU, operation room pharmacy service and anticoagulant clinic) has been developed at NTU Hospital, the main APPE site, in recent years. Training courses for community pharmacist also began in 2010.
RESULTS: The Pharm.D. program paralleled for 5 years with the Bachelor of Science (B.S.) in Pharmacy which has been conferred since 1953. Undergraduate students may choose Pharm.D. program or staying in B.S. program after completion of 2 year pre-Pharm courses. An early exposure, so-called shadowing experiences, is offered to guide students for decision making. Students study advanced pharmacy courses and 23 credit hours of integrated therapeutic courses in the next 3 year. They spend 640 and 180 hours of intermediate pharmacy practice experiences (IPPEs) in hospital and community pharmacy in the 4th year, respectively. Thirty six weeks of advanced pharmacy practice experiences (APPEs) take place in the last year. Students are required to complete APPEs in critical care, general ward and specialized pharmacy services. Electives include community pharmacy, administration, industrial pharmacy and research/academia. All students enrolled in NTU SP began in the entry-level Pharm.D. program since September 2014.
CONCLUSION: Currently 3 out of 8 pharmacy schools in Taiwan run Pharm.D. programs. Even though variations exist among these programs, the direction toward Pharm.D. education has established for evolving healthcare systems.

267. An advanced practice residency in global health *Sharon E. Connor, Pharm.D.*, Lauren J. Jonkman, Pharm.D., MPH, BCPS; School of Pharmacy, University of Pittsburgh, Pittsburgh, PA
PURPOSE: Global health is a rapidly growing area for work to improve and achieve equity in health for all people worldwide. Advanced Practice residencies are designed to produce specialized practitioners with an advanced degree of proficiency and expertise in working with interdisciplinary teams to deliver pharmacy services in a specific area of practice. There are few pharmacy residency programs designed to enhance the clinical skills of pharmacists in global health settings. We describe a residency program that places an emphasis on global health, assisting residents in developing skills in direct patient care, teaching, and research in resource-poor settings globally.
METHODS: The program was designed to enhance the resident's clinical pharmacy and problem-solving skills. Core practice experiences were created through partnerships with global partners in order to provide experience with both research and patient care in low-resource settings. Pharmacy residents elect experiences focusing on care in resource-poor areas outside the United States. Residents are required to complete a research project in an international setting.
RESULTS: A total of five residents have been trained to provide clinical care in low resource settings since 2011. Resident skills include formulary development, stock management, and the development of treatment guidelines in low-resource settings. Resident research projects have included qualitative research evaluating perspectives of diverse populations, pharmacovigilance in a central hospital, program monitoring and evaluation for chronic disease management in a rural setting, and a needs assessment for clinical pharmacy services training.
CONCLUSION: As key players in global health, it is imperative that pharmacists receive formal training in the field. This residency program demonstrates that a wide variety of clinical skills may be developed through structured training in global health. This program serves as a model for training a global health pharmacist. Innovative programs focusing on global health are essential for developing capacity for change.

268. Utilizing HIV post-exposure (PEP) kits for patients in the United States, United Kingdom, and Australia *Nadia Lian, Pharm.D. Candidate*[1], Elizabeth Unni, BPharm, MBA, Ph.D.[2], William Kuykendall, Pharm. D.[3]; (1) School of Pharmacy, Roseman University of Health Sciences College of Pharmacy, Riverton, UT (2) Roseman University of Health Sciences College of Pharmacy, S Jordan, UT (3) Department of Pharmacy, Roseman University of Health Sciences College of Pharmacy, Henderson, NV
PURPOSE: Truvada® is recommended by the World Health Organization as post-exposure prophylaxis (PEP) for Human Immunodeficiency Virus (HIV). PEP is prescribed within 72 hours for individuals who might have been exposed to HIV by sexual assault or needle stick injury. PEP is also available as a 3–5 day regimen starter kit for individuals who may be exposed to HIV, but without immediate access to a physician's office. They start the therapy and later get the base-line HIV test. This is especially important for those who are traveling to developing countries where there is an increased risk of HIV transmission. The objective of this study is to evaluate the HIV PEP guidelines in the US, UK, and Australia regarding the utilization of HIV PEP when traveling to developing countries.
METHODS: Electronic databases were used to search for articles in English regarding HIV PEP guidelines issued by accredited universities, traveling agencies and country organizations in US, UK, and Australia.
RESULTS: The US guidelines for HIV PEP kits are provided by the Center for Disease Control and Prevention with no indication for prescribing them for individuals traveling to developing countries. The Australian guidelines are provided by Australasian Society for HIV Medicine (ASHM) and the UK guidelines are provided by British Association for Sexual Health and HIV (BASHH) and the National Health Services (NHS). Both ASHM and NHS recommend that individuals traveling to developing countries contact their physician and be prescribed an HIV PEP kit. The cost of HIV PEP is roughly $22.40 in Australia and it is free in UK.
CONCLUSION: All three countries have similar HIV PEP guidelines, however, only the UK and Australia's public is educated about the use of HIV PEP kits and they are prescribed PEP kits when going on medical/volunteer/religious mission to developing countries to reduce HIV transmission.

269. International deployment of a virtual dispensing simulator supporting pharmacy education Marcus Ferrone, Pharm.D.[1], Tina Brock, MS, EdD[1], Lisa Holle, Pharm.D., BCOP[2], Jill Fitzgerald, Pharm.D.[3], Keith Sewell, MS[4], Marian Costelloe, MS[4]; (1) Clinical Pharmacy, University of California, San Francisco, San Francisco, CA (2) Department of Pharmacy Practice, University of Connecticut School of Pharmacy, Storrs, CT (3) University of Connecticut (4) Monash University
PURPOSE: Pharmacists provide an important service by supplying medications to patients that are safe and effective. While traditional dispensing labs have proven too costly to maintain, simulations offer students the opportunity to master basic competencies in a safe virtual environment. With this in mind, faculty at UCSF and UConn sought to deploy an interactive web-based tool (MyDispense) that had been developed by Monash University to teach/reinforce dispensing skills.
METHODS: Because the tool was originally developed to support Australian dispensing, it had to be adapted for US practice. This was achieved through a series of collaborative sessions where process, product, and legal standards were reconciled. Implementation pilots were held in spring 2014 (UCSF) and fall 2014 (UConn). Following these sessions, learners and preceptors completed surveys about their experiences.
RESULTS: Survey data was collected from the first-year winter quarter student cohort (n = 102) at UCSF. While many students

possess community pharmacy experience (34%), the majority of the first year pharmacy class (98%) communicated their satisfaction of the online simulation- affording them the opportunity to make dispensing mistakes and learn from this particular feedback in a virtual environment. Overall, learners reported that the software was easy to use, that it enhanced their knowledge and skills of dispensing, and that it should be used early and often in a pharmacy curriculum. Preceptors also suggested that the tool raised the preparedness of students completing introductory placements.
CONCLUSION: Interactive web-based tools such as MyDispense can be an effective and efficient way to teach practice skills in an enjoyable manner. UCSF students have had an overwhelmingly positive response to learning within this simulated environment. These results provide an incentive to consider further development of the software and conduct a prospective study to determine its true educational impact. Continual expansion of the MyDispense program to other US pharmacy schools is also on going.

270. Clinical contact workshop for pharmacy students in a Mexican University *René Francisco Bassó-Quevedo, Pharm.*, María del Carmen Medel-Bojórquez, Pharm.; Facultad de Ciencias Químicas e Ingeniería, Universidad Autónoma de Baja California, Tijuana, B.C., Mexico
PURPOSE: Through the implementation of a Clinical Contact Workshop (CCW), pharmacy students can improve their knowledge and clinical skills on pharmacotherapy. Due to a lack of a clinical practice rotation in most Mexican pharmacy schools, the students have their only opportunity to be introduced to the hospital environment.
METHODS: The curriculum of the Mexican pharmacy schools do not have clinical practice rotations in the hospital, therefore a CCW was implemented. During the CCW, the students 1) Created and implemented formats to document the pharmacological history of patients, 2) Attended to the medical rounds, 3) Interviewed a minimum of two hospitalized patients, 4) Evaluated their pharmacotherapy, mainly in search for Drug Related Problems and 5) Wrote a pharmaceutical intervention for each of them. The interventions were sent to a staff pharmacist for assessment and the patient cases were presented to an audience.
RESULTS: This workshop has been implemented during the last six semesters, 134 students has attend to it and there have been 272 patient cases; the interventions were evaluated by the pharmacists as good or very good in 76% of them; their clinical and communication skills, improved by 80% between the first and second case. It has been a rewarding experience to 89% of the students, both academically and in the humanities.
CONCLUSION: The students developed better clinical skills in the real hospital environment, than the ones that could be acquired in a classroom. Being with patients created a sense of responsibility in the students. The interventions presented were well received by the pharmacists.

HIV/AIDS

271. Building capacity through implementation of a clinical pharmacy training model for HIV medicine Kimberly K. Scarsi, Pharm.D., MSc[1], Oluremi O. Olaitan, B.Pharm, MSc[2], Holly E. Rawizza, M.D.[3], Seyed Jalal Hosseini, MPH[3], Obioha C. Eberendu, BPharm, MSc[4], Robert L. Murphy, M.D.[5], Phyllis J. Kanki, DVM, ScD[3], Prosper Okonkwo, M.D.[2], Kristin M. Darin, Pharm.D.[5]; (1) Department of Pharmacy Practice, University of Nebraska Medical Center, Omaha, NE (2) AIDS Prevention Initiative in Nigeria (APIN), Lagos, Nigeria (3) Department of Immunology and Infectious Diseases, Harvard T. H. Chan School of Public Health, Boston, MA (4) AIDS Prevention Initiative in Nigeria (APIN), Nigeria (5) Division of Infectious Diseases and Center for Global Health, Northwestern University Feinberg School of Medicine, Chicago, IL
PURPOSE: To enhance care for HIV-infected patients, pharmacists need expertise in the pharmacotherapy of HIV and related illnesses. Most pharmacist training programs in Nigeria focus on antiretroviral logistics rather than clinical pharmacy issues. To address this gap, the AIDS Prevention Initiative in Nigeria (APIN) developed and implemented HIV clinical training programs for pharmacists.
METHODS: Two training programs were developed: a *basic* training and an *advanced* training for those who achieved competency at the basic training. Teaching modalities included didactic lectures; question and answer sessions; interactive, case-based discussions; and mock counseling. Participants took a multiple choice test at the beginning (pre-) and end (post-) of training to measure short-term improvement as a result of the training, identify content areas in need of further emphasis, and assess competency (score $\geq$75%). Test scores and number achieving competency were compared using a paired t-test, student's t-test, or chi square, as appropriate.
RESULTS: From 2007 to 2013, APIN organized 8 clinical trainings for 395 pharmacists: 6 basic (n = 318) and 2 advanced (n = 71) trainings. Paired test results were available for 389 (99%) pharmacists; of these, 292 (75%) achieved competency and there was a mean improvement of 29% between pre- and post-test scores (55% versus 84%, $p < 0.01$). Among participants from health facilities, mean test score improvement was greatest among those from tertiary (n = 162) versus secondary or primary (n = 179) facilities (33% versus 24%, $p < 0.01$), and significantly more pharmacists from tertiary facilities achieved post-test competency (92% versus 68%, $p < 0.01$).
CONCLUSIONS: Along with antiretroviral scale-up, there is a parallel need to expand clinical knowledge for all cadres of healthcare providers. This training model improved pharmacists' knowledge of HIV medicine, based on pre- and post-test results. However, enhanced training for pharmacists practicing in non-tertiary facilities and further assessment of the training model's long-term impact on patient care is needed.

Other

272. Merging global health and pharmacy through a PGY2 public health residency *Priscilla Ko, Pharm.D.*; Bristol-Myers Squibb Foundation and Rutgers University, Princeton, NJ
PURPOSE: The opportunities as a pharmacist in the global health setting are incredibly vast. As pharmacy practice differs country to country this provides a challenging, but unique dilemma in assessing the needs of communities and how to resourcefully utilize pharmacy education and skills to address these issues. The poster will provide background about the PGY2 Public Health Residency program as a joint venture between Rutgers and Bristol-Myers Squibb Foundation in creatively merging pharmacy expertise in a global backdrop of sub-Saharan Africa.
METHODS: From July-December 2014 the resident explored areas in Swaziland, Lesotho and the rural Eastern Cape of South Africa as a component of a 6-month global health expedition.
RESULTS: In Swaziland, focuses on quality improvement in an outpatient pharmacy department led to initiatives improving communications between medical providers, patients and pharmacy staff. In Lesotho, areas of academia were bolstered through invitation as a guest lecturer and preceptor at the National University of Lesotho School of Pharmacy, participation in student organization activities, and developing a written report comparing and contrasting the differences in school curriculums. In rural Eastern Cape of South Africa, emphasis was placed on education on medication storage and handling practices for patients and community health workers. Moreover, impacts such as longer and healthier lifespans of HIV+ patients, efforts through prevention of HIV transmission, and incorporation of traditional medicine with Western medical care were observed as consequences of the program.
CONCLUSION: Under the tutelage of Rutgers University and Bristol-Myers Squibb Foundation the PGY2 Public Health

Residency explored pharmacy through a clinical, academic, and philanthropic scope of practice and allowed for a mutual exchange of knowledge and skills between partners and the resident. Continuity of the program also provided glimpses of long-term, sustainable effects in developing countries.

273. Global pharmacy education initiatives in the Ohio State University College of Pharmacy *Hyun-Su Kim, Pharm.D., MA*, Jennifer Rodis, Pharm.D., BCPS, FAPhA, Robert Brueggemeier, Ph.D., Kenneth Hale, Ph.D., RPh; College of Pharmacy, The Ohio State University, Columbus, OH

PURPOSE: As a part of the Global Pharmacy Initiatives of The Ohio State University College of Pharmacy (OSU-COP), multiple educational endeavors aim to expose students to global healthcare concerns, promote international experiences, and strengthen pharmacy education in transitioning countries through coordinated support. One approach to share knowledge and practices with students from different parts of the world via videoconference will be presented.

METHODS: As the world becomes increasingly interconnected, it is important to develop strategies "to enhance the health of global citizens by improving pharmacy education, research, and pharmacy services across the world through collaboration with international institutes." To align with this mission, OSU-COP facilitates an annual video conference with China Medical University (CMU) College of Pharmacy in Taichung, Taiwan since 2010. In December of 2014, two colleges of pharmacy from Taiwan, CMU and Taipei Medical University (TMU), and the OSU-COP experimented a three-way video conference. CMU and OSU College of Pharmacy students prepared 30-minute presentations followed by a question and an answer session. The topic selected in 2014 was 'Misuse and abuse of medications for sleep disorders in the United States (US) and China.'

RESULTS: The exchange of students' interests and expertise between colleges of pharmacy in Taiwan and the US advanced students' knowledge on health challenges each community experiences around the world and strengthened relationships among these global universities.

CONCLUSION: This opportunity provides student collaboration at distance and sets a new platform to share the US pharmacy practice and experiences with global partner institutions via eLearning. The expansion of the virtual conference for teaching courses abroad as well as continuing professional development education on clinical pharmacy among faculty, practitioners, and researchers in Taiwan is in discussion.

274. Implementing a sustainable system to address pharmaceutical supply chain challenges in western Kenya: the revolving fund pharmacy model Imran Manji, BPharm[1], Simon Manyara, BPharm[1], Beatrice Jakait, BPharm, Pharm.D.[1], Eunice Kosgei, Dip Pharm Tech[1], Sonak Pastakia, Pharm.D., MPH[2], Ellen Schellhase, Pharm.D.[3], Monica Miller, Pharm.D.[2]; (1) Department of Pharmacy, Academic Model Providing Access to Healthcare (AMPATH), Eldoret, Kenya (2) Department of Pharmacy Practice, Purdue University College of Pharmacy (3) Department of Pharmacy Practice, Purdue University, West Lafayette

PURPOSE: Access to essential medicines is crucial for any healthcare system. However, this remains a challenge in Sub-Saharan Africa. The Purdue Kenya Partnership, as part of the Academic Model Providing Access to Healthcare (AMPATH), has implemented the revolving fund pharmacy (RFP) model across western Kenya. These RFPs, located within public health facilities, serve as back-up pharmacies that sell medications when government pharmacies are stocked out. Medications are sold at a small mark-up – far less than commercial price – and revenue is used to restock the RFP. RFPs incorporate three major stakeholders: AMPATH, the government health facility and the community. Objective: To describe the successes and financial sustainability of the RFP model.

METHODS: We analysed pharmacy records in each health facility for essential drug availability before and after implementing the RFP model. Once each RFP was started, we tracked the number of prescriptions filled, sales, net income and use of additional income by health facilities.

RESULTS: Between April 2011 and April 2014, 12 RFPs were established. Availability of essential medicines improved from an average of 41% before the start of the RFP to 94% after the RFP was implemented. Across all RFPs, a total of 327,344 prescriptions were filled, sales of US$ 176,353 were attained and a cumulative net income of US$ 33,111 was realized. The extra income was used to fund a number of facility and community improvement projects including servicing of equipment, renovations, purchase of dental, obstetric and laboratory equipment and to enhance clean water supply to local communities.

CONCLUSION: The RFP model demonstrates financial sustainability and is a potential solution for medication stock-outs in resource-limited settings. It has become a critical component of AMPATH's entire healthcare system. This includes chronic disease management, maternal, neonatal and child health, HIV care, community health insurance and group and peer-based care.

275. Medication taking behavior and adherence during a short term medical mission *Sharon E. Connor, Pharm.D.*, Lauren J. Jonkman, Pharm.D., MPH, BCPS; School of Pharmacy, University of Pittsburgh, Pittsburgh, PA

PURPOSE: Access to essential medicines remains a problem worldwide. Short-term medical missions attempt to fill this access gap. Some of the factors that affect medication-taking behavior are customs, access to medication, and health literacy. There is little known about how patients use medications provided by short-term medical missions. Specifically, little is known about patient medication-taking behavior and adherence in rural areas of low- or middle-income countries. The primary goal of this study was to assess adherence as well as other medication taking behaviors in a rural area of Latin America during a short-term medical mission

METHODS: This study was conducted at the San José Medical Clinic, Honduras. The first 125 individuals during each of two mission trips were included. Patients were included if they received at least one medication during their visit. Participants were asked to recall medication instructions immediately after counseling. Within one week, follow-up home visits were conducted; all patients were eligible for follow-up. At follow-up, patients were interviewed using a survey to assess medication direction comprehension, adherence (Morisky Scale and pill counts), literacy skills, and medication sharing behavior.

RESULTS: Of the 250 patients included only 74 patients were available for follow-up. Of these 74 patients, 63.5% percent were female; the average age was 26 years. Patients received an average of 2.12 medications. Slightly more than half (53%) of patients were able to read typed medication instructions. Nine (12.3%) patients admitted to sharing their medications with others. When compliance was assessed by pill counts, 73% of patients had the appropriate number of tablets remaining.

CONCLUSION: Patients in this study used medications as prescribed a majority of the time. Patients had a high rate of medication adherence and a low rate of sharing medication. Literacy rates indicate that providers should recognize the need for appropriate medication counseling.

International Clinical Pharmacy Practice Ambulatory Care

276. A retrospective review of a pharmacist-managed smoking cessation program in a Singapore Hospital *Phaik Yuan Poh, Master of Pharmacy (Honours)*, Celine Chang Chyi Ng, BSc Pharmacy (Honours); Department of Pharmacy, Changi General Hospital, Singapore, Singapore

PURPOSE: To determine (1) the effectiveness of a pharmacist-managed smoking cessation clinic (SCC), and (2) the association between abstinence rates and different treatment modalities, in Changi General Hospital.
METHODS: All patients referred to the SCC from December 2008 to December 2012 were retrospectively reviewed. These patients received individualised quit plans that involved structured smoking cessation counselling. The majority of patients also received additional cessation aid in the form of mono- or combination therapy comprising nicotine replacement therapy (NRT), varenicline, or bupropion. The primary study end points were point-prevalence abstinence rates (1) for all subjects, and (2) associated with various treatment modalities, immediately following completion of SCC review, and at 6- and 12-month follow-up.
RESULTS: The point-prevalence abstinence rates for 445 evaluated patients at completion of SCC review, and 6- and 12-month follow-up were 19.8%, 23.8% ($p = 0.033$), and 25.4% ($p = 0.009$), respectively. The difference in abstinence rates at 6- and 12-month follow-up was not statistically significant. A significant association between abstinence rates and the use of pharmacotherapy was detected at 6-months' follow-up ($p = 0.005$) but not at SCC review completion ($p = 0.101$) or at 12-months' follow-up ($p = 0.054$). The number of subjects in our study was too small to assess the effectiveness of individual treatment modalities. Nevertheless, abstinence rates were highest at 6- and 12-month with use of varenicline (37.4% and 34.3%, respectively) followed by combination NRT (21.7% and 26.1%). Furthermore, patients who had received only structured smoking cessation counselling had abstinence rates of 20.7% and 26.0% at 6- and 12-month follow-up.
CONCLUSION: Patient participation in a pharmacist-managed SCC programme was associated with progressive and significantly improved abstinence rates at 6- and 12-months following programme completion. The use of pharmacotherapy was significantly associated with overall abstinence rates at 6-months' follow-up. Varenicline appeared to be the most successful pharmacotherapeutic agent for smoking cessation.

277. Effectiveness of independent pharmacist prescribers in glycaemic control of type 2 diabetes *Mohammed Abutaleb, Ph.D.*[1], Douglas Steinke, Ph.D.[2], Steve Williams, MRPharmS[3], Naveed Younis, M.D.[3], Mary P. Tully, Ph.D.[2]; (1) Pharmaceutical Care, Jazan Health Affairs, Sabya, Saudi Arabia (2) Pharmacy Practice, Manchester Pharmacy School, Manchester, United Kingdom (3) Wythenshawe Hospital, South Manchester University Hospital, Manchester, United Kingdom
PURPOSE: The aim was to assess the glycaemic control effectiveness of a pharmacist with independent prescribing authority who run outpatient diabetes clinics in a secondary care teaching hospital in Manchester, UK.
METHODS: Ethical approval was granted to use data from electronic medical records for outpatient diabetes clinics. A retrospective secondary data analysis for patients seen by the pharmacist in place of a doctor in some visits between January 2006 and January 2013 were categorised as the study group; those who had never seen the pharmacist were considered as control. The average change in patients' HbA1c were calculated. Five statistical models were applied to explore the relationship between study group and change in HbA1c, using propensity score adjustment and matching.
RESULTS: Of 1,305 (59.0%) who were eligible, 330 (25.3%) were allocated to the study group and 975 (74.7%) to the control group. The pharmacist tended to see patients with more complex diabetes, as most of the predictor variables were significantly higher in the study group. The average yearly change of HbA1c in the study group was slightly lower but statistically non-significant than in the control (see Table 1) suggesting comparable impact of the pharmacist outcomes. Non- inferiority testing suggests pharmacist's outcomes were non-inferior. Table 1: Results of unadjusted and adjusted analyses comparing average yearly change in HbA1c in the study and control group

	Model 1 - Unadjusted	Model 4 – Propensity score + independent predictors adjusted	Model 5 – Matched on propensity scores
Beta	−0.014	−0.011	−0.011
Se	0.028	0.026	0.033
p-value	0.6	0.6	0.7

CONCLUSION: Independent pharmacist prescriber delivered equivalent level of glycaemic control as provided by doctors. Adjusting for propensity scores using two different methods in addition to sensitivity analysis give more confidence that the results are generalisable and as unbiased as possible.

Cardiovascular

278. Clinical pharmacy services at a referral center for cardiovascular diseases in Iran *Azita H. Talasaz, Pharm.D., BCPS*, Mehrnoush Dianatkhah, Pharm.D.; Department of Clinical Pharmacy, Tehran Heart Center, Tehran University of Medical Sciences
Like other university hospitals, in Tehran Heart Center affiliated to Tehran University of Medical Sciences, clinical pharmacist is an expert in the therapeutic use of medications within the system of health care. Clinical pharmacy services was initiated from three years ago in this main referral hospital for cardiovascular diseases. As a board certified pharmacotherapy specialist, she routinely provides medication therapy evaluations and recommendations to patients and other health care professionals both in verbal and written consultations. Same as other clinical pharmacists, she acts as a primary source of scientifically valid information and advice regarding the safe, appropriate, and cost-effective use of medications. Her activities can be divided in five parts. First, the clinical pharmacist is present at the daily rounds of patients' visits with cardiologists and give recommendations on the choice of medications, the best dose based on patients' comorbidities. Second, with regards to antibiotic stewardship program, administration of parenteral broad spectrum antimicrobials should be confirmed by a clinical pharmacist, in order to restrict the antimicrobial resistance. Third, as a director of pharmacy and therapeutics committee of the hospital, the rational use of medications is ensured by the supervision of the clinical pharmacist by preparing and implementing specific protocols. Forth, when more than ten medications have been prescribed for a patient, the clinical pharmacist has to evaluate patients' therapeutic regimens based on efficacy, safety, adverse effects or drug interactions. Furthermore, each prescribed medication of patients with renal insufficiency, should be reevaluated by the clinical pharmacist for any essential changes with respect to dosage or the drug of choice. Fifth, in the outpatient setting, treatment will be performed by the interaction between the cardiologist and clinical pharmacist. Participation of a clinical pharmacist in the outpatient clinics including heart failure and hypertension, reduced inappropriate prescribing and adverse drug effects significantly.

Clinical Administration

279. The use of a strategic plan for the clinical pharmacy section in a tertiary care center purpose Rayf Abulezz, IV, B.S, Pharm.D, BCPS[1], Mansoor Khan, IV, BS, MS, BCOP[2], Hani Alhamdan, IV, BS, MS[2]; (1) Pharmacy Department, Prince Mohamed bin Abdulaziz Hospital-NGHA, Madinah, Saudi Arabia (2) King Abdulaziz Medical City-Jeddah-NGHA
PURPOSE: To develop and implement a strategic plan with higher standards for the clinical pharmacy section (CPS), which

would positively reflect on patient care while maximizing future successes.
METHODS: In 2011, a strategic plan was adopted from the 2007 American College of Clinical Pharmacy's strategic plan with modifications. The mission of the CPS is to advance human health and the quality of life by extending the frontiers of clinical pharmacy. Its vision is the CPS to drive positive changes in quality patient care by advancing pharmacotherapy to achieve optimal medication therapy. The plan outcomes include the establishment of clinical pharmacy services as an essential component of patient care in all practice settings, advancement in clinical pharmacy and pharmacotherapy through engagement in research, advancement in clinical pharmacy through training and education, development of successful models of practice, and dissemination of up-to-date knowledge to advance pharmacotherapy and patient care, maximize the efforts to achieve advocacy from other departments and higher administration, and work with the pharmaceutical care administration to maximize patient care and improve pharmacy as a profession. These outcomes were subcategorized into several strategies, which were also subcategorized into measurable objectives. The timeline for the achievement these outcomes was five years.
RESULTS: Within two years of developing the strategic plan, we were able to achieve 65%, 100%, 78%, 100%, 90%, and 71% of the objectives for the first, second, third, fourth, fifth, and sixth outcome, respectively. We were able to exceed the achievement of 41% of the objectives. We were not able to achieve 15% of the objectives, and only 15% of the objectives were partially achieved.
CONCLUSION: The CPS was successful in achieving most of the objectives of the strategic plan. Adopting a strategic plan with higher standards has led to significant improvements in the clinical pharmacy services.

Community Pharmacy Practice

280. Development of community pharmacy-based clinical research in Japan *Tomoko Miyazaki, Master of Clinical Pharmacy*[1], Ryoichi Fujiwara, Ph.D.[1], Jay D. Currie, Pharm.D., R.Ph.[2], Bernard Sorofman, Ph.D.[2], Tomoo Itoh, Ph.D.[1], Yuji Yoshiyama, Ph.D.[1]; (1) Kitasato University School of Pharmacy, Tokyo, Japan (2) The University of Iowa College of Pharmacy, Iowacity, IA
PURPOSE: In Japan, the duration of pharmacy education was recently lengthened from 4 to 6 years. The education of pharmacists with the advanced clinical knowledge and skills is fully implemented. However, many community pharmacists don't know how to plan and evaluate clinical research.An international academic exchange agreement between Kitasato University and the University of Iowa was initiated in 2010. In 2014, faculty from Kitasato University visited the University of Iowa College of Pharmacy to learn clinical-based research methodology that is applicable in community pharmacy practice in Japan.
METHODS: Two Kitasato faculty visited Iowa for 2 weeks. Meetings were held with almost 30 faculty, researchers, fellows and residents. Community pharmacies and the University of Iowa Hospitals and Clinics were visited to understand the healthcare system, patient care process and patient care research in United States.
RESULTS: A significant difference between Japan and the US involves the individuals who contribute to clinical-based research in community pharmacy. In Japan, there is little engagement of academia in community pharmacy and there are few community residency programs. In contrast, research is conducted routinely in community practice and a community residency program is well established at the University of Iowa. Community residents complete a comprehensive project and present it regionally and nationally within the PGY1 Residency Program. It is acknowledged that such programs are useful to develop residents as both 'clinical pharmacists' and 'researchers'. Projects completed by residents often focus on the ability to modify lifestyle factors in diseases like diabetes, hypertension or hyperlipidemia. Collaboration with university researchers on such projects allows for increased rigor of the science and serves to support the resident from project conception to completion to result in dissemination.
CONCLUSION: As pharmacy research in Japan becomes more patient-oriented and clinically-based, new research models in community pharmacy practice will need to be established and implemented.

Critical Care

281. Pharmacists' involvement in the development of a cardiac critical care unit in a resource-constrained setting Susie Crowe, Pharm.D., BCPS[1], Stephanie Lukas, Pharm.D., MPH[2], Benson Njuguna, BPharm[3], Gilbert Koech, BPharm[4], Imran Manji, BPharm[3], John Lawrence, M.D.[5], Peter Park, MBA[6]; (1) Department of Pharmacy Practice, Purdue University College of Pharmacy, West Lafayette (2) Human Resources for Health, Yale University, Kigali, Rwanda (3) Department of Pharmacy, Academic Model Providing Access to Healthcare (AMPATH), Eldoret, Kenya (4) Department of Pharmacy, Moi Teaching and Referral Hospital, Eldoret, Kenya (5) The Hubert-Yeargan Center for Global Health, Duke University Medical Center, Durham, NC (6) Finance, Academic Model Providing Access to Healthcare (AMPATH), Eldoret, Kenya
PURPOSE: To provide pharmacist assistance in the creation of the cardiac critical care unit (CCU) at Moi Teaching and Referral Hospital (MTRH) in Eldoret, Kenya
METHODS: Cardiovascular disease is a leading cause of death in Kenya. Rheumatic heart disease affects >200,000 patients each year, and often affects younger patients. The CCU, the only one outside Nairobi, opened at MTRH in February 2013 as a collaboration between Duke University and MTRH to address this challenging population. The CCU serves a catchment area of >16 million people, and treats both pediatric and adult patients. CCU patients receive continuous infusion (CI) medications with intravenous (IV) pumps and continuous monitoring of vitals. Challenges include difficulty maintaining adequate medication supplies in this setting where it takes weeks to procure medications, lack of reliable electricity, and limited equipment availability.
RESULTS: A revolving fund pharmacy provides a backup supply of medication during shortages and has supplied >60 different CCU medications. Pharmacists authored 18 adult and 5 pediatric CI protocols to assure patient safety in this setting that uses IV syringe pumps, limited use of central lines, and where nurses mix all IV medications. A pharmacist co-authored an admission order set that addresses treatment of acute coronary syndrome, decompensated heart failure, and vasopressors/inotropes. The pharmacy team authored and implemented a sliding scale insulin protocol, which was the first at MTRH. Pharmacists round twice daily in the CCU with a multidisciplinary team including physicians and nursing. The pharmacist, one of the few constants on the rounding team, is actively involved in overall CCU management. Since opening, 6 pharmacy residents (both Kenyan and American) and 6 Kenyan pharmacy interns have trained in the CCU.
CONCLUSION: The CCU opened as a four-bed unit and has expanded to ten-beds. Pharmacists are an integral part of the CCU team, focusing on sustainable medication procurement and safety.

Education/Training

282. Patient Counseling Activities of University of San Carlos Pharmacy students in preparation for clinical practice *Elizabeth Tan, MS Pharmacy*; Department of Pharmacy, School of Health Care Professions, University of San Carlos, Cebu City, Philippines
PURPOSE: The purpose is to document patient counseling activities done in and out of classroom to provide simulation and actual experience for Pharmacy students. They were designed to

match expected ideal practice that can take place in hospital or community settings.
METHODS: Counseling was done as return demonstrations by pairing and drawing lots to be assigned as either patient or pharmacist. Patient picks a role like antagonistic patient, mute patient, etc. and the partner is not aware of it. Teacher observes counseling session with a checklist and rating sheet. Students switch roles. Second, students are asked to pick a drug which they have to prepare for counseling a patient, who is a Pharmacy teacher. Students and patients are not revealed. Roles are also portrayed. In this session, the patient has a checklist and rating sheet to evaluate the student. Third activity requires students to work in pairs and visit offices of the University to find an appropriate patient. He must have at least 3 drugs being maintained at that time. Students get medication list and schedules another visit for counseling service and drug information distribution (leaflets). Patient uses a checklist and rating sheet for to evaluate them. This is placed in a sealed envelope to be given to the teacher.
RESULTS: Students find the return demonstration crucial in preparing for counseling. Simulation helps build confidence for when facing teachers as patients, it is more challenging. Meeting real patients through office visits helped improve counseling methods. Most patients were grateful as most have never received counseling services from their pharmacists in real life.
CONCLUSION: Studentsâ€™ counseling skills improved over the three opportunities. Most indicated they feel this is a service they want to provide at work. They felt that they were prepared to provide counseling in community and hospital settings.

283. Development of a surgery pharmacists community of practice in Alberta: Combining technology with tacit knowledge *Mary Gunther, BScPharm, ACPR*, Stacey Ginther, BScPharm, Pharm.D., Alice Chan, BScPharm, ACPR, Pharm.D., Richard Parrish, II, BSPharm, Ph.D., FCCP; Provincial Pharmacy Services, Alberta Health Services, Edmonton, AB, Canada
PURPOSE: Pharmacists can make valuable contributions to the care of surgical patients. The presence of a less structured practice environment and differences in resource allocation can lead to barriers to surgical clinical pharmacy practice. Engagement surveys and performance evaluations identified great diversity in clinical practices among pharmacists supporting surgical patient care. Pharmacists expressed feeling isolated and wanting greater practice support. In addition, surgical practices experience a high staff turnover of pharmacists. As a result, clinical pharmacy leadership developed a structured and supported network of surgery pharmacists to provide opportunities for knowledge and experiential sharing. This project describes the development of a Surgery Pharmacists Community of Practice across four large urban hospitals in Edmonton, Alberta.
METHODS: Clinical pharmacists working in surgical practices across Edmonton were contacted by email to gauge interest in participation. Interested pharmacists were provided with access and training for Microsoft Lync, a secure technology platform allowing real time communication and sharing of electronic materials. Pharmacists were invited to participate in one hour online discussions, and pharmacy clinical leadership attended as facilitators.
RESULTS: The first one-hour, bi-monthly session was held in January 2014. Self-identified topics of discussion have included new perioperative care resources, updated guidelines, and common practice challenges. The group's membership expanded to include pharmacists from across the province. A shared internal website has since been created for the collection and accessing of resources. Meetings have been well-attended, and direct informal feedback generally has been positive. Ongoing plans include supporting active participation to evolve into peer-led sessions and continuing to establish networking opportunities among the group's members.
CONCLUSION: Communities of Practice using virtual meeting platforms can be a useful tool to support pharmacist engagement, networking and practice development, especially where many barriers to clinical pharmacy practice exist.

284. Student exchange program between Keio University and US universities for international clinical practice *Hisakazu Ohtani, Ph.D.*, Patrick Foster, M.D., Motoko Kanke, Ph.D., Tomonori Nakamura, Ph.D., Yoshihiro Abe, Ph.D., Mayumi Mochizuki, Ph.D.; Keio University Faculty of Pharmacy, Tokyo, Japan
PURPOSE: The purpose is to present the international student exchange program for pharmacy practice at Keio University.
METHODS: Keio University Faculty of Pharmacy offers an elective program for overseas clinical rotations in the USA and Thailand for 4 to 5 weeks, in addition to the mandatory domestic clinical pharmacy practice in hospital and community pharmacies. The program is based on agreements (MOUs) for student exchanges with four U.S. universities (i.e., The University of Iowa, The University of North Carolina at Chapel Hill, Texas Tech University, University of Washington) and Khon Kaen University in Thailand. We also accept U.S. and Thai students for international clinical practice in Japan.
RESULTS: In 2014, we sent eight students to the USA and four students to Thailand. Applicants are required to submit their application during their fourth year (*N.B.,* pharmacy education in Japan consists of six years after high school). Student selections are made from written applications, followed by an interview. Students are required to complete didactic classes in pharmacotherapy in English (2.5 hours per day for four weeks), most of which are given by foreign lecturers, before the overseas rotation during their sixth year. We accepted eight and six incoming students from the U.S. in 2013 and 2014, respectively. They stayed in Japan for four to six weeks for elective APPE rotations. The program consists of multiple site visits, clerkships in medical facilities, research lab work at Keio University, and presentations, all available in English.
CONCLUSION: Outbound post-rotation Japanese student feedback assessment found that although participants are quite satisfied and encouraged with the program, they felt that their clinical knowledge and skills were insufficient. In the summer of 2015, we are planning to ask incoming U.S. students to fill out a questionnaire, which will also be shown in the presentation.

285. International Clinical Pharmacy Scholars Program (ICPSP) *Charles Sands, III, BSPharm, Pharm.D.*[1], Robert Henderson, BSPharm, Pharm.D., FCCP, FASHP, BCPS[1], Michael Hogue, Pharm.D., FAPhA, FNAP[1], Roger Lander, BSPharm, Pharm.D., FCCP, FASHP, BCACP[1], Paula Thompson, Pharm.D., MS, BCPS[1], Dan Gillis, Pharm.D.[2]; (1) Pharmacy Practice Department, McWhorter School of Pharmacy, Samford University, Birmingham, AL (2) Department of Pharmaceutical Services, Princeton Baptist Medical Center, Birmingham, AL
PURPOSE: Samford University's McWhorter School of Pharmacy (MSOP) began formal relationships with the Baptist Hospital, Pusan, Korea, 1985; Yanbian University College of Pharmacy, Yanji, China, 1991; Sookmyung University College of Pharmacy in Seoul, Korea, 1995; Peking Union Medical College Hospital, Beijing, China, 1999; University of Zambia College of Pharmacy, Lusaka, Zambia, 2008; Beijing University of Chinese Medicine, 2014. Out of these relationships MSOP developed an International Clinical Pharmacy Scholars Program (ICPSP).
METHODS: The program consists of international clinical pharmacy scholars training at MSOP (3–12 months) and visits of MSOP faculty to the scholar's international sites (1–2 weeks) to hold seminars and onsite clinical training.
RESULTS: The first international clinical pharmacy scholar was from China and visited MSOP in 1999 with an MSOP faculty member subsequently visiting China and providing follow-up training in the scholar's hospital. Eighteen international scholars have attended training programs at MSOP and 15 MSOP faculty have made international follow-up trips. Many countries around the world have developed national health policies mandating

clinical pharmacy services. The MSOP ICPSP was established to facilitate compliance with these mandates and provide opportunities for clinical pharmacy education and training in modern clinical pharmacy services that ensure optimal medication therapy outcomes for patients. International scholars have come from the following institutions: Peking Union Medical College Hospital, Beijing, China; Baptist Hospital, Pusan, Korea; Yanbian University College of Pharmacy, Yanji, China; China Pharmaceutical University, Nanjing, China; Shanghai Tongren University Hospital, Shanghai, China; Chongqing University Hospital, Chongqing, China; University Hospital, Kuala Lumpur, Malaysia; University of Zambia College of Pharmacy, Lusaka, Zambia; University of Gadjah Mada, Yogyakarta, Indonesia, and Okayama University Hospital, Okayama, Japan.
CONCLUSION: The development at MSOP of the International Clinical Pharmacy Scholars Program has enabled international pharmacists to position themselves to optimize patient care in their facilities in their respective countries.

286. Expanding clinical pharmacy education and service at a large Chinese Hospital Robert Henderson, BSPharm, Pharm.D., FCCP, FASHP, BCPS[1], Michael Hogue, Pharm.D., FAPhA, FNAP[1], *Roger Lander, BSPharm, Pharm.D., FCCP, FASHP, BCACP*[1], Dan Mei, BSPharm[2], Paula Thompson, Pharm.D., MS, BCPS[1], Dan Gillis, Pharm.D.[3], Charles Sands, III, BSPharm, Pharm.D.[1]; (1) Pharmacy Practice Department, McWhorter School of Pharmacy, Samford University, Birmingham, AL (2) Department of Pharmaceutical Services, Peking Union Medical College Hospital, Beijing, China (3) Department of Pharmaceutical Services, Princeton Baptist Medical Center, Birmingham, AL
PURPOSE: The Peking Union Medical College Hospital (PUMCH) in Beijing, China, founded in 1921 by the US Rockefeller Foundation, is the leading hospital in China. It is affiliated with the Peking Union Medical College and the Chinese Academy of Medical Science. Samford University's McWhorter School of Pharmacy (MSOP) began formal collaboration with PUMCH pharmacy officials in 1999 to establish a clinical pharmacy program for the hospital.
METHODS: The program consists of a combination of PUMCH pharmacist training at MSOP (3–6 months) and visits of MSOP faculty to PUMCH (1–2 weeks) to hold seminars and onsite clinical training. In 2009 MSOP senior pharmacy students began participating in an international APPE at PUMCH.
RESULTS: The first PUMCH pharmacist visited Samford in 1999, and a total of 10 PUMCH pharmacists have trained at Samford University. These pharmacists have returned to PUMCH to establish new clinical services that include: clinical pharmacokinetics, antibiotic stewardship, dosing in renal failure, hypertension, diabetes and chronic kidney disease management, geriatrics, nutrition support, anticoagulation, and pharmacy management. The Chinese Government has mandated clinical pharmacy services. To comply with these mandates and to provide modern clinical pharmacy services that ensure optimal medication therapy outcomes for Chinese patients, PUMCH and Samford agreed to work together to develop a clinical pharmacy training/exchange program. This program is a model for other hospitals in China. Documentation: Ten PUMCH pharmacists have participated in the program at Samford. Seven MSOP faculty have made 20 trips to Beijing, and 16 MSOP students have completed an international APPE at PUMCH. The 10 PUMCH pharmacists have established numerous new clinical programs within their hospital in Beijing.
CONCLUSION: The development of a clinical pharmacy practice training program has enabled PUMCH pharmacists to position themselves to optimize patient care.

287. An international collaboration to support development of clinical pharmacy practice in Tianjin Medical University Cancer Institute & Hospital *Caroline Zeind, Pharm.D.*[1], Yi Gao-Roberts, Pharm.D.[2], Chao Zhang, MS[3], Zheng Chen, MS[3], Chen Wang, BS[4]; (1) Center for International Studies, MCPHS University, Boston, MA (2) Pharmacy Department, UMass Memorial Medical Center, Worcester, MA (3) Pharmacy Department, Tianjin Medical University Cancer Institute & Hospital, China (4) Pharmacy Department Director, Tianjin Medical University Cancer Institute & Hospital, China
PURPOSE: Historically, pharmacy education and practice in China has focused on pharmaceutical sciences. In the 1980s, clinical pharmacy education was first established, and clinical pharmacy practice initiatives in China have only developed recently. The clinical pharmacy of Tianjin Medical University Cancer Institute & Hospital (TMUCIH) was first established in 1988 and has expanded steadily over the last 25 years. Currently, the clinical pharmacist team is comprised of 11 members and provides comprehensive pharmaceutical services including Lung Cancer, Breast Cancer, Gastrointestinal Oncology, Intensive Care, and Bone and Soft Tissue Tumor Departments. Recently, TMUCIH Pharmacy Department established an international collaboration with MCPHS University Center for International Studies to support the on-going development of clinical pharmacy practice services.
METHODS: The initial goals of the collaboration are to provide opportunities for clinical pharmacists from TMUCIH to visit MCPHS University and to gain clinical pharmacy practice experiences in the hospital and academic pharmacy settings as part of a structured program.
RESULTS: During the 2015 spring semester, two Oncology clinical pharmacists from TMUCIH are completing an eight-week certificate program at MCPHS University. The program has been designed to meet the professional development goals of the clinical pharmacists and supports the clinical practice goals of the TMUCIH Pharmacy Department. As part of the MCPHS University program, the clinical pharmacists attend oncology seminars and are gaining relevant pharmacy practice experience at hospital partner sites under the guidance from clinical pharmacy faculty.
CONCLUSION: These types of international collaborations are beneficial to both institutions as a means of sharing global clinical pharmacy practices. Through this collaboration, the TMUCIH pharmacists are gaining valuable experience from hospital administrators, pharmacists, and clinical pharmacy faculty on specific projects relevant to their work. The clinical pharmacists from TMUCIH will be able to build on their experiences and to apply to their practice upon their return.

Geriatrics

288. Pharmacist-led medication review for elderly with fall-related admissions in Hong Kong Kenneth Cheung, BPharmHons, MSc Clinical Pharmacy, International Practice and Policy, BCPS[1], Chun Chung Chan, BPharm[1], Ting Kwan Yim, MBChB[2]; (1) Department of Pharmacy, United Christian Hospital, Hong Kong (2) Department of Medicine and Geriatrics, United Christian Hospital, Hong Kong
PURPOSE: Certain medications, e.g. psychoactive drugs, and polypharmacy have been shown to increase fall risk in the elderly. This paper aims at describing the development, delivery, and preliminary outcomes of pharmacist-led medication review as part of a multidisciplinary fall assessment and prevention program for elderly in an acute hospital in Hong Kong.
METHODS: Two clinical pharmacists have become members of a multidisciplinary fall assessment team since October 2014. A list of fall-risk increasing drugs (FRID) was compiled based on literature review. A pharmacist fall assessment form was then developed to address four medication-related fall risks, namely, (1) use of FRID, (2) anticholinergic burden, (3) polypharmacy and (4) medication nonadherence. A senior geriatrician referred elderly patients admitted for falls with or without hip fracture to clinical pharmacists for medication review. Clinical pharmacists then provided bedside patient interview for medication reconciliation, assessment of patients' medication-related fall risks, and identification of adverse drug reactions and other drug-related problems. When appropriate, clinical pharmacists provided recommendations on optimizing patients' drug regimen directly to physicians.

RESULTS: Between October and December 2014, clinical pharmacists interviewed 133 patients and made 36 interventions that were all accepted by physicians. Nature of these interventions and their relative frequencies were summarized as below:

Type of intervention	Number (%)
Switching a FRID to therapeutic alternative	10 (28%)
Review FRID use with dosage change or discontinuation	5 (14%)
Review of antidiabetic drug regimen in view of hypoglycemia	5 (14%)
Adding calcium & vitamin D supplementation post-fracture	6 (17%)
Medication reconciliation	5 (14%)
Managing drug interactions	2 (6%)
Choice of proper drug formulation for swallowing difficulties	2 (6%)
Identification of and education against medication nonadherence	1 (3%)

CONCLUSION: Pharmacists can play an important role in minimizing medication-related fall risks and managing various drug-related problems through comprehensive medication review for geriatric patients admitted for falls.

Health Services Research

289. Clinical Pharmacists' Journey as collaborators and leaders through "CHAMP-Path" study *Sherin Ismail, Bsc, Pharm.D., BCPS*[1], Mohamed Osman, Bsc, Pharm.D., BCPS[1], Rayf Abulezz, B.S., Pharm.D., BCPS[2], Hani ALHamdan, BSc. Pharm., M.Sc.[1], K.H Mujtaba Quadri, M.D., Diplomate American Board of Internal Medicine and Nephrology[3]; (1) Pharmaceutical Care Department, National Guard Health Affairs, Jeddah, Saudi Arabia (2) Pharmaceutical Care Department, National Guard Health Affairs, Madinah, Saudi Arabia (3) Shifa College of Medicine and Shifa International Hospital, Shifa College of Medicine and Shifa International Hospital, Islambad, Pakistan
PURPOSE: Clinical pathways (CPs) provide a comprehensive timeline map for patient care plans aiming to improve patient-centered outcomes. We aim to present the journey of clinical pharmacists in the development and implementation of CPs in a tertiary care, Joint Commission International accredited hospital in Jeddah, Saudi Arabia.
METHODS: Clinical pharmacists participated in the development of CPs as core and leading members of CPs task force through literature review, critical appraisal and discussion with other health care professionals through over fifty meetings. The aim was to integrate evidence, clinical expertise and align with formulary restrictions and guidelines to provide cost-effective order sets for various medical conditions identified as the leading causes of admissions in medical wards. Additionally, several tools and services were adapted to guide prescribing and standardization of care through a time bound Computerized Prescriber Order Entry (CPOE).
RESULTS: Fifteen clinical pathways were developed and integrated into CPOE following the Institute of Safe Medication Practice standards for order sets. Pharmacy department initiated a pilot of medication reconciliation within 24 hours of admission and counseling prior to discharge in a consistent manner. Tools implemented include: reporting of creatinine clearance to guide prescribing, integrated advisory flags for maximum infusion rates and dosing. Clinical pharmacists are following patients in daily rounds to assess the implementation of CPs. Furthermore, a continuous process of orientation and education are provided for pharmacy staff and medical teams regarding the implementation of CPs. Moreover, Five clinical pathways are currently included in Collaborative Health care professionals Approach for Monitoring patient-centered outcomes through Pathways (CHAMP-Path), which are pragmatic RCTs in comparison with usual care, with grants awarded by King Abdullah International Medical Research Center in 2012 to-date.
CONCLUSION: Clinical Pharmacists are crucial members of multidisciplinary team and play a proactive role to improve patient-centered outcomes through clinical pathways.

Hematology/Anticoagulation

291. Establishment and evaluation of anticoagulation clinic incorporating clinical pharmacist in Egypt *Eman Elnawasany, BSc.Pharm*[1], Mahmoud Diaa, Pharm.D.[2]; (1) Clinical Pharmacy Department, Mahalla Cardiac Center, Elmahalla Elkobra, Egypt (2) Hospital Pharmacy Administration, Central Administration of Pharmaceutical Affairs, Nasr city, Egypt
PURPOSE: Pharmacist managed anticoagulation services are well established in U.S and European nations. In Egypt, this practice hasn't been established. This study was conducted to 1)document the implementation of the first Anticoagulation clinic(AC) new model in Egypt incorporating clinical pharmacist, evaluate it and compare it with the old model as a step towards Clinical pharmacist managed (AC).
METHODS: The new (AC) Model devised by clinical pharmacist at National Heart Institute outpatient clinic comprised many components including: 1) Computerized patient files 2)Patient interviewing schemes 3)Warfarin protocol 4)Physician referral notes and assist tools and 6)Patient assist tools. It utilized both ordinary visits and phone call systems for follow up. Patients receiving anticoagulation and having six previous INR readings were included. Pregnant patients were excluded. The two models were compared for 1) Primary outcomes including percentage of patients' INR within the recommended therapeutic range (TTR) and within $\pm$ 0.3 units of the recommended therapeutic range (Expanded TTR), 2) Secondary outcomes including incidence of thromboembolic (TE) and bleeding events, patient knowledge and satisfaction.
RESULTS: The new (AC) clinic enrolled 81 patients. TTR was 45% for the new (AC) model versus 27% for the old model ($p = 0.0001$). Expanded TTR was 61% for the new (AC) model versus 43% for the old model ($p = 0.0001$).Incidence of major TE and bleeding events was decreased with no significant difference ($p = 0.25$, $p = 0.678$). Minor bleeding events were significantly reduced ($p = 0.0001$). Median patient total knowledge score was 6 for the new (AC) model versus zero for the old model ($p = 0.0001$). Patients showed high mean satisfaction response.
CONCLUSION: The new AC model incorporating clinical pharmacist was more effective in achieving target anticoagulation control, reducing TE and bleeding events and improving patient knowledge.

292. Low molecular weight heparins treatment monitoring: Is current clinical practice adequate? Konstantinos Ioannidis, Pharm.D., MSc, Ph.D., *Apostolos Papachristos, Pharm.D., MSc*, Ioannis Skarlatinis, Pharm.D.; Pharmacy, Hygeia Hospital Athens, Athens, Greece
PURPOSE: In special patients groups (elderly, obese, pregnant) is recommended that anti-Xa activity measurment is performed in order to ensure efficacy and to avoid adverse events during treatment with Low Molecular Weight Heparins (LMWH). The therapeutic range, 4 hours after subcutaneous administration, is 0.6–1.0 and 0.85 units/ml for enoxaparin and tinzaparin respectively. In general population no monitoring is recommended. Our goal was to evaluate the percentage of the therapeutic anti-Xa activity measurements in patients who receive appropriate therapeutic dose according to Summary of Product Characteristics (SPC).
METHODS: From 1 January 2013 until 31 March 2014 all patients receiving LMWH were monitored for anti-Xa activity.
RESULTS: In total 233 patients received LMWH (enoxaparin and tinzaparin) for treatment, 118 (51%) received dose according to SPCs and 115 (49%) received decreased doses due to bleeding, low platelet count or any surgical procedure and they were excluded. Of the 118 patients 54 (46%) had low, 52 (44%) normal and 12

(10%) high anti-Xa activity. In low and high anti-Xa activity doses were increased or decreased to the next level respectively. After dosage adjustment a new measurement took place. More specific 18 (33%) patients had extremely low anti-Xa activity, so antithrombin III (AT-III) activity was measured and deficiency was detected in all of them, so treatment changed to direct thrombin or factor-Xa inhibitor. One month later a second measurement was feasible in 5 patients and revealed recover of AT-III.
CONCLUSION: A large number of patients do not achieve therapeutic anti-Xa levels and a significant percentage had AT-III deficiency. In addition, the fact that the repeated AT-III measurement was normal indicates that as has already been published AT-III acquired deficiency can occur in hospitalized patients due to stress conditions. As a result, LMWH treatment monitoring in hospitalized could ensure safety and that adequate anticoagulation effect is achieved.

HIV/AIDS

294. Addressing gaps in HIV care through a pharmacist-managed HIV-peer educator program in western Kenya Rakhi Karwa, Pharm.D.[1], Susie Crowe, Pharm.D.[2], Mercy Maina, BPharm[3], Sonak Pastakia, Pharm.D., MPH[4]; (1) Department of Pharmacy Practice, Purdue University College of Pharmacy, West Lafayette, IN (2) Purdue University College of Pharmacy, West Lafayette, IN (3) IIGH, AMPATH, Eldoret, Kenya (4) Academic Model Providing Access to Healthcare (AMPATH), Eldoret, Kenya
PURPOSE: To describe the implementation of a pharmacist-managed HIV-peer educator program on an inpatient medical service in a rural, resource-constrained setting of Kenya.
METHODS: AMPATH, the Academic Model Providing Access to Healthcare, has provided HIV care to >150,000 patients in Western Kenya since 2001. Because current estimates state 1.6 million people have HIV in Kenya, the need for cost-effective solutions is urgent. Task shifting from medical personnel to peer educators (PE) may assist in expanding access to antiretroviral (ARV) therapy. Peer-based care (PBC) has been shown to decrease psychosocial barriers to care, improve ARV adherence, decrease treatment failure, and decrease loss to follow-up. In collaboration with AMPATH, Moi Teaching and Referral Hospital and Moi University, the Purdue Kenya Partnership implemented an HIV-peer educator program to provide formal counseling and linkage to care for HIV-infected patients admitted to the inpatient medical service.
RESULTS: In May 2014, the HIV-peer educator program was established with the hiring of 4 educators who received training on HIV testing and counseling, adherence techniques and side effect monitoring. Each day HIV-peer educators conduct pre/post HIV test counseling, disease and medication counseling, and ARV medication refills for patients. PEs communicate adherence issues, side effects, and social issues with the patientÕs medical team. Pharmacists, who manage the program, act as a resource for trouble-shooting and ensure proper referrals are made. PEs contact patients after discharge to ensure linkage to the appropriate clinic, reinforce adherence, and act as an accessible resource for patient questions. Since initiation, HIV-peer educators have provided services to >1000 patients in the inpatient setting and follow-up with >300 patients in post-discharge care.
CONCLUSION: By documenting the retention of patients in HIV care at AMPATH, we will be able to justify the creation and growth of the HIV-peer educator program.

295. Increasing the use of isoniazid prophylactic therapy for TB prevention among PLHIV in HIV treatment centers in Lagos State, Nigeria Oluremi Olaitan, B.Pharm, MSc[1], Ogochukwu Ginigeme, MBBS, MPH[2], Patrick Akande, MBBS, MPH[3], Oluwatoyin Jolayemi, MBBS, MPH[4], Prosper Okonkwo, M.D.[5], Saratu Olabode-Ojo, MBBS, MPH[6]; (1) PSCM, AIDS Prevention Initiative in Nigeria (APIN), Lagos, Nigeria (2) Clinical, APIN LTD, Ojuelegba- Lagos, Nigeria (3) AIDS Prevention Initiative in Nigeria (APIN), Nigeria (4) Programs, AIDS Prevention Initiative in Nigeria (APIN), Ojuelegba- Lagos, Nigeria (5) AIDS Prevention Initiative in Nigeria (APIN), Lagos, Nigeria (6) Clinical, AIDS Prevention Initiative in Nigeria (APIN), Lagos, Nigeria
PURPOSE: Tuberculosis remains the most common cause of morbidity among People Living with HIV (PLHIV). As part of a comprehensive package of HIV care, Nigeria has adopted the WHO recommendation on the use of isoniazid preventive therapy (IPT) in PLHIV with active TB ruled out. This recommendation is challenging to implement for some clinicians because of the difficulty of excluding TB in PLHIV. Giving isoniazid to PLHIV with TB amounts to monotherapy with a risk of developing drug-resistant TB (DRTB). Prior to May 2014 there was no widespread use of IPT for PLHIV in Lagos State.
METHODS: This intervention aimed at reducing the incidence of TB related morbidity amongst PLHIV in the APIN program. It sought to improve the knowledge of clinicians and pharmacists on the efficacy and safety of IPT in PLHIV without TB, resulting in increased prescription of IPT by clinicians and provision of adequate adherence counseling by pharmacists. The State Tuberculosis Control Program ensured adequate availability of INH. Barriers to the uptake of INH by PLHIVs were identified, continuous monitoring of the TB status of PLHIV receiving IPT help promote adherence, detect TB occurrence and help to generate in-country evidence based data on the efficacy of IPT
RESULTS: These interventions commenced in May 2014 and as at the end of September 2014, 322 PLHIV were receiving IPT across three APIN supported HIV treatment centers in the state.
CONCLUSION: Nationwide adoption of the IPT strategy can increase the uptake of use of IPT among PLHIV thereby reducing the incidence of TB related morbidity. It would be useful to generate evidence for the efficacy of IPT among this group of patients, especially with the availability of GeneXpert technology.

296. Optimizing therapy for tuberculosis/HIV co-infected patients through a rifabutin access protocol Kristin M. Darin, Pharm.D.[1], Oluremi O. Olaitan, BPharm, MSc[2], Holly E. Rawizza, M.D.[3], Patrick A. Akande, MBBS, MPH[2], Chad J. Achenbach, M.D., MPH[1], Babafemi O. Taiwo, MBBS[1], Robert L. Murphy, M.D.[1], Phyllis J. Kanki, DVM, ScD[3], Prosper I. Okonkwo, M.D.[2], Kimberly K. Scarsi, Pharm.D., MSc[4]; (1) Division of Infectious Diseases and Center for Global Health, Northwestern University Feinberg School of Medicine, Chicago, IL (2) AIDS Prevention Initiative in Nigeria (APIN), Nigeria (3) Department of Immunology and Infectious Diseases, Harvard T. H. Chan School of Public Health, Boston, MA (4) Department of Pharmacy Practice, University of Nebraska Medical Center, Omaha, NE
PURPOSE: For tuberculosis (TB)/HIV co-infected patients on protease inhibitor (PI)-based antiretroviral therapy (ART), rifabutin is preferred to rifampin due to drug-drug interactions. Although not widely available in resource-limited settings, the AIDS Prevention Initiative in Nigeria (APIN) has provided rifabutin to patients on PI-based ART who require TB treatment since 2008. Given the impact of rifabutin cost on programmatic funds and complex management of rifabutin/ART drug-drug interactions, a systematic process for approval and guidance on the use of rifabutin was developed.
METHODS: APIN formed a clinical team (Rifabutin Team) to develop and implement a Rifabutin Access Protocol that outlines clinical indications for use, procedures for requesting approval, dosing, prescribing, and dispensing. The expert members are based in Nigeria (Lagos, Abuja, Jos, and Ibadan) and the United States (Chicago, Omaha and Boston); hence, communications occur primarily via email. Together with physicians, clinical pharmacists on the team assess the appropriateness of and provide recommendations for rifabutin use. In addition, the APIN pharmacy team coordinates rifabutin distribution and use tracking, as well as compounding rifabutin suspensions for pediatric patients.
RESULTS: From 2008 to 2014, the APIN Rifabutin Team received 297 requests for rifabutin use, of which 286 (96%) were approved: 226 for adults and 60 for children. The duration of

time between receipt of request and approval was available for 216 (76%) cases, of which 165 (76%) were approved within 2 days (median time=1 day; range: 0–24). Common reasons for delay were insufficient clinical information or the request not reaching all approval team members.
CONCLUSION: APIN successfully implemented a Rifabutin Access Protocol that allows for expert guidance on managing the complex treatment of TB/HIV co-infection. This multidisciplinary team model could be easily adapted to other settings or therapies. Next steps include ongoing evaluation of the approval process and analysis of TB and HIV outcomes in patients on rifabutin.

297. Development and implementation of a clinical pharmacy training manual for HIV therapy in Nigeria Oluremi O. Olaitan, BPharm, MSc[1], Kimberly K. Scarsi, Pharm.D., MSc[2], Obioha C. Eberendu, BPharm, MSc[1], Isaac O. Abah, BPharm, MSc[3], Patrick A. Akande, MBBS, MPH[1], Robert L. Murphy, M.D.[4], Phyllis J. Kanki, DVM, ScD[5], Prosper I. Okonkwo, M.D.[1], Kristin M. Darin, Pharm.D.[4]; (1) AIDS Prevention Initiative in Nigeria (APIN), Nigeria (2) Department of Pharmacy Practice, University of Nebraska Medical Center, Omaha, NE (3) Pharmacy Department, Jos University Teaching Hospital, Jos, Nigeria (4) Division of Infectious Diseases and Center for Global Health, Northwestern University Feinberg School of Medicine, Chicago, IL (5) Department of Immunology and Infectious Diseases, Harvard T. H. Chan School of Public Health, Boston, MA
PURPOSE: Pharmacists play a key role in HIV prevention, care and treatment. To enhance clinical pharmacy training on HIV therapy, the AIDS Prevention Initiative in Nigeria (APIN) developed and coordinated in-person training to over 400 pharmacists. Though successful, a more efficient, scalable training model was needed for pharmacists throughout the country.
METHODS: APIN developed and implemented a written training manual, designed for ongoing self-learning and wide dissemination throughout Nigeria. The covered topics were based on the validated, in-person, didactic curriculum. Chapters were written in collaboration between Nigerian and U.S.-based pharmacists and physicians. A voluntary online evaluation tool was developed to monitor and gather user feedback on manual content and clarity.
RESULTS: The first version of the APIN Clinical Pharmacy Training Manual for HIV Medicine contains 17 chapters, each with learning objectives and self-assessment questions. The manual provides a comprehensive framework for HIV medication management with an emphasis on issues affecting resource-constrained settings. Topics include HIV pathophysiology, prevention, antiretroviral pharmacotherapeutic issues, considerations for pregnant women and children, common co-infections, and medication adherence. In November 2014, the manual was introduced during the 87th Annual National Conference of the Pharmaceutical Society of Nigeria and was distributed to nearly 2000 conference participants in PDF format on a memory stick. The manual is also available by request through APIN in either electronic or print format. As of Feb 15, 2015, 65 persons (80% pharmacists) have completed the online user registration and 57 complete chapter evaluations have been submitted.
CONCLUSION: Developing a comprehensive, self-learning training manual on HIV therapy, available as both electronic and print format, allowed for distribution to more pharmacists compared to in-person training programs. Next steps include periodic content updates, driven by evolving HIV treatment guidelines, as well as evaluating usage and feedback from manual users.

Infectious Diseases

299. Improvement in the appropriateness of outpatient antibiotics prescription: from the role of pharmacist Yi Harn Chan, R.Ph.[1], Wuan-Jin Leu, M.S.[2], Chia-Shan Tsai, M.S.[1], *Shih-Ya Huang, R.Ph.*[1], You-Meei Lin, M.S.[1]; (1) Department of Pharmacy, Shuang Ho Hospital, Taipei Medical University, New Taipei City, Taiwan (2) Department of Pharmacy, Taipei Medical University - Shuang Ho Hospital, New Taipei City, Taiwan
PURPOSE: The challenging task of improper use of antibiotic in outpatient including unnecessary orders of antibiotics for common cold, prolonged duration of antibiotic treatment. Therefore, antimicrobial stewardship program (ASP) is enforced to regulate the prescribing behavior of antibiotics.
METHODS: Firstly, a computerized antimicrobial audit system was introduced in end of 2012 and cooperated with the Computerized Physician Order Entry (CPOE). An alert system was developed when antibiotics was prescribed for upper respiratory infections. On the other hand, duration of antimicrobial treatment of outpatients was restricted through CPOE which only specific infectious disease can be prescribed longer than 7 days. Interventions and feedbacks of inappropriate prescriptions will be given to physicians by pharmacist every month. Finally, antimicrobial defined daily dose (DDD) per total amount of prescriptions and antibiotic prescription rate were utilized as an indicator to analyze the outcome of ASP.
RESULTS: The ratio of antibiotic defined daily dose (DDD) per total amount of prescriptions has declined by 16% from the first quarter of 2013 (382.3) to the fourth quarter of 2013 (327.7). The antibiotic prescription rate has reduced from 5.26% in first quarter of 2013 to 4.82% in fourth quarter of 2013.
CONCLUSION: In conclusion, cooperation of antimicrobial system with the CPOE and pharmacist interventions has improved the ASP outcomes.

300. Evaluating the performance on hospital vancomycin dosing nomograms in Taiwan *Shih-Ya Huang, R.Ph.*[1], Yen-Ying Lee, Pharm.D.[1], Jui-Chia Chang, M.S.[1], Ying-Chen Chen, R.Ph.[1], Wuan-Jin Leu, M.S.[1], You-Meei Lin, M.S.[1]; Department of Pharmacy, Shuang Ho Hospital, Taipei Medical University, New Taipei City, Taiwan
PURPOSE: Institutional vancomycin nomograms targeting two different trough concentrations of 10–15 and 15–20 mg/L depending on indications were established since 2012. The aim of this research is assessing the performance of the vancomycin nomograms implementation. In addition, the risk factors associated with failure to achieve target vancomycin trough concentrations are analyzed.
METHODS: We retrospectively studied patients receiving intravenous vancomycin during hospitalization between January 2012 and June 2014. Patients 18 years of age or older and with vancomycin trough concentrations at steady state were included. Patients with creatinine clearance (CrCL) <30 mL/min were excluded. Patient characteristics in the groups within and out of vancomycin desired range were compared using the Mann–Whitney U-test for continuous variables and a Chi-squared test for categorical variables.
RESULTS: A total of 251 patients were reviewed. The average age was 58.5 ± 18.24 years, average CrCL was 69.9 ± 25.59 mL/min, and the mean vancomycin trough concentration was 15.5 ± 10.16 mg/L. Total of 42.2% (n = 106) patients reached the desired vancomycin trough concentrations and 57.8% (n = 145) were out of range. Age was significantly different when comparing these two groups (mean age 64.3 ± 17.8 vs. 57.5 ± 17.2 years, p = 0.002). In addition, CrCL was also significantly different between the two groups (mean CrCL 72.2 ± 25.8 vs. 66.8 ± 25.1 mL/min, p = 0.049). Vancomycin was dosed compliant with the institutional dosing guideline in 75.3% (n = 189) patients. Compared to those whose vancomycin was not dosed based on the nomograms, significantly more patients reached the desired vancomycin trough concentration under institutional vancomycin dosing recommendation (31% vs. 46%, p = 0.033).
CONCLUSION: More patients achieved the desired vancomycin trough concentrations range when vancomycin was dosed compliant with the institutional vancomycin dosing nomograms. In addition, patient's age and CrCL may be

associated with failure to achieve target vancomycin trough concentrations.

Managed Care

301. Influence of pharmacist intervention on the knowledge of anticoagulation therapy with warfarin by the patient *Xiang Qian, Master*[1]; Peking University First Hospital, China

PURPOSE: To investigate the influence of pharmacist intervention on the knowledge of anticoagulation therapy with warfarin by the patient.

METHODS: Patients who were admitted to the cardiovascular ward at the Peking University First Hospital, and who were prescribed anticoagulation therapy with warfarin from October 2013 to November 2014 were involved. Patients were divided into a control group (Cardiology ward No. 1) and an intervention group (Cardiology ward No.2). In the control group, patients received usual care, meaning that physicians and nurses introduced anticoagulation knowledge for them; while the intervention group received pharmaceutical care instead that was provided by clinical pharmacists. Assessment was implemented by a structured questionnaire with a total of 13 questions that included key points with regard therapy with warfarin anticoagulation. All patients were assessed for their knowledge about warfarin anticoagulation therapy by nurses at the time of discharge.

RESULTS: The intervention group enrolled 141 patients, and the control group enrolled 125 patients. Scores of intervention group and control group at discharge were 10.65 ± 2.15 vs. 7.77 ± 2.63 respectively,with a statistical difference ($p < 0.05$). In addition, there remained a statistical difference ($p < 0.05$) after controlled baseline data. For 58 patients who had ever taken warfarin in the intervention group, scores at admission and discharge were 7.57 ± 2.91 vs. 10.21 ± 1.89 respectively, which were statistically different ($p < 0.05$) before and after the pharmacists' intervention. Twelve questions from the assessment questionnaire of both groups at discharge also had a statistical difference ($p < 0.05$)

CONCLUSION: Knowledge of warfarin therapy was superior in those patients that had received a pharmacists' intervention as compared those patients that had received usual care.

Medication Safety

303. Clinical pharmacists' involvement in the quality assurance of medication order sentences built for an electronic medical record system at a new, state of the art women and children's hospital in Qatar *Kyle Gunter, Pharm.D.*[1], Anish Patel, M.Pharm., Nassir Ali, M.Pharm.[1], Farah Nawab, Pharm.D.; Department of Pharmacy, Sidra Medical and Research Center, Doha, Qatar

PURPOSE: To describe clinical pharmacists' involvement in quality assurance (QA) of medication order sentences within an electronic medical record system (EMR) during the commissioning phase of a new women and children's hospital in Qatar.

METHODS: An international team of twelve clinical pharmacists (UK, USA, Canada, and Qatar) were assigned to perform quality analysis on medication order sentences built as part of EMR implementation. The team identified 29 elements to be reviewed, 15 of which related directly to the technical build within the system itself. The other 14 elements encompassed clinical drug related categories such as correct dose, route and frequency. QA was judged completed when each orderable was reviewed by two pharmacists independently without any change. 1291 orderable medications with 5564 order sentences were identified for the initial round of QA. Additional rounds were performed until completion criteria were met for all orderables. Assignments were rotated to prevent the same pharmacist from completing consecutive rounds of QA. Ethics approval was not required for this project.

RESULTS: The project required 59 working days and 6 rounds of QA were needed to meet completion criteria. After two rounds of QA it was determined 9 of the technical elements did not require additional review. The data generated in the QA process is being evaluated for future publication opportunities.

CONCLUSION: This hospital will be a fully digital academic medical center utilizing the EMR as the primary tool for all aspects of the medication use process. The assurance of safe and accurate medication orders is key to the success of the hospital. The use of clinical pharmacists to develop and QA all aspects of the process including order sentences should ensure a high level of safety within the system. Our goal is to provide the highest level of safety in pharmaceutical care anywhere.

305. Pharmacy services through short-term international mission improving pharmacy practice *Michael Hogue, Pharm.D., FAPh.A., FNAP*[1], David Luthin, Ph.D.[2], Pilar Murphy, Pharm.D., BCACP[3], Jessica Skelley, Pharm.D., BCACP[3]; (1) Pharmacy Practice Department, McWhorter School of Pharmacy, Samford University, Birmingham, AL, USA (2) Department of Pharmaceutical, Social and Administrative Sciences, Samford University McWhorter School of Pharmacy, Birmingham, AL, USA (3) Department of Pharmacy Practice, Samford University McWhorter School of Pharmacy, Birmingham, AL, USA

PURPOSE: Schools and Colleges of Pharmacy have an opportunity to impact pharmacy practice in remote areas through engagement with mission-sending partners to improve access to pharmacist-provided services.

METHODS: The McWhorter School of Pharmacy (MSOP) established an elective course "Applied Medical Missions" in 2014. The course requirements include participation in a short term (7–14 day) International medical mission trip. MSOP works with partner organizations to shape the types of pharmacy services which will be provided, and provides a PharmD faculty member for the teams. MSOP supported three faculty members and 18 students' participation in three medical mission outreach trips to Africa, Peru and Dominica in collaboration with two national organization partners in summer 2014. MSOP faculty and students provided traditional pharmacy dispensing services through these organizations, and on some trips also assisted with services such as triage, diabetes counseling, blood pressure monitoring and eye exams. Additionally, the faculty and students evaluated the types of services and processes by which services were provided to identify areas for improvement in medication ordering, dispensing, and overall pharmacy workflow for future teams.

RESULTS: Process improvements for medication dosing, particularly among pediatric patients were instituted. Standardized formularies and dosing schedules assisted the volunteers in resolving numerous drug dosing errors made by local providers who may have not been trained on use of certain medications.

CONCLUSIONS: One of the partner organizations has incorporated our suggestions into their operational procedures for medical teams, which we hope will improve quality on short term trips in the future. Additionally, we made connections with the pharmacy school and health ministry officials in one of the countries, for which we have provided updated textbooks for their program, with plans to work with the school to improve the clinical pharmacy education program in the future. We will continue to foster relationships to improve care globally.

307. Compliance enhancing patient information leaflets – a strategy to decrease patient misadventure with oral chemotherapies *Berenice Sheridan, B.Pharm., BCOP*, Ian Larmour, B.Pharm., Allan Manser, B.Pharm., Susanne Sturm, B.Pharm., Bronwyn Allan, B.Pharm., Obaid Fazli, B.Pharm., Andrew Lim, B.Pharm., LiLing Ng, B.Pharm., Vi Mai, B.Pharm., Tin Vo, B.Pharm., ChiHao La, B.Pharm., An Pham, B.Pharm., Tara Sugumar, B.Pharm., Nadia Widuch, B.Pharm.; Monash Health, Australia

PURPOSE: The use of oral chemotherapies is steadily increasing. Patient preference and lower administration costs are offset by non-compliance and medication misadventure. Potential consequences include treatment inadequacy, adverse effects, re-hospitalisation and even death. The Australian Health Department mandated to improve the way that oral chemotherapies are dealt with within the health sector. One avenue explored in our pharmacy department, was to construct supplementary consumer information leaflets that contained specific techniques to improve patient compliance.
METHODS: Following a literature review, information leaflets were constructed by clinical pharmacists for all oral chemotherapies available. These leaflets contained techniques, such as administration charts, to improve patient understanding. Once completed, the leaflets underwent review by health professionals and consumer groups. The leaflets were then distributed to patients as a supplement to current consumer information. Patients completed questionnaires to indicate whether the new leaflets had enhanced understanding and compliance. A review of the data kept by the oncology nurse practitioner was conducted to compare the number of incidents reported pre and post implementation.
RESULTS: All of the 50 patients surveyed indicated that the new leaflets had enhanced their understanding. Over 98% of the patients found that the administration chart aided compliance. Information on the treatment of common side effects was particularly helpful. There was a 90% reduction in the number of medication incidents due to non-compliance since the implementation of the leaflets.
CONCLUSION: The creation of patient friendly medication leaflets by clinical pharmacists, has led to better patient understanding and a lower rate of medication incidents within our public hospital network. These leaflets provide a personalised way for pharmacists to manage their oncology patients. As similar chemotherapy regimens are used internationally, these leaflets may provide a template to be adopted by other institutions.

308. Provision of pharmacy interventions to promote medication safety in a selected medical center in the Philippines – great catch program Hazel Faye Docuyanan, M.Sc. Hospital Pharmacy[1], Mary Jeane Robles, B.Sc. Pharmacy[2]; (1) Philippine Society of Hospital Pharmacists (PSHP) (2) Department of Pharmacy Services, Clinical Pharmacy Section, Makati Medical Center, Makati City, Philippines
PURPOSE: To provide pharmacy interventions in order to prevent medication errors, and promote medication safety.
METHODS: Prospective, date gathering of interventions provided There are several stages in the medication management system when pharmacy interventions are provided by either the inpatient pharmacist or the clinical pharmacist. The stages are: prescribing, transcribing, drug appropriateness review, medication order review and drug therapy monitoring (clinical pharmacy rounds) and administration validation through Medication Administration Record review. Every time the pharmacist identifies a drug-related problem, he/she provides interventions - will refer to the prescribing physician or the nurse and recommend resolutions so that errors are intercepted or corrected. Documentation is done for every intervention. Data is reported to the Medication Safety Subcommittee and Therapeutics Committee for system improvement initiatives. Pharmacists with the most number of interventions are recognized and appreciated every month and a special award is given at the end of the year.
RESULTS: Pharmacy interventions are greatly useful during the prescribing stage and transcribing stage. These are where most of the errors are intercepted and corrected. Pharmacy interventions are usually provided during the drug appropriateness review and clinical pharmacy rounds. Doctors and nurses are the most common persons contacted in order to resolve the identified problem. The most common resolutions are to initiate new drug order, corrected the error or clarify the order. Average acceptance rate to the intervention is 98.7%. The average time to resolve the intervention is 11 minutes.
CONCLUSION: Provision of pharmacy interventions intercepts and prevents medication errors. It also promotes patient safety by identifying potential harm caused by drug interactions or drug reactions, and recommending solutions accordingly. The great catch program through provision of pharmacy interventions is one of the effective tools in developing a culture of safety.

309. Impact of pediatric pharmacist interventions in general pediatric ward in Korea *Sook Hee An, Ph.D.*[1], Jae Youn Kim, Ph.D.[2], Hyesun Gwak, Ph.D., Pharm.D.[3]; (1) College of Pharmacy, Wonkwang University, Iksan, South Korea (2) Department of Pharmacy, Asan Medical Center, Seoul, South Korea (3) College of Pharmacy & Division of Life and Pharmaceutical Sciences, Ewha Womans University, Seoul, South Korea
PURPOSE: Pediatric patients are at the potential risk for medication error because of the need to calculate doses individually, greater pharmacokinetic variability and lack of appropriate pediatric dosage forms. The purpose of this study was to record and analyze all interventions during seven months to evaluate the impact of a pediatric pharmacist to prevent medication errors.
METHODS: A pediatric pharmacist performed and documented clinical interventions in three general pediatric wards. Information included medication name and specific intervention performed were collected.
RESULTS: During the study period, there are 97,826 medication orders reviewed for appropriateness before dispensing and 351 interventions by pharmacist. The rate of acceptance of the pharmacist's recommendations by physicians was 97%. The most common interventions were dosage change (27%), correction of duplicated order (23%) and drug formulation change (14%). Sedative/analgesia, antibiotics and cardiovascular drugs were the most common drug classes in which interventions were made (20.7%, 16.0% and 16.0%, respectively). The severity of prescribing errors intervened by pharmacist were categorized as potentially lethal error (0%), serious errors (2.9%), significant errors (27.6%), minor errors (67.8%), and no errors (1.7%).
CONCLUSION: Pharmacist interventions in general pediatric ward prevented medication errors and potential adverse drug events and contributed to patient safety.

310. Evaluation of incorporation medication claims data into hospital electronic health record Tzu-Hsuan Lu, M.S.[1], *Shih-Ya Huang, R.Ph.*[2], You-Meei Lin, M.S.[3]; (1) Department of Pharmacy, Taipei Medical University- Shuang Ho Hospital, New Taipei City, Taiwan (2) Department of Pharmacy, Shuang Ho Hospital, Taipei Medical University, New Taipei City, Taiwan (3) College of Pharmacy, Taipei Medical University, Taipei, Taiwan
PURPOSE: Taiwan launched a single-payer National Health Insurance (NHI) program in 1995. Improvement of access to healthcare results in doubled ambulatory visit, and related to depletion of the healthcare resources and inappropriate medication use. The NHI applied cloud technology to build a patient-centered "PharmaCloud System" in 2013. Health care provider can check patients' prescription records in the preceding 3 months when giving prescription or drug consultation. This study aims to analyze the impact of incorporation PharmaCloud into hospital electronic health record.
METHODS: Patients visited in ambulatory care in a teaching hospital between December 2014 and January 2015 were recruited. With patient consent, the medication claims data from PharmCloud integrated in computerized physician order entry (CPOE) system. The alerting module would generate if the same therapeutic medication class was prescribing. The therapeutic class of medications and physician acceptance rate were also determined.
RESULTS: Among 53,433 prescriptions were integrated PharmaCloud into hospital electronic health record, 3.92% with duplicate alerts. Most duplicated medication therapeutic class were "platelet aggregation inhibitors excl. heparin" (10.51%), "Benzodiazepines" (8.98%), "Contact laxatives" (4.87%), "Angiotensin II antagonists" (4.39%), and "HMG CoA reductase inhibitors" (4.11%). Of the 2,094 duplicate alerts, 35.65%

were accepted. Meanwhile, reduction of medication consumption $ 16,202 USD.
CONCLUSION: Potential duplicate medications are detected efficiently by incorporating PharmaCloud into hospital electronic health record. Implantation of the integrated system resulted in improving medication safety and saving medical resources.

Nutrition

311. The fight against malnutrition: education for Guatemalan natives about creating a balanced diet using locally available resources *Robin L. Koffarnus, Pharm.D., BCACP*[1], Renee Holder, Pharm.D., BCPS[2]; (1) Texas Tech University Health Sciences Center, School of Pharmacy, Dallas, TX (2) Roseman University of Health Sciences College of Pharmacy, Henderson, NV
PURPOSE: Due to the combined results of low literacy, poverty, and a diet high in starches, many native Guatemalans living in smaller villages suffer from malnutrition, despite the availability of many locally grown resources. During a medical trip in June 2014, 2 posters were created for a locally run medical clinic in an effort to increase education and awareness about the importance of eating a balanced diet.
METHODS: The authors worked with an individual who was both a Guatemalan native, and a local educator in community awareness programs to come up with a list of fruits, vegetables, proteins, and carbohydrate sources that would be both affordable and easily obtained by the local populace. One poster focused on education about the Plate Method, a tool commonly used to educate diabetes patients about portion size and the correct ratio of carbohydrates:proteins:vegetables. The second poster contained an example 7 day meal plan utilizing only locally available ingredients. Each poster was hand drawn and translated into Spanish, the common language of the Guatemalan people.
RESULTS: The 2 posters were completed prior to the end of the trip and presented to clinic staff. The authors provided training to the staff on how to use the posters for patient education. The posters were then hung in the clinic education classroom to be used for patient and community classes.
CONCLUSION: In the fight against malnutrition in the Guatemalan people, education will play an enormous role. Though a small step forward, these 2 posters will help local educators provided examples of a balanced diet for patients and community members in a Guatemalan village.

Oncology

312. Clinical and economic impact of intervention of pharmacists in a large volume chemotherapy preparation unit *Ji Min Han, Master*[1], Ju Yeun Lee, Doctor[2], Seock Ah Im, Doctor[3], Sung Yun Suh, Master[4], Sun Hoi Jung, Master[4], Hyang Sook Kim, Master[4], Hyeon Joo Hahn, Master[4]; (1) Department of Oncology Pharmacy, Seoul National University Hospital, Seoul, South Korea (2) College of Pharmacy, Institute of Pharmaceutical Science and Technology,Hanyang University, Ansan Gyeonggi-do, South Korea (3) Department of Internal Medicine, College of Medicine, Seoul National University, Seoul, South Korea (4) Department of Pharmacy, Seoul National University Hospital, Seoul, South Korea
PURPOSE: Due to the complexity and narrow therapeutic range, medication errors (MEs) involving anticancer chemotherapy are common and can cause fatal harm to patients. Considering most MEs occur during prescribing process, pharmacists in chemotherapy preparation units play a critical role to prevent potential harm. Limited studies have evaluated the clinical services of pharmacists during chemotherapy preparing and dispensing process. This study aimed to evaluate the clinical and economic impact of pharmacist interventions in a large volume chemotherapy preparation unit.
METHODS: Pharmacist intervention records from May 2011 to April 2012 at chemotherapy preparation unit in a 1600-bed tertiary hospital were retrospectively reviewed. Frequency, type and acceptance rate were documented. Clinical significance of interventions was rated by one physician and one pharmacist. To determine the economic impact of pharmacists' intervention, cost-benefit analysis was conducted. Benefit was estimated through cost avoidance from interventions with the potential to avoid an adverse drug event (ADE) using probability, reported additional costs for ADE treatment in this institution and cost saving from interventions preventing product waste. Cost was estimated from the annual pharmacist salary corresponding to the time spent in reviewing chemotherapy prescriptions.
RESULTS: Among 106,215 cancer chemotherapy prescriptions in 6,364 patients, 631 cases of interventions were performed in 435 patients. The acceptance rate was 79.4%. Most cases of unaccepted interventions were about dosage adjustment within the range of less than 10% of the prescribed dosage. Regarding the clinical significance of pharmacist interventions, more than half of the interventions were considered as clinically more than "significant" (53.6%). Cost-benefit analysis showed that clinical interventions of pharmacist in chemotherapy dispensing units had a clear cost benefit with a net cost-benefit 110,612,986 won ($101,481) and a cost-benefit ratio of 3.4.
CONCLUSION: Pharmacist intervention in chemotherapy preparation unit contributed to significant improvement of patient safety and decrease in health care cost.

313. Evaluation of the extent and impact of oncology clinical pharmacy service in a tertiary hospital in Hong Kong – first 10-month experience *Keary Zhou, Pharm.D.*[1], Wai Tung Cheung, B.Sc. Pharmacy[2], Yu Yeung Wong, B.Sc. Pharmacy[2]; (1) School of Pharmacy, The Chinese University of Hong Kong, Shatin, Hong Kong (2) Department of Pharmacy, Tuen Mun Hospital
PURPOSE: Oncology pharmacist counseling service was launched at the Prince of Wales Hospital (PWH) since the end of 2011 for all patients who are newly starting on chemotherapy or other anti-cancer agents. This study aims to evaluate the extent and impact of pharmacists' intervention and to recognize the potential risk factors of DRPs in a local tertiary hospital.
METHODS: A retrospective review was carried out. Information regarding the service between February 2012 and December 2012 were collected. Drug Related Problems (DRPs) identified were classified according to the PCNE Classification V6.2. An independent oncology pharmacist was responsible for evaluating the clinical significance of individual DRPs. Potential risk factors leading to the occurrence of a pharmacist's intervention were also analyzed.
RESULTS: A total of 842 patients were included in this study. DRPs were identified in 255 (30.3%) patients. Common problems identified fall under the "Treatment Effectiveness" and "Adverse Reactions" categories. Common causes of DRPs include concomitant drug-food interactions, inappropriate combination of drugs, and non-compliance issue of patients. There were 356 interventions performed at prescriber, patient/carer and drug levels. The majority (95.3%) of DRPs were "somewhat significant" or "significant" and the average Intervention Ranking Score (range 1-6) was 3.13 (S.D.=0.45). One or more concomitant diseases ($p < 0.001$), hypertension ($p = 0.026$), polypharmacy ($p = 0.027$), type of treatment ($p = 0.006$), and lung carcinoma ($p < 0.001$) were found be significant positive risk factors to the occurrence of interventions in the univariate analysis.
CONCLUSION: Significant DRPs were identified through the oncology pharmacy counseling service and pharmacists were able to optimize drug therapy as a whole. Further studies are required to build a more comprehensive model of risk factors. Awareness of the various DRPs and the possible risk factors of the DRPs should be the key to a high-standard drug therapy.

314. Pharmacist-run medication compliance clinic in oncology patients *Grace Man Ying Cheng, B.Pharm., M.Med.Sci.*[1], Leone Kit Ming Wong, B.Pharm., M.Med.Sci., BCOP[1], Terence Ching Yeung Mak, M.Pharm.[1], Harry Ho Yin Yiu, M.B.B.S.[2], Kenneth Kwok Ming Law, B.Pharm.[1], Wilson Yun Shing Leung, B.Pharm.,

Ph.D., BCPS[1]; (1) Department of Pharmacy, Queen Elizabeth Hospital, Hong Kong (2) Department of Clinical Oncology, Queen Elizabeth Hospital, Hong Kong
PURPOSE: As the oncology treatment paradigm shifts from in-patient to out-patient setting, patients have to be well trained to be responsible for managing their medications at home. Pharmacist-run medication compliance clinic was established to improve quality and safety of drug management in patients started on oral anticancer therapy.This audit aims to evaluate the number and type of drug-related problems (DRPs) identified.
METHODS: Patients who were newly prescribed oral anticancer medications in Queen Elizabeth Hospital were referred to the pharmacist medication compliance clinic. Interventions made by oncology pharmacist in 2013 were documented in this prospective audit. Details of interventions were recorded into an electronic database. These interventions were then classified according to the nature of problem, cause, type of intervention and outcome using Pharmaceutical Care Network Europe (PCNE) Classification scheme for DRPs.
RESULTS: A total of 379 patients attended the clinic in 2013, with 185 interventions recorded. Majority of DRPs were related to patients failing to use drug properly, and 95% could be solved by the pharmacist at patient level. Top three causes were inappropriate timing of administration and/or dosing intervals (43%), followed by drug under administered/not administered at all (21%) and patient unable to use drug or form as directed (5.9%). Capecitabine was generally failed to be taken after meals or every twelve hours. Drug interactions between tyrosine-kinase inhibitors and gastric acid inhibitors were also identified. 84% of the DRPs were rated as significant or above in which three of them were regarded as serious. Safe handling education was provided to five patients with swallowing difficulties. Request for additional supportive care medications were made by 31 patients.
CONCLUSION: With pharmacist counselling, patients can be better educated to be responsible for managing their oral anticancer therapy in terms of administration, side effect management and drug interaction management. Supportive care medication prescribing can be a potential area for future development.

315. Types of medication errors in oncology setting in Greece: Is clinical pharmacist role beneficial and cost-effective? Konstantinos Ioannidis, Pharm.D., M.Sc., Ph.D.[1], *Apostolos Papachristos, Pharm.D., M.Sc.*[1], Ioannis Skarlatinis, Pharm.D.[1]; Pharmacy, Hygeia Hospital Athens, Athens, Greece
PURPOSE: Preventable medication errors (PME) occur in all oncology centers with potential severe consequences such as enhanced toxicity or impaired disease control. Clinical pharmacist's participation in multidisciplinary oncological teams is associated with prevention of such errors and as a result better quality services as well as cost-saving. However, the role is still not well established in Greece. Our aim was to analyze the clinical pharmacist's contribution in patient's safety and the economic impact of the interventions.
METHODS: Analysis of the clinical significant interventions made by clinical pharmacists during chemotherapy order check before administration from 1 January 2013 until 31 December 2014. All of the interventions were documented and accepted by physician.
RESULTS: A total number of 732 individual patients were treated and 9251 chemotherapies were administrated. 379 interventions were recorded, 209 (55%) in dose, 63 (17%) in pre-and-post-medications, 40 (11%) in dilution, 28 (7%) in wrong or missed chemotherapy agent, 24 (6%) in administration and 15 (4%) in drug-drug interactions. Of the 209 dose interventions 64% regarded inappropriate increased and 36% decreased dose. The reasons for increased and decreased dose were wrong creatinine clearance (CrCl) calculation 44%-25%, protocol deviation 24%-32%, wrong body surface area calculation (BSA) 16%-38%, impaired liver function 4%-1% and toxicities 12%-4% respectively.
CONCLUSION: The most common PME were incorrect calculation of CrCl and BSA. According to literature 17% of PMEs will lead to hospitalization. In our institution the average bed stay is 4 days with cost 1.400 €/day. So, the interventions lead to a saving of 360.800 €. Furthermore, hospital will avoid bed capacity reduction of 257 bed-days. The annual cost for a clinical pharmacist responsible to check that amount of orders is less than 35.000 €. Consequently, pharmacist participation in oncologic team leads to decrease in costs and to a significant improvement in safety and quality of patient care.

317. Implementation of a pharmaceutical care service in the outpatient pediatric oncology clinic *M Felipe Silva,M, Pharmacist*, C Jesús Henríquez,Pharmacist, R Romina Escobar,Pharmacist, MSc, V Jorge Morales,Pharmacist; Clinical Pharmacy Service, Hospital Dr. Luis Calvo Mackenna, Santiago, Chile
PURPOSE: To create a pharmaceutical care service in an outpatient pediatric oncology clinic and register the pharmacist interventions and medication errors.
METHODS: During a 9-month period all new diagnosed patients with acute lymphoblastic leukemia (ALL) were included in the program and received pharmaceutical care. The pharmaceutical interventions were classified in relation to drug administration, medicine use education, necessary drug addition and prevention-detection-treatment and/or notification of an adverse drug reaction. All the chemotherapy prescriptions were checked and the medication errors were identified, registered, and classified according to The National Coordinating Council for Medication Error Reporting and Prevention NCC MERP system.
RESULTS: Twenty-nine ALL patients were included, 266 pharmacotherapy follow-up activities were made and 540 chemotherapy orders were reviewed. The total number of interventions was 179 with relation to: medicine use education (82.2%), drug administration (9.5%), prevention-detection-treatment and/or notification of an adverse drug reaction (5%) and necessary drug addition (1.7%). Eighty-three medication errors were detected: others (51.7%), wrong dosage form (16.9%), wrong time (7.2%), dose omission (6%), improper dose (5%), wrong duration (4.8%), wrong technique (3.6%), wrong drug (2.4%), drug-drug interaction (1.2%) and deteriorated drug error (1.2%). All prescription errors were potential and all the patient-related errors were corrected during the patient education. During the chemotherapy order checking, 183 incomplete prescriptions were found and completed. They were related to the patient name and/or record number (63.8%), weight, height and/or body surface area (19.6%) or protocol name (16.6%).
CONCLUSION: The implementation of a pharmaceutical care service in our outpatient pediatric oncology clinic has lead to identification of drug related problems and medication errors that, if not prevented, can affect the efficacy and safety of patient treatment.

Other

318. Analysis of Pharmacist intervention in Chinese International Hospital *Jinjin Mou,Master*, Hao Lu,Master, Yi Pang,Bachelor; (1) Department of Pharmacy, Beijing United Family Hospital, Beijing, China
PURPOSE: In contrast to the situation in developed countries, pharmacists in developing countries are largely underutilized. Prescription review and interventions are pharmacists' important responsibilities. The rate of pharmaceutical interventions due to computerized prescription order entry ranges from 5.9% to 35% depending on the study. There was no published data found from state hospitals in China on pharmacist intervention rate. The objectives of this study were to measure the incidence of prescription problems that required pharmacist intervention and to determine types, reasons and severity of the intervened prescriptions in an international hospital in China.

METHODS: Pharmacist intervention data in outpatient pharmacy in Beijing United Family Hospital, was collected from Oct.1st to Dec.31st of 2014. Intervention reasons were specified, and severity was rated.
RESULTS: The proportion of prescription interventions appeared small (0.55% based on one-month data), which was similar to that (0.68%)in a teaching hospital in Malaysia reported in 2003. There were total 209 intervened prescriptions in three months. Among 193 accepted interventions, 47.92% (92) were rated as significant and 31.77% (61) were mild. Severity of potentially lethal, serious and no consequence accounted for 0.52%, 9.90% and 10.42%, respectively. The top five reasons in descending order were high dosage, conflict/incomplete information in medication order, unavailable or inappropriate dosage form, drug dosage too low for patient's condition and inappropriate dosage interval. Missing or mix-up in medication order by doctors was the most common reason for serious errors. There were 25.39% errors which had happened in Emergency Department setting. Medication prescribed without supporting data or evidence for young children was a concern.
CONCLUSION: Pharmacists can prevent most of medication errors by reviewing orders and providing counseling service for patients, ensuring the medication safety and efficacy. In China, more pharmacist activities are needed in health care team.

320. An introduction to the Global Health PRN and its members *Robin L. Koffarnus,Pharm.D., BCACP*[1], Kristin M. Darin,PharmD[2], Ashley Hedges,PharmD[3], Bernice Man,Pharm.D[4], Cory Nelson, Pharm.D., Emily Peron,Pharm.D.[5], Tran Tran,Pharm.D.[6], Renee Holder,PharmD, BCPS[6]; (1) Texas Tech University Health Sciences Center, School of Pharmacy, Dallas, TX (2) Division of Infectious Diseases and Center for Global Health, Northwestern University Feinberg School of Medicine, Chicago, IL (3) VA Pittsburgh Healthcare System, US Department of Veterans Affairs, Pittsburgh, PA (4) Chicago State University College of Pharmacy, Chicago, IL (5) School of Pharmacy, Virginia Commonwealth University, Richmond, VA (6) Roseman University of Health Sciences College of Pharmacy, Henderson, NV
PURPOSE: Global health is commonly defined as health issues that go beyond national boundaries. Clinical pharmacists can have a significant stake in advancing global health, and defining their role in this practice area. To address this, the ACCP Global Health PRN was formed. Here within, we describe the purpose of the Global Health PRN and highlight the practices of its members.
METHODS: A needs assessment for a PRN focused on global health was performed by creating a petition for interest and analyzing characteristics of current ACCP members who did not belong to any PRN. This data was compiled and submitted to ACCP for approval of the PRN. Once approved, the chair was appointed by ACCP prior to the 2014 Annual Meeting. The chair, advised by ACCP and PRN leadership, developed task forces and charges for the PRN based on highest priority needs for a new PRN.
RESULTS: Following the needs assessment, 101 ACCP members signed the petition of interest. Of the 230 members with "Other Interest Area" identified, 99 did not belong to any PRN. Out of 108 members from the 12 randomly selected countries, 52 did not belong to any PRN. The Global Health PRN was officially formed in August 2014, with the stated purpose of enhancing the skills of clinical pharmacists and pharmacy trainees as well as research and collaboration on issues of global health concern. To date, the Global Health PRN has 88 members, many of whom have provided or are currently providing global health services around the world. Examples of these services include training and education programs for healthcare providers, development of patient education materials, inter-professional clinical and research collaborations, and medication dispensation.
CONCLUSION: The Global Health PRN aims to promote the role of the clinical pharmacist in global health and to ultimately improve health worldwide.

Pediatrics

321. Results from the development of a clinical pharmacy program in a Chilean pediatric hospital: a 6 year review experience *M Felipe Silva,Pharmacist*[1], V Jorge Morales,Pharmacist[1], C Jesús Henríquez,Pharmacist[1]; Clinical Pharmacy Service, Hospital Dr. Luis Calvo Mackenna, Santiago, Chile
PURPOSE: To show the result of the last 6 years of the clinical pharmacy unit and evaluate the process using activity indicators.
METHODS: All the interventions made by the clinical pharmacy service in a 220-bed pediatric hospital recorded during the last 6 years were reviewed and analyzed. They were classified and adapted from Farre Riba et al (2000). The clinical rounds assisted and number of monitored patients were also recorded. The clinical services included were: the Bone Marrow Transplant Unit, the Intensive Care Units (Cardiovascular, Neonatal and Pediatric), Oncology (in and outpatients) and Support Services.
RESULTS: In total 16,842 pharmacy interventions were made in 5,112 patients and 4,147 clinical rounds were assisted. The type and number of pharmacy interventions were: therapeutic drug monitoring and dose adjustment/maintenance 7,635 (45.3%), dose adjustment 3,253 (19.3%), drug-drug or drug food interaction 1,303 (7.7%), need for additional treatment 1,194 (7.1%), medication administration change 1,090 (6.5%), suspension of contraindicated drug 993 (5.9%), treatment duration change 745 (4.4%), suspension of unnecessary drug 416 (2.5%) and adverse drug reaction notification and management 213 (1.3%). The number of clinical pharmacists increased from one in 2009 to two in 2013 and to three in 2014. The monitored patients increased from 321 to 1609 (+501%) and the medication review activities increased from 545 in 2009 to 1,767 in 2014 (+373%). There was an average of 3.4 interventions per monitored patient and 4.1 interventions per clinical round assisted. On average each pharmacist made 1,918 interventions per year.
CONCLUSION: The clinical pharmacy service has experienced a substantial growth during the last 6 years, increasing the number of pharmacists, monitored patients and pharmacy interventions.

322. Optimization of indicators of clinical pharmacy activities at a Chilean pediatric hospital *M Felipe Silva,Pharmacist*[1], H Andrea Campos,Pharmacy student[2], C Jesús Henríquez,Pharmacist[1], V Jorge Morales,Pharmacist[1], L Betzabé Rubio,PhD[2]; (1) Clinical Pharmacy Service, Hospital Dr. Luis Calvo Mackenna, Santiago, Chile (2) University of Chile, Santiago, Chile
PURPOSE: To develop a method in order to describe the clinical pharmacy activities and measure the impact of pharmacist's clinical interventions.
METHODS: A 3 month prospective study in the Bone Marrow Transplant Unit, the Intensive Care Units, Oncology (in and outpatients) and support services of a pediatric hospital was conducted. The pharmacy activities related to Medication Review and Drug Monitoring were recorded and classified according to Farre Riba et al (2000) and adapted to this hospital. The interventions significance scale was made according to the same author and adapted to a simplified scale of: negative, not very significant, significant, very significant and extremely significant.
RESULTS: The clinical interventions were made by three clinical pharmacists. The total number of patients included was 877 and the number of pharmacotherapy follow-ups was 2,777, which included the review of drug prescriptions, drug administration, chemotherapy protocols, and therapeutic drug monitoring. During this study,, 683 interventions were made in 387 patients during 240 clinical rounds. The most frequent pharmacist clinical interventions were drug dose adjustments (45.5%) 22.1% of which were based on serum drug levels. More interventions were made in the Oncology Unit (47.0%), but more interventions per 100 patients were made in the BMT Unit (134). Considering all the clinical services the number of interventions made in each clinical round, per 100 monitored patients and per clinical

pharmacist was three, 78 and 228 respectively. The intervention acceptance rate was 100% and they were related to safety (56.8%), efficacy (40.1%) and education (2.9%). The clinical impact of all interventions was 0% negative, 2.6% not very significant, 34.6% significant, 61.9% very significant and 0.9% extremely significant.
CONCLUSION: This method helps to better describe the impact of clinical pharmacy interventions. As we can see they where more related to safety and the majority where very significant.

Pulmonary

323. The effect of Palivizumab in the incidence rate of hospitalisation for Respiratory Syncytial Virus infection in high-risk preterm infants in Doha, Qatar: three-year retrospective *Ahmed Elmasoudi,Master of clinical pharmacy*[1], Tracy Robson, PhD[2], Hoda Badran,M.Sc. Clinical Pharmacy[1], Ahmed Khalil,BSc., Pharmaceutical science[1]; (1) Pharmacy Department, Hamad General Hospital, Doha, Qatar (2) School of Pharmacy, Queen's University Belfast, Belfast, UK
PURPOSE: Palivizumab prophylaxis is considered effective and safe for preventing respiratory syncytial virus (RSV) hospitalisations among preterm infants. To evaluate whether administration of palivizumab to preterm infants, during the first RSV season, reduces the incidence rate of infection and hospitalisation.
METHODS: A three-year retrospective study was carried out in the pediatric ward in a tertiary setting hospital. We included all preterm infants who received at least one dose palivizumab in HGH from 2010–2013.
RESULTS: Of 781 high-risk preterm infants, 42 were hospitalised for RSV infection in the first 16 months of life. The incidence rate was 5.31 per 100 person-years (95% CI: 3.90–5.9); the same incidence rate was found by calendar month. A multiple logistic regression analysis established that the characteristics associated with higher incidence were low gestational age, male gender and epidemic period (October – April). At least one dose of palivizumab was administrated to 141 (18%) infants; during the study period, the number of high-risk infants increased from 22 (15.6%) in 2010, to 58 (41.2%) in 2013.Other independent factors associated with increased palivizumab use were non-Qatari mother, male gender, month of birth, low gestational age and diagnosis with broncho-dysplesia. Adverse events were low and recorded in only 7% injections.
CONCLUSION: In Qatar the incidence rate of hospitalisation for RSV infection and associated risk factors was similar to that found in other published studies. Palivizumab prophylaxis given as 5 monthly IM injections is safe and effective for prevention of RSV hospitalisation in preterm infants with < 32 weeks' gestational age and in infants with from 32 to 36 weeks' gestational age. It is also effective in preterm infants with a diagnosis of broncho dysplasia. Palivizumab administration is well tolerated with few side effects.

Residents and Fellows Research in Progress ADR/Drug Interactions

324. Physicians Perception of ADR Reporting at a University hospital, Saudi Arabia *Mohamed Alarifi,PhD*[1]; Clinical Paharmacy, College of Pharmacy, King SAud University, Riyadh, Saudi Arabia
PURPOSE: To assess the knowledge and attitudes of physicians towards adverse drug reactions ADRs reporting at King Khalid University Hospital, Riyadh, Saudi Arabia.
METHODS: The study was conducted in King Khalid University Hospital (KKUH) Riyadh Saudi Arabia over a three months period from April to June 2014. A self-administered questionnaire was delivered to 116 physicians. The questionnaire comprised of close-ended as well as some open-ended questions. Descriptive statistics including frequency distribution and percentages were used for both demographic data and various responses to the questions.
RESULTS: The response rate was 81.09%. The mean age of the respondents was 33.3 ± 11.49 years. Of the 94 physicians who completed the questionnaire, 88.7% of them didn't know about the National Pharmacovigilance Center. Almost all the physicians (95.7%) were not satisfied by their training in ADRs reporting while half (49.3%) of the respondents thought that only serious ADRs should be reported.
CONCLUSION: There is a need for more educational and training programs for physicians regarding the pharmacovigilance system and ADRs reporting. More research is needed to study the knowledge and attitudes of other healthcare professionals and in various settings.

Adult Medicine

325. Implementation of a pharmacist driven stress ulcer prophylaxis discontinuation protocol in non critically ill patients in a community teaching hospital *Francesco Ciummo,Pharm.D.*[1], Ashmi Philips, Pharm.D.[2], Philip Coco,Pharm.D., BCPS[1], Mona Patel,Pharm.D.[1], Thom K. Nguyen,Pharm.D., BCPS, CTTS[2]; (1) Department of Pharmaceutical Services, Hunterdon Medical Center, Flemington, NJ (2) Department of Pharmacy Practice and Administration, Rutgers, The State University of New Jersey, Piscataway, NJ
PURPOSE: Current guidelines and literature support the use of stress ulcer prophylaxis (SUP) in critically ill patients, but routine use in their non-critically ill counterparts is not typically recommended due to the low reported incidence of stress ulcers in this population. The objective of this study was to assess the impact of a pharmacist-driven SUP discontinuation protocol in patients admitted to a medical/surgical unit.
METHODS: This prospective evaluative study conducted between February and April 2015 received expedited IRB approval. Patients were enrolled in the study if they received any acid-suppressive medications on formulary. Appropriateness of therapy was based on a modification of the 1999 American Society of Health-System Pharmacists SUP guidelines. The primary outcome of this study was to evaluate the number of discontinuations of inappropriate SUP by pharmacy residents and clinical generalists. Secondary outcomes assessed the number of IV to PO conversions in patients who will continue SUP therapy, incidence of nosocomial bleeding, and new onset *Clostridium difficile* infection (CDI). All outcomes were analyzed using descriptive statistics.
RESULTS: There were a total of 33 patients included in the study. Among them, 15 patients had a recommendation to discontinue therapy that was accepted, 13 patients had a recommendation to discontinue therapy that was rejected, and 5 patients met appropriate criteria for stress ulcer prophylaxis therapy. There were no observed instances of new onset CDI or nosocomial bleeding.
CONCLUSION: The implementation of a pharmacist driven SUP discontinuation protocol reduced the total number of patients receiving inappropriate therapy. Judicious use of all medications is important and evaluation of SUP in non-critically ill patients may be incorporated into daily clinical generalist activities.

326. Prospective randomized controlled trial to evaluate the effect of a rivaroxaban patient assistance kit (R-PAK) for patients discharged with rivaroxaban for treatment of VTE *Brandon Nuziale,PharmD*, Andrew J. Crannage,PharmD, BCPS, Zachary A. Stacy,Pharm.D., BCPS, Jamie M. Pitlick,Pharm.D., BCPS; St. Louis College of Pharmacy, St. Louis, MO
PURPOSE: There is limited literature evaluating patient adherence to the direct oral anticoagulants (DOACs) for the treatment of venous thromboembolism (VTE). Non-adherence may occur with rivaroxaban due to the required dose and frequency change

on day 21. The objective of the study is to determine the impact of a rivaroxaban discharge kit on patient adherence.
METHODS: This prospective, randomized, controlled trial is evaluating a primary outcome of adherence to transitioning rivaroxaban dosing on day 22 for acute treatment of VTE. Patients > 18 years of age prescribed rivaroxaban for the treatment of VTE and who provide informed consent are included. Patient's health literacy is assessed, then randomly assigned to pharmacy driven rivaroxaban education (control group) or pharmacy driven education plus a rivaroxaban patient adherence kit (RPAK). Enrolled patients are contacted by phone 30-35 days post discharge to assess adherence and complete a satisfaction survey. A chi-square or Fisher's Exact test is being used to evaluate baseline characteristics and the primary outcome.
RESULTS: To date, 12 patients (n = 6 RPAK, n = 6 control) have been enrolled in the study. Of those that have fully completed the study (n = 10), all have reported properly transitioning on day 22. Overall adherence in the RPAK group is 100%, compared with a mean adherence rate of 94.6% in the control group. Additionally, patients in the control group are at higher risk for decreased health literacy based on the Single Item Literacy Screener (SILS). This may correlate to a potential relationship between a patient's likelihood of poor health literacy and their adherence to rivaroxaban.
CONCLUSION: The RPAK is a novel concept for a newer anticoagulant with the potential to improve patient care. As enrollment continues to increase, the ability to further analyze results will expand. Project completion is anticipated at the time of presentation.

328. Maddrey discriminant function: discriminating alcoholic hepatitis treatment appropriately? *Ryan Owens,PharmD*[1], Heather Snyder,PharmD[2], Jennifer Twilla,PharmD, BCPS[3], Sanjaya Satapathy,MD[4]; (1) Pharmacy, University of Tennessee Health Science Center/Methodist University Hospital, Memphis, TN (2) Pharmacy, University of Tennessee Health Science Center/Methodist University Hospital, Memphis, TN (3) Methodist University Hospital, Memphis, TN (4) Methodist University Hospital Transplant Institute, Memphis, TN
PURPOSE: Maddrey discriminant function (MDF) score is a measure of disease prognosis in alcoholic hepatitis (AH) used to identify patients at highest risk of mortality. To improve survival, guidelines recommend pharmacologic therapy in severe patients (MDF ≥32).However, controversy exists in the literature whether pharmacotherapy is beneficial for severe patients. Treatment is not recommended in patients with MDF <32. The purpose of this study was to evaluate use of the MDF score as a risk stratification method to assess the need for pharmacologic therapy in hospitalized AH patients and determine the effect on mortality.
METHODS: A retrospective review of AH patients admitted to Methodist LeBonheur Healthcare adult hospitals between 06/2009-06/2014 was conducted. Inclusion criteria: age >18 years and ICD-9 code for AH. Exclusion criteria: other potential liver injury etiology, steroid or pentoxifylline use prior to hospitalization, incomplete MDF data, history of liver transplant, death within 24 hours of hospital admission, N-acetylcysteine administration, and pregnancy.
RESULTS: Of the 494 patients screened, 234 met inclusion criteria with 57 patients receiving treatment (MDF ≥32, n = 42; average MDF=47) and 177 patients receiving no treatment (MDF ≥32, n = 20; average MDF=15). For patients with an MDF ≥32 there was no difference in 28-day mortality between the treatment vs. non-treatment groups (31% vs 11%, respectively; p = 0.18) and no difference in 6-month mortality (45% treatment vs 38% non-treatment; p = 0.75). For patients with an MDF <32 there was no difference in 28-day mortality between the treatment vs. non-treatment groups (0% vs 7%, respectively; p = 1.00) and no difference in 6-month mortality (11% treatment vs 13% non-treatment; p = 1.00).
CONCLUSION: Pharmacological treatment showed no survival benefit regardless of disease severity. More data is needed to adequately assess the utility of MDF in selecting appropriate candidates for AH treatment and to identify an MDF range that yields a survival advantage.

Ambulatory Care

329. Chronic obstructive pulmonary disease (COPD) management in an underserved population: Evaluation of current practices at Old Town Clinic (OTC) *Srilatha Tavisala,Pharm.D.*[1], Jessina C. McGregor,Ph.D.[2], Elizabeth Le,PharmD[1], Harleen Singh, Pharm.D.[2]; (1) College of Pharmacy, Oregon State University/Oregon Health & Science University, Portland, OR, USA (2) Oregon State University/Oregon Health & Science University College of Pharmacy, Portland, OR, USA
PURPOSE: There is limited evidence investigating COPD management in underserved populations. The Global Initiative for Chronic Obstructive Lung Disease (GOLD) highly recommends spirometry to confirm COPD diagnosis and avoid mistreatment. The goal of this project is to assess if the current practice in COPD management at Old Town Clinic are in accordance with the GOLD guideline.
METHODS: Current Old Town Clinic patients with COPD were identified as those who had an office visit between 12/2013-12/2014 and COPD diagnosis code. A random sample of 100 patients was selected for chart review. The following data were collected: demographics, spirometry, COPD treatment, medication refill history, comorbidities, smoking status, immunizations, exacerbations and hospitalizations in the past year. Patients were stratified into low- and high-risk groups per GOLD guidelines. The frequency of patients diagnosed and managed in concordance with GOLD guidelines was summarized overall and by relevant sub-groups.
RESULTS: Among the 60 charts reviewed to date, 30 (50%) were diagnosed with COPD at Old Town Clinic. Average age of the study population was 58.4 years (SD=8.4). Majority of patients were current smokers 43 (72%) and had one or more psychiatric disorders 48 (80%). COPD diagnosis was supported by spirometry, as directed by GOLD, in only 12 (40%) of patients diagnosed at Old Town Clinic. Of the 17 patients (28.3%) identified as high risk for exacerbation, 5 (29%) were not on appropriate therapy and 11 (65%) were non-adherent to current regimen. Twenty-six patients (43.3%) could not be risk stratified due to limited data. Influenza vaccine was appropriately received by 18 (30%) in the past year and 30 (50%) received Pneumovax.
CONCLUSION: Preliminary results indicate underutilization of spirometry to confirm COPD diagnosis; hence it is important to identify barriers to obtaining spirometry. Improved utilization of spirometry will better inform medication therapy management in high-risk patients.

330. Analysis of medication discrepancies identified by clinical pharmacists in an outpatient cardiology clinic *Brittany Bruch, PharmD*[1], Ryan Jacobsen,PharmD, BCPS[1], Milena Gebska,MD, PhD[2]; (1) Department of Pharmaceutical Care, University of Iowa Hospitals and Clinics, Iowa City, IA (2) Department of Internal Medicine, University of Iowa Hospitals and Clinics, Iowa City, IA
PURPOSE: The purpose of this study was to identify the number and type of clinically important medication discrepancies present within the electronic medical record medication list.
METHODS: This study was a retrospective review of patients seen in a general cardiology clinic. Pre-existing medication lists were compared to a pharmacist-conducted, comprehensive medication therapy review obtained during a cardiology visit. Discrepancies between these lists were analyzed and categorized according to type of discrepancy (incorrect medication, incorrect dose, incorrect directions, omission, or patient not taking medication) and level of potential harm (low, moderate, or high). The percentage of discrepancies involving cardiovascular medications was also assessed.

RESULTS: A total of 346 medication discrepancies were identified within 121 comprehensive medication therapy reviews, averaging 2.9 discrepancies per review (range: 0-17). Of the 121 reviews completed, 83% contained at least one discrepancy, with 17% containing five or more. Most discrepancies (57%) were classified as moderate level of potential harm; however, over 20% of patients had at least one high-harm discrepancy identified on their medication list. A large percentage of discrepancies (43%) included medications that were removed from the medication list due to the patient "not taking". Discrepancies involving cardiovascular medications accounted for 27% of total discrepancies, but occurred across at least 45% of patients.
CONCLUSION: The results of this study indicate that medication discrepancies are very common and could affect the quality and safety of patient care. Medication reconciliation is an important aspect of outpatient care but does take time and a specific skillset. In this study, the discrepancies were identified and resolved by a clinical pharmacist; however, many clinics do not currently offer pharmacy services. Future efforts must identify strategies to improve patient safety and decrease potential harm in regards to medication reconciliation.

331. Medication-related problems identified during pharmacist hospital discharge clinic visits *Kimberly A. Sanders,PharmD*[1], Emily Hawes,PharmD, BCPS, CPP[2], Gretchen Tong,PharmD, CPP[2], Lauren Sievers,PharmD, BCPS[2], Mark Gwynne,DO[2], Andrew Lipshutz,PharmD, BCPS[3], Nicole R. Pinelli,PharmD, MS, CDE[1]; (1) University of North Carolina Eshelman School of Pharmacy, Chapel Hill, NC (2) Department of Family Medicine, University of North Carolina, Chapel Hill, NC (3) Department of Pharmacy, University of North Carolina Medical Center, Chapel Hill, NC
PURPOSE: To describe medication-related problems (MRPs) and health care utilization for patients seen at the University of North Carolina (UNC) Family Medicine Center for multidisciplinary hospital discharge follow-up visits that included a clinical pharmacist.
METHODS: This study was a retrospective chart review of patients at least 18 years of age who were discharged from the UNC Family Medicine Inpatient Service to community dwelling, had established care with a primary care provider at the UNC Family Medicine Center, and attended a discharge follow-up visit including pharmacy services between January 1, 2013 and September 15, 2013. During these visits the pharmacist performed discharge medication reconciliation, identified and intervened on MRPs, and provided patient education. The primary outcome was to identify the most common MRP classifications and medications using the validated iMAP tool. The secondary outcome was to compare 30-day readmission rates and emergency department (ED) visits in those receiving enhanced pharmacy services compared to usual care.
RESULTS: A total of 83 patients (57.1 $\pm$ 15.0 years, 50.6% white, 53.0% male) were seen by a clinical pharmacist in multidisciplinary discharge follow-up visits during the study period. There were 351 MRPs identified (4.2 $\pm$ 2.5 per patient); of those, non-adherence was the most common classification (39.9%), followed by suboptimal dosing, duration, frequency, administration (20.8%), and suboptimal drug (17.4%). The most common medications associated with MRPs were insulin (5.1%), omeprazole (4.0%), aspirin (2.8%), and warfarin (2.6%). Rehospitalization or ED visits within 30 days of discharge occurred with 6.0% and 10.8% of patients, respectively. Comparison of health care utilization for those receiving enhanced pharmacy services compared to usual care is ongoing and will be completed for presentation.
CONCLUSION: Multiple MRPs were identified during clinical pharmacist visits following hospital discharge. The majority of MRPs involved patient variables such as non-adherence. Future analysis will determine the impact of follow-up visits on health care utilization.

332. Effects of a pharmacy intervention on statin prescribing in the ambulatory setting *Scott Coon,Pharm.D., BCPS*, Justinne Guyton, Pharm.D., BCACP, Amie Brooks,Pharm.D., BCACP, BCPS; Department of Pharmacy Practice, St. Louis College of Pharmacy, St. Louis, MO
PURPOSE: To evaluate the effect of a pharmacist intervention on the prevalence of appropriate statin therapy in a low income, minority population.
METHODS: Statin-naïve patients aged 40–75 years with LDL < 190 mg/dL and no clinical atherosclerotic cardiovascular disease (ASCVD) were considered for study inclusion. Indication for primary prevention statin therapy was determined by evaluating 10-year risk for ASCVD via the ACC/AHA pooled cohorts equation. Following enrollment, patients were block randomized to intervention and control arms, stratified by the presence or absence of diabetes mellitus (DM). The intervention consisted of a patient-specific primary care provider notification on the day of a scheduled appointment including 1) assessment of statin eligibility and 2) recommendation for appropriate statin therapy, while controls were observed. Odds ratios were used to compare the likelihood of statin therapy post-visit.
RESULTS: Over 100 patients have been screened for study inclusion, from which 25 patients were considered indicated for statin therapy based on sufficient risk for ASCVD in a 10-year period ($\geq$ 7.5% risk with or without DM) and the absence of contraindications to therapy. Screened patients were mostly excluded based on age criteria or current statin therapy at baseline. Patients were more likely to be prescribed appropriate statin therapy with patient-specific PCP messaging vs. observation, though data are too preliminary to assess whether this difference is statistically significant.
CONCLUSION: Based upon partial data, a provider-focused pharmacist intervention improved the likelihood of appropriate statin prescribing for primary prevention. Data collection is ongoing.

333. Impact of a Spanish Language Insulin Education Office Visit on the Use of Insulin in Hispanics *Pedro Medina,PharmD*, Julie Kroger,PharmD; Ambulatory Care Pharmacy, Kaiser Permanente, Redwood City, CA
PURPOSE: The purpose of this study was to evaluate the impact of a novel Spanish insulin education office visit for Hispanic diabetes patients in their decision to initiate insulin.
METHODS: In this single center study, Hispanic adult patients (aged 18-75 years) with type 2 diabetes mellitus on at least two or more oral anti-diabetes medications with a hemoglobin A1C (A1C) of $\geq$ 7.5% were recruited from active Kaiser Permanente health care members for a novel insulin education visit. Participants were given a diabetes perception questionnaire to help identify any potential barriers in initiating insulin and their willingness to start insulin prior to the intervention. In addition, patients also watched a four minute patient narrative video during their clinic visit. The primary endpoint was to determine the insulin initiation rate for Spanish speaking patients that underwent this new office visit. Secondary endpoints included change in A1C from baseline, patient perceptions of diabetes and insulin, and potential benefit of the narrative video on patient confidence and motivation to initiate insulin. The study was conducted from October 2014-March 2015 at the Kaiser Permanente Cardiovascular Risk and Diabetes ambulatory clinic at Kaiser Permanente Redwood City.
RESULTS: The insulin initiation rate for patients that underwent this novel insulin education office was 81.8% (n = 11). Four of these patients were initially unwilling to start insulin prior to the intervention, but eventually three of them were started on insulin during the post-intervention phase (p = 0.25). The study population had an average A1C reduction of 1.4% (n = 11).
CONCLUSION: This novel Spanish insulin education office visit approach may help motivate and build confidence for Hispanic patients to help initiate insulin.

334. Advancing Pharmacy Practice through a Novel Chronic Myeloid Leukemia Ambulatory Care in Brazil: Structure, Process and Results *Lucas Okumura,RPh*[1], Valquiria Antunes,RPh[2], Karina Aguiar,RPh[3], Tatiane Farias,RPh[3], Vania Andrzejevski,RPh[3], Vaneuza Funke,MD, MSc[3]; (1) Clinical Pharmacy/Hospital Pharmacy Division, Hospital de Clínicas de Porto Alegre, Porto Alegre, Brazil (2) Clinical Hospital, Federal University of Paraná, Brazil (3) Clinical Hospital, Federal University of Paraná, Curitiba, Brazil

PURPOSE: Chronic Myeloid Leukemia (CML) has become a longstanding disease after the introduction of Tyrosine Kinase Inhibitors (TKI). Thenceforth, adherence to this drug class is one of the most important clinical endpoints, when treating such hematologic neoplasm. Pharmacists-driven ambulatory services comprise an interesting strategy to promote adherence within CML patients, but few studies have been addressing innovation on these services. This pilot study aims to characterize a novel clinical pharmacy service to CML patients.

METHODS: This is a cross-sectional study conducted in a Brazilian University Hospital (Reference Hematology Centre). We retrospectively collected demographic and clinical data from CML patients on TKI therapy, who were attended by clinical pharmacists in 2014. Data were expressed as descriptive statistics. We also described the structure, process (how patients were selected to consultations) and results (number of Drug-Related Problems and interventions) from this service.

RESULTS: Based on chart reviews, patients were selected to pharmacists' consultation on the day before physicians' consultations. In the aforementioned setting, there were 300 patients/year receiving TKI therapy, and clinical pharmacists provided consultations to 150 patients, which were predominantly men (55%) with 51.7 (±15.5) years old. Most of them had 1 (IQR=2) comorbidity and were on 3 (IQR=3) medications. Regarding CML, most of them were on adequate response to therapy (105 achieved Major or Complete Molecular Response). Pharmacists identified 70 drug-related problems, of which 10 were related to incorrect TKI administration (with or without food) and 16 were due to TKI dose omission (due to unmanaged adverse reactions).

CONCLUSION: Chart reviews before pharmacists consultations organized the ambulatory service by selecting relevant patients with confirmed or suspected drug therapy problems, which were solved within medical staff, patients or caregivers. Consulting patients before physicians could also address a thorough assessment on incorrect TKI use before suggesting tumor resistance or disease progression.

335. Utilization of Twice Daily Dosing of Insulin Glargine in Type 2 Diabetes Mellitus *Hansita Patel,Pharm.D.*, Rebecca L. Attridge, Pharm.D., MSc, BCPS, Kimberly Cauthon,PharmD, CGP, Cheryl K. Horlen,Pharm.D., BCPS, Elizabeth M. Urteaga,PharmD, Amy Witte, PharmD; University of the Incarnate Word Feik School of Pharmacy, San Antonio, TX

PURPOSE: Certain patients with Type 2 Diabetes Mellitus (T2DM) may not be optimally managed on typical once daily dosing of insulin glargine. Clinicians often attempt to optimize dosing of insulin glargine by using twice daily dosing. Currently, there are limited data regarding twice daily dosing of insulin glargine in T2DM. The purpose of this project is to determine when clinicians split the dose of insulin glargine to twice daily by obtaining the percentage of patients prescribed twice daily dosing versus once daily at total daily doses between <30 units, 30-59 units, 60-89 units and ≥90 units.

METHODS: Data was collected from medical records between 03/25/2011 and 03/25/2014 from the national Veterans Affairs Informatics and Computing Infrastructure (VINCI) database to investigate what daily doses ranging from <30 units, 30-59 units, 60-89 units, ≥90 units of insulin glargine have been split for patients with T2DM. Data came from 13 pharmacist run clinics within the South Texas Veterans Health Care System (STVHSC). Descriptive statistics, Wilcoxon Rank Sum for continuous data, and Chi-Square Test for nominal data were used for statistical analysis.

RESULTS: Of 1366 T2DM patients receiving insulin glargine, 364 (26.6%) were on twice daily dosing. The majority of patients prescribed twice daily dosing were on larger total daily doses (TDD) of insulin glargine including 40.1% of those on 60-89 units and 89.7% on ≥90 units. In contrast, the majority of patients on lower TDD of <60 units were on once daily dosing, with only 2.7% of those on <30 units and 7.9% on 30-59 units on twice daily dosing.

CONCLUSION: In accordance with manufacturer recommendations, clinicians split insulin glargine doses ≥90 units for approximately 90% of patients. However, clinicians also split TDD <90 units in up to 47.5% T2DM patients, the majority of which are on TDD >60 units.

336. Assessment of clinical pharmacy interventions to reduce outpatient use of high-risk medications in the elderly *Sarah Cox, Pharm.D.*[1], A. Shaun Rowe,Pharm.D., BCPS[2], Julie Jeter,M.D.[3], Andrea S. Franks,Pharm.D., BCPS[2], Rachel Renwick,Pharm.D.[1], Shaunta' M. Ray,Pharm.D., BCPS[2]; (1) Department of Pharmacy, University of Tennessee Medical Center, Knoxville, TN (2) Department of Clinical Pharmacy, University of Tennessee Health Science Center, College of Pharmacy, Knoxville, TN (3) University of Tennessee Graduate School of Medicine, Knoxville, TN

PURPOSE: High risk medication use (HRME) and drug-disease interactions (Rx-DIS) in the elderly, as defined by the Healthcare Effectiveness Data and Information Set (HEDIS) criteria, are significantly associated with mortality, hospital admission, and need for emergency care. This study aimed to evaluate the impact of pharmacist interventions on use of HRME and Rx-DIS in the outpatient elderly population.

METHODS: Patients 65 years of age or older were prospectively screened for HRME and Rx-DIS prior to their visit with their primary care provider. If HRME or Rx-DIS were noted, the pharmacist sent an electronic flag alert to the physician, alerting them of their findings with a suggestion for a safer alternative agent. The recommendation acceptance rate was assessed and then compared to a historical control from a similar timeframe.

RESULTS: HRME and/or Rx-DIS were changed 25.9% of the time in the pharmacist intervention group compared to only 2% of the time in the historical control group ($p = 0.001$). The most frequently changed medication classes included skeletal muscle relaxants, benzodiazepines, and nonsteroidal anti-inflammatory drugs (NSAIDs). Over 85% of the medication changes were preserved at the end of the study period. There was no difference between groups in the number of patients with Rx-DIS or HRME.

CONCLUSION: Clinical pharmacy interventions result in significant reductions in use of HRME and Rx-DIS in the outpatient elderly population. Utilizing electronic communication allows pharmacists to provide meaningful interventions for numerous patients being seen in a high volume family medicine clinic setting.

337. Transitional care pharmacy: providing MTM services to high-risk patients at a critical access hospital to improve patient outcomes *Elizabeth Le, PharmD*[1], Lisa Sandoval, PharmD, BCPS[2]; (1) College of Pharmacy, Oregon State University/Oregon Health & Science University, Portland, OR, USA (2) Department of Pharmacy, Providence Hood River Memorial Hospital, Hood River, OR, USA

PURPOSE: With the increase in interest at transitions of care, many hospitals across the nation are looking into developing these services. Most of these services are nurse-led transitional care programs. However, many of the issues these nurses meet concern medication reconciliation, complex medication regimens,

and polypharmacy. Several studies have shown that pharmacist-led medication therapy management (MTM) services may improve appropriate prescribing, increase adherence, and decrease cardiovascular events and medical costs. This study focuses on developing an algorithm to run a report identifying patients who may benefit from MTM services shortly after or during a hospital/emergency department (ED) visit, conducting MTM on identified patients and measuring the impact of these services.
METHODS: Design a tool to identify patients 18 and older who are currently admitted/in the ED and who have recently discharged (<7 days) based on (1) Presence of at least one of the following disease states: diabetes mellitus, congestive heart failure, chronic obstructive pulmonary disease AND (2) one of the following: Medicare D MTM eligibility criteria, presence of high risk medications, visit to the ED/admitted to the hospital two or more times in the last 30 days. Once the tool has been created, the report will be run once weekly. Patients identified by this tool will be visited (if currently admitted) or called (if discharged) to inquire about interest in MTM services. Patients not consenting to MTM services will be excluded from the service.
RESULTS: There was no difference in the number of patients seen before and after the intervention was implemented.
CONCLUSION: More research is necessary to determine a way to more easily identify patients who would benefit from MTM services, how to more effectively engage patients to keep their appointments, and to increase the sample size in future studies.

338. Comparison of biphasic premixed insulin versus once daily basal insulin in insulin-naive veteran patients with type 2 diabetes
Catlin Grisham-Takac, Pharm.D.[1], Julianne Yeary, Pharm.D.[2], Krystal Edwards, Pharm.D., FCCP, BCPS[3], Lisa Chastain, PharmD, BCACP[4], Kevin C. Kelly, PharmD, BCPS[5]; (1) VA North Texas Healthcare System, Dallas, TX (2) University of Mississippi Medical Center, Jackson, MS (3) Texas Tech UHSC School of Pharmacy, Dallas, TX (4) Pharmacy Practice - Ambulatory Care Division, Texas Tech University Health Sciences Center, Dallas, TX (5) Veterans Affairs North Texas Health Care System, Dallas, TX
PURPOSE: To evaluate time to glycemic control in insulin-naïve type 2 diabetes mellitus (T2DM) patients initiated on biphasic premixed insulin or once daily basal insulin.
METHODS: A retrospective cohort study of T2DM patients who were insulin naïve and started on insulin therapy between October 1, 2010 and September 30, 2014 was conducted. Data was collected until patients met goal A1c ≤ 8%, failed therapy or 3 years had elapsed. Primary outcome was percent to reach goal A1c ≤8% after initiation of biphasic premixed insulin (70/30) or once daily basal insulin (NPH or detemir) in one year. Secondary outcomes included percentage of patients reaching goal; insulin dosage (units/kg) needed to reach goal; incidence of self-reported hypoglycemic events on each regimen and change in weight. Outcomes were assessed using paired t-test, chi-squared test and ANOVA as appropriate with significance defined as $p < 0.05$.
RESULTS: A total of 186 patients (60 in NPH, 64 in detemir, and 65 in 70/30 groups) were included with similar baseline characteristics. Patients in the 70/30 group had higher A1c and more were on oral antidiabetic therapy in the NPH and detemir groups. Of the included patients, 72.3%, 53.3%, and 48.4% patients reached A1c < 8% in 1 year of insulin initiation in the 70/30, NPH, and detemir group respectively ($p = 0.0149$). More patients in the 70/30 group reached A1c goal ≤8% throughout the study duration ($p = 0.0028$) with similar outcomes for time to goal, weight change and hypoglycemia. The 70/30 patients also required a higher insulin dosage ($p < 0.001$).
CONCLUSION: A higher percentage of insulin naïve patients with type 2 diabetes who were started on a premixed biphasic insulin regimen were able to reach goal A1c ≤8% in one year's time compared to those started on a once daily basal regimen.

339. Medication adherence tools applied to patients discharged from a cardiology ward: a pharmacist-led ambulatory service in Brazil
Patricia Carvalho Baruel Okumura, RPh[1], Bianca de Oliveira Cata-Preta, RPh, Walleri Christini Torelli Reis, RPh, Rangel Ray Godoi, RPh, MSc, Lucas Miyake Okumura, RPh[3], Maria Luiza Drechsel Favero, RPh, MSc, Thais Teles de Souza, RPh, MSc, Cassyano Januario Correr, RPh, MSc, PhD; (1) Clinical Pharmacy Division, Hospital de Clinicas de Porto Alegre, Porto Alegre, Brazil (2) Clinical Pharmacy/Hospital Pharmacy Division, Hospital de Clínicas de Porto Alegre, Porto Alegre, Brazil
PURPOSE: The use of medication adherence tools in developing countries is underexplored. In this pilot study, we aimed to: (a) describe the medication adherence of outpatients that were discharged from a Brazilian University Hospital's Cardiology ward; (b) explore associations between adherence tools' scores and clinical parameters.
METHODS: We conducted a cross-sectional study and data were collected from clinical registries from patients that received consultation at one Pharmacist-led Ambulatory Care setting. Three questionnaires (ARMS, BMQ and MEDTAKE) were correlated with clinical and drug therapy profiles. Null hypothesis rejection was set at 5%.
RESULTS: We included 53 patients. Most of them were older than 65 years old and did not complete primary school. In average, there were six health conditions per patient and most of them were on polypharmacy. ARMS (average score 15.6 ± 3.4) had significant correlations with MEDTAKE ($r = 0.535$, $p < 0.01$) and BMQ ($r = 0.38$, $p < 0.01$). ARMS was the only tool that correlated with number of health conditions under control ($r = -0.312$, $p < 0.05$).
CONCLUSION: In the aforementioned setting, especially in elderly outpatients, ARMS had an inverse association with number of health conditions under control and it may play a role to identify adherence problems.

Cardiovascular

341. Impact of clinical pharmacy services on dofetilide monitoring
Lieth Quffa, Pharm.D., *Andrew Franck, Pharm.D*; North Florida/South Georgia Veterans Health System, Gainesville, FL
PURPOSE: Anti-arrhythmic therapy (AAT) is a cornerstone of management for patients with atrial fibrillation and other cardiac arrhythmias. An important opportunity for clinical pharmacy services exists given the high risk potential of these medications. The purpose of the clinical pharmacy AAT monitoring service at our institution is to improve compliance with safety monitoring parameters and promote consistency of care. The genesis of this service was to monitor dofetilide therapy in accordance with the Unites States Food and Drug Administration's risk evaluation and mitigation strategy (REMS) for prevention of pro-arrhythmic effects.
METHODS: A retrospective cohort study was performed on all patients prescribed dofetilide within the North Florida/South Georgia Veterans Health System over an 18 month period. Patients were included if they were 18 years or older and had taken dofetilide consecutively for more than three months. Two cohorts were compared: patients who received dedicated clinical pharmacy services and patients who received standard care. Patient demographics and rate of compliance with REMS criteria were obtained. REMS criteria include assessment of serum electrolytes, renal function, electrocardiogram and drug-drug interactions at routine intervals. The primary outcome was the proportion of patients meeting the criteria in each group.
RESULTS: Eighty-seven patients were included in our study with a total of 308 patient encounters. Forty encounters were seen in clinical pharmacy services group and 268 in standard care group. Preliminary results show 78% compliance with recommended monitoring parameters in the standard care group and 98% in

the clinical pharmacy services group. This difference was statistically significant ($p < 0.05$).
CONCLUSION: Dedicated clinical pharmacy services were associated with improved dofetilide monitoring, as seen by higher adherence to REMS criteria. This improvement could lead to enhanced patient safety and outcomes. Expansion of clinical pharmacy AAT monitoring services is underway at our institution with further evaluation pending.

342. The effects of total dose infusion intravenous iron administration in patients with acute heart failure *Bonnie Kaminsky, PharmD*, Kristen T. Pogue, PharmD, BCPS (AQ CV), Michael P. Dorsch, PharmD, MS, BCPS, Sarah Hanigan, PharmD, BCPS, Todd Koelling, M.D.; University of Michigan Hospitals and Health Centers, Ann Arbor, MI
PURPOSE: Iron deficiency is common in heart failure (HF), and intravenous (IV) iron therapy has been associated with improved clinical status in ambulatory HF patients. The objective of this study was to determine the safety and efficacy of total dose infusion (TDI) IV iron administration in patients with acute HF.
METHODS: This was a retrospective cohort study of patients admitted to the University of Michigan Health System between January 2010 and August 2014 for HF with low iron studies during admission. Patients were grouped into cohorts based on the receipt of IV iron. The primary outcome was change in hemoglobin over time. Secondary outcomes included 30-day all-cause readmission, time to readmission, and adverse events.
RESULTS: Forty-four patients receiving IV iron and 128 control patients were identified. IV iron was commonly administered as a TDI of iron dextran, with a mean dose of 1057 (± 336) mg. The mean baseline hemoglobin was 9.4 (±0.23) mg/dL and 10.1 (± 0.13) mg/dL in the IV iron and control patients, respectively. At day 28, the mean increase in hemoglobin was 2.61 mg/dL and 0.23 mg/dL in the IV iron and control groups, respectively. IV iron resulted in a significantly greater increase in hemoglobin over time ($p = 0.0001$). This effect was preserved when adjusted for baseline hemoglobin and predictors of change in hemoglobin ($p = 0.001$). 30-day all-cause readmission rates were 30% and 22% for patients receiving IV iron and control patients, respectively ($p = 0.2787$). Two IV iron patients experienced adverse events, which included nausea, vomiting, headache, and back pain.
CONCLUSIONS: TDI IV iron dextran is well tolerated and associated with significant improvement in hemoglobin in acute HF compared to control. Further study is warranted to determine the clinical benefits of this therapy.

343. Impact of statin therapy on risk of incident diabetes: a population-based cohort study with Korean national health insurance claim database *Jimin Lee, PharmD, BCPS*, Yoojin Noh, BS, Sooyoung Shin, PharmD, Sukhyang Lee, PharmD, PhD; College of Pharmacy, Ajou University, Suwon, South Korea
PURPOSE: The aim of this study was to examine the association between statin use and new onset diabetes (NOD).
METHODS: A population-based cohort study was conducted using the Korean Health Insurance Review and Assessment Service (HIRA) database, which contains the claims of 97.0% of population in Korea. Using HIRA data from January 2009 to December 2014, we identified new statin users among adult patients with preexisting ischemic heart disease to assess incident diabetes associated with statins. Matched controls were selected using proportionate stratified random sampling. Multivariate cox-proportional hazard regression model was used to estimate the association between statin therapy and incidence of NOD after adjusting for potential confounders.
RESULTS: A total of 188,693 adult patients were included in the analysis; statin exposure group ($n = 94,370$) and statin non-exposure group ($n = 97,323$) were matched for age and sex. The rates of NOD were 7.82% and 4.29% in the exposure group and in the non-exposure group, respectively. The risk of NOD was higher among statin users (crude HR 2.27 [95% CI, 2.19–2.36], adjusted HR 1.83 [95% CI, 1.53–2.18]) than among non-statin users. Patients treated with high potency statin were more likely to be at risk of NOD.
CONCLUSION: Among adult patients with preexisting ischemic heart disease, the use of statin therapy appears to increase risk of NOD. Periodic screening and monitoring for diabetes may be warranted while statin therapy is continued.

344. Triple versus dual antiplatelet therapy of cilostazol or sarpogrelate with aspirin and clopidogrel after percutaneous coronary intervention: a retrospective cohort study using Korean National Health Insurance Claim Database *Yoojin Noh, BS*, Jimin Lee, PharmD, BCPS, Sooyoung Shin, PharmD, Sukhyang Lee, PharmD, PhD; College of Pharmacy, Ajou University, Suwon, South Korea
PURPOSE: Triple antiplatelet therapy (cilostazol or sarpogrelate with aspirin and clopidogrel) has been used in patients who underwent percutaneous coronary intervention (PCI) in Korea. We aimed to evaluate efficacy and safety of the antiplatelet therapies after PCI in national health insurance claim database.
METHODS: This is a retrospective cohort study using the Korean Health Insurance Review and Assessment Service database from January 2009 to December 2014. Patients with ischemic heart disease treated with antiplatelet therapy (AC: aspirin, clopidogrel, ACC: aspirin, clopidogrel, cilostazol, or ACS: aspirin, clopidogrel, sarpogrelate) after undergoing PCI during the index period from January 2010 to December 2012 were included in the analysis. During the follow-up period up to December 31, 2014, the incidence of major adverse cardiovascular events (MACE) including death, myocardial infarction, target lesion revascularization, and ischemic stroke was assessed among the groups. Bleeding complications as adverse drug events were also evaluated.
RESULTS: Out of 93,876 patients with PCI during the index period, 69,491 patients started dual (AC) or triple antiplatelet therapy (ACC or ACS). At the 24-month follow-up, triple therapy groups had a similar incidence of MACE compared to dual therapy group (ACC vs. AC HR 1.32, $p = 0.452$, ACS vs. AC HR 1.045, $p = 0.401$). Rate of bleeding events did not differ among the groups (ACC vs. AC HR 1.01, $p = 0.738$, ACS vs. AC HR 1.27, $p = 0.698$). Comparing between triple therapy groups, ACS group was more effective in preventing MACE (HR 0.74, $p = 0.05$). Incidence of MACE was also lower in ACS group in patients with diabetes mellitus (HR 0.75, $p = 0.005$).
CONCLUSION: This study showed that triple antiplatelet therapies provide similar efficacy with no significant difference in bleeding risk compared to dual antiplatelet therapy in patients with ischemic heart disease who underwent PCI. Patients with diabetes mellitus may benefit more from using triple therapy with sarpogrelate.

345. Identifying days alive out of hospital as a useful metric to track success in an interdisciplinary heart failure disease management program *Erika Giblin, Pharm.D.*[1], Shawn Anderson, Pharm.D., BCACP[2], Allison White, Pharm.D.[1]; (1) North Florida/South Georgia Veterans Medical Center, Gainesville, FL (2) Department of Veterans Affairs, Gainesville, FL
PURPOSE: The increasing prevalence of heart failure (HF) is a growing health concern as it is associated with high morbidity and mortality, as well as a high cost and burden on the healthcare system. Heart failure disease management programs (HFDMP) have been implemented as a means to improve patient care and reduce cost. Days alive out of the hospital (DAOH) is a potential outcome measure that may help to estimate the total burden of HF and signify the impact of a HFDMP on this population. The purpose of this research is to assess the measure of DAOH and percent DAOH in a Veteran population participating in an interdisciplinary HFDMP in order to add useful information regarding the total disease state burden for those enrolled.

METHODS: A HFDMP was implemented at our institution in 2008. For the current study, we retrospectively reviewed HF patients followed in the program from October 1, 2008 to September 30, 2012. Data collected included baseline demographics and medical history, readmissions for HF, length of hospital stays, and mortality. DAOH and percentage DAOH were then calculated and assessed for each patient at specific time points: 30 days, 180 days, 365 days, and annually thereafter. Descriptive statistics were utilized to summarize endpoints and capture trends in DAOH, readmissions, and mortality. This retrospective analysis was IRB and VA R&D approved.
RESULTS: Preliminary results show an average DAOH of 87.95% among 633 patients enrolled during the initial three years of the HFDMP. Complete results are expected to be available at the ACCP 2015 Annual Meeting.
CONCLUSIONS: DAOH is not a fully appreciated quality metric. However, tracking this metric may highlight the total burden of HF and better quantitate the clinical benefit of interdisciplinary HF care.

346. Safety and efficacy of vitamin D supplementation after left ventricular assist device (LVAD) or heart transplantation (HT) *Ian Hollis, PharmD*[1], Prashanth Iyer, PharmD[2]; (1) Department of Pharmacy, University of North Carolina Medical Center, Chapel Hill, NC (2) University of North Carolina Hospitals, Chapel Hill, NC
PURPOSE: This retrospective study examined the use of daily vitamin D_3 (cholecalciferol) supplementation in left ventricular assist device (LVAD) and/or heart transplant (HT) patients to determine the dose required to achieve therapeutic levels without presenting a safety risk.
METHODS: Electronic records of 83 patients undergoing initial LVAD or HT implantation between January 1st, 2009 and July 1st, 2014 and who received cholecalciferol supplementation were included. Patients' age, weight, serum creatinine, serum calcium, and 25-hydroxy (25-OH) vitamin D levels were assessed at the time of surgery and after treatment to determine efficacy in correcting deficiency.
RESULTS: Cholecalciferol was prescribed at daily doses of 1000, 2000, 3000, and ≥4000 IU. Eighty-one percent of patients were subtherapeutic (<30 ng/mL) prior to treatment, with a mean level of (19.6 + /- 12.7). Baseline vitamin D levels were 19.3, 12.4, 13.1, and 15.6 ng/mL in the 1000, 2000, 3000, and ≥4000 IU groups, respectively. Levels increased by 14.8, 21.5, 25.9, and 18.7 ng/mL, respectively. Achievement of therapeutic levels occurred in 81%, 71.7%, 90%, and 71.4% of patients, respectively. Serum calcium increased from baseline by 0.33–0.63 mg/dL across the four groups with no patients experiencing hypercalcemia. Statistical comparison of these results along with efficacy relative to each patient's baseline weight is pending.
CONCLUSION: The incidence of vitamin D deficiency in our LVAD and HT patient population is very high. Correction with cholecalciferol at 1000–4000 units/day resulted in a comparably effective increase in levels with no safety concerns. Maintenance doses exceeding the current FDA recommendation of 600–800 IU/day and on par with The Endocrine Society's 1500–2000 IU/day in adults may be required to achieve therapeutic 25-OH levels in this patient population.

347. Appropriate monitoring to improve amiodarone safety and tolerability Sarah Norrid, Pharm.D.[1], Shannon W. Finks, Pharm.D.[2], Robert B. Parker, Pharm.D.[3], *Kelly C. Rogers, Pharm.D.*[2]; (1) Veterans Affairs Medical Center, Memphis, TN, USA (2) Department of Clinical Pharmacy, University of Tennessee College of Pharmacy, Memphis, TN, USA (3) University of Tennessee Dept of Pharmacy, Memphis, TN, USA
PURPOSE: Amiodarone is indicated for the treatment of ventricular and atrial arrhythmias but its use is complicated by an extensive adverse drug event (ADE) profile. ADEs affect multiple organ systems and vary in severity from minor to life threatening. Appropriate baseline and follow-up evaluation is warranted to provide early detection and prevention of ADEs. The North American Society of Pacing and Electrophysiology (NASPE) provide specific recommendations for monitoring of patients prescribed amiodarone. The purpose of this study was to assess compliance with these recommendations in patients at the Memphis Veterans Affairs Medical Center.
METHODS: A retrospective, single-site analysis of computerized medical records of veterans receiving amiodarone was performed. Baseline monitoring included assessment of liver function tests (LFTs), thyroid function tests (TFTs), pulmonary function tests with D_LCO (PFTs), chest x-ray (CXR), and electrocardiogram (ECG). Assessment of follow-up monitoring included LFTs and TFTs every 6 months, CXR and ECG annually, as well as any hospitalizations or emergency department visits secondary to ADEs.
RESULTS: One hundred patients were included for evaluation of baseline monitoring; rate of adherence was LFTs 94%, TFTs 79%, ECG 90%, CXR 63%, and PFTs 9%. Fifty-one patients were evaluated for 6 month follow-up; adherence rates were LFTs 61% and TFTs 35%; with only 33% of patients receiving both LFTS and TFTs. Thirty-five patients were evaluated for 12 month follow-up; rate of adherence was LFTs 54%, TFTs 31%, ECG 34%, and CXR 29%; with only 11% of patients receiving all tests.
CONCLUSION: Adherence to recommended amiodarone monitoring needs improvement. Based on this study, a standard order set for amiodarone is being developed to prompt providers to obtain appropriate monitoring tests. After implementation, we plan to re-examine compliance with NASPE guideline recommendations to assess improvement in adherence.

348. Characterization of Heparin-Induced Thrombocytopenia in Status 1A Cardiac Transplant Candidates *Shannon Piche,PharmD*, Scott Nei,PharmD, Ilya Danelich,PharmD, Yuk Ting Lydia Leung, PharmD, Jennifer Lose,PharmD, Gregory Barsness,MD, Narith Ou, PharmD; Mayo Clinic Hospital, Rochester, MN
PURPOSE: Development of heparin-induced thrombocytopenia (HIT) in status 1A cardiac transplant candidates is potentially detrimental as it affects anticoagulant choice for cardiopulmonary bypass during transplantation. This study aims to determine the incidence of HIT in patients awaiting cardiac transplant as well as characterize the relationship between the cumulative amount of heparin administered and the duration of exposure with subsequent development of HIT.
METHODS: A single-center retrospective analysis was conducted in cardiac transplant candidates listed as status 1A between January 1, 2004 and February 1, 2015. Clinical HIT was diagnosed in individuals with a positive serotonin release assay, a positive platelet factor-4 enzyme-linked immunosorbent assay (PF4 ELISA) with a heparin reactivity >40% and heparin inhibition >50%, or a hematology consultation diagnosis of clinical HIT. The amount of heparin administered and heparin exposure were collected for all study participants and compared between HIT-positive and HIT-negative individuals.
RESULTS: A total of 83 patients met enrollment criteria. A PF4 ELISA for the HIT-antibody was performed prior to transplantation in 26% (n = 22), among those evaluated, 5 of 83 (6%) patients were diagnosed with HIT. The median total heparin administered in HIT-positive and HIT-negative individuals was 2300 units/kg (1188 – 7766 units/kg) and 2506 units/kg (987 – 7484 units/kg), respectively (hazard ratio 1.003, p = 0.96). The median number of days on heparin was 22 days (8 – 27 days) in HIT-positive individuals as compared to 14 days (6 – 35 days) in HIT-negative individuals (p = 0.78).
CONCLUSION: There was no difference between HIT-positive and HIT-negative individuals when comparing the total heparin dose and number of days on heparin therapy, thus, limiting hep-

arin exposure in status 1A transplant candidates may not be necessary.

349. An inpatient multidisciplinary educational approach to reduce 30-day heart failure readmissions *Ahmed Aljabri,Pharm.D.*[1], Ferena Salek,Pharm.D.[2], Linda Calkins,RPh, MPH[2], Kyle Malhotra, Pharm.D./MPH candidate[3], Deborah Dienst,RN[2], Karen Smith,PhD, RPh[4]; (1) Center for Health Outcomes & PharmacoEconomic Research, University of Arizona College of Pharmacy, Tucson, AZ (2) Northwest Medical Center, Tucson, AZ (3) College of Pharmacy, University of Arizona, AZ (4) School of Pharmacy, Regis University, Denver, CO

PURPOSE: Northwest Medical Center (NMC) implemented a multidisciplinary intervention in efforts to reduce heart failure (HF) readmissions and improve quality of care. This study is designed to evaluate the impact of NMC's multidisciplinary approach on 30-day HF readmissions.

METHODS: This retrospective observational study included patients ≥18 years old admitted to NMC with documented HF diagnosis and excluded patients discharged to hospice. Intervention components were: (1) inpatient pharmacy student counseling; (2) inpatient HF education provided as a group class to patients and caregivers and/or inpatient HF nurse one-on-one education; and (3) follow-up phone call 1-3 days post-discharge reinforcing important HF topics. Intervention patients were compared to a historical group (control) who were admitted prior to implementation of readmission penalties mandated by the Affordable Care Act. The primary outcome was readmission to NMC within 30 days post HF discharge.

RESULTS: A total of 221 patients were identified in the intervention and 183 in the control groups. Of the patients in the intervention group, 44.8% (n = 99) received only pharmacy student counseling, 47.1% (n = 104) received HF education, 25.3% (n = 56) were contacted 1-3 days post discharge; and only 10.4% (n = 23) received all intervention components. The difference in the primary outcome was not statistically different with a 3.8% (n = 7) readmission rate in the control group compared to 4.5% (n = 10) in the intervention group (p = 0.73). Univariate analysis demonstrated a significant association between pharmacy student counseling and 30-day HF readmissions (p = 0.03); however, no difference was observed after adjusting for all variables.

CONCLUSION: Neither the intervention nor components were associated with significant reduction in the primary outcome. This may be due to study limitations: the incidence of readmissions was small thus limiting study power; many opportunities to provide the intervention were missed; and we were unable to adjust for increased risk that may occur with severe disease.

350. Rates of clinically significant bleeding and venous thromboembolism in surgical patients receiving prophylactic rivaroxaban *Andi Corya,PharmD*[1], Emily Hutchison,PharmD, BCPS[1], Alexis Paris,PharmD[2], Sara Hart,PharmD, BCPS[1]; (1) Indiana University Health (2) Purdue University

PURPOSE: Venous thromboembolism (VTE) is a life-threatening complication in traumatically injured and orthopedic patients, with a reported incidence up to 58%. Despite prophylaxis with enoxaparin, VTE rates in these at risk patients remain high. Rivaroxaban has been studied for VTE prophylaxis in patients undergoing elective total hip or knee arthroplasty. Compared to enoxaparin, rivaroxaban had a similar safety profile with increased efficacy in preventing VTE. The purpose of this study is to evaluate the efficacy and safety of rivaroxaban for VTE prophylaxis in trauma and orthopedic patients.

METHODS: A retrospective cohort of patients admitted to IUH Methodist Hospital for orthopedic or trauma services between June 2011 and May 2014 was performed. The primary efficacy endpoint is rate of documented VTE (pulmonary embolism [PE] or deep vein thrombosis [DVT]). Primary safety endpoint is development of a clinically significant bleeding event during the duration of prophylactic rivaroxaban therapy.

RESULTS: A total of 854 patients received at least 1 dose of rivaroxaban during hospital admission were evaluated for inclusion. Eighty-four patients were excluded based on inmate status, pregnancy, age (<18 years), or if non-prophylactic rivaroxaban was used (>10 mg daily), leaving 770 patients included in the analysis. All patients were admitted for trauma or orthopedic care. Four patients were diagnosed with a VTE event (0.52%, 2 DVTs and 2 PEs) after receiving at least 1 dose of rivaroxaban. Two patients were diagnosed with a bleeding complication while on prophylactic rivaroxaban (0.26%, 2 gastrointestinal bleeds). A composite endpoint of patients who had neither a VTE nor bleeding event was observed in 99.2% of patient who received rivaroxaban for VTE prophylaxis.

CONCLUSIONS: Retrospective data analysis demonstrated a low rate of VTE and bleeding events in this population. Rivaroxaban may offer a viable alternative VTE prophylaxis agent for patients after a traumatic injury or orthopedic procedure.

351. Comparative effectiveness of milrinone vs dobutamine on out-of-hospital mortality in patients with acute decompensated heart failure *Jordan King,PharmD*[1], Amy Sainski-Nguyen,PhD[1], Rashmee Shah,MD, MS[2], Mark Munger,PharmD[1], Joseph Biskupiak,PhD, MBA[1], Adam Bress,PharmD[1]; (1) Department of Pharmacotherapy, University of Utah, Salt Lake City, UT (2) Division of Cardiovascular Medicine, University of Utah, Salt Lake City, UT

PURPOSE: Dobutamine is associated with an increased risk of in-hospital mortality compared to milrinone for the treatment of acute decompensated heart failure (ADHF). Their relative associations with post-hospitalization mortality have not been established.

METHODS: We performed a retrospective analysis of patients who survived hospitalization with ADHF that included treatment with dobutamine or milrinone, between 01/01/00 to 12/31/14. ADHF was defined as an ICD-9 code 428.x, receipt of an IV loop diuretic and/or BNP values >400 pg/mL during admission. We compared all-cause and cardiovascular specific mortality, and 30 day all-cause re-hospitalization between patients treated with milrinone versus dobutamine using stabilized inverse probability (IP) weighted logistic regression models.

RESULTS: We identified 767 patients who survived ADHF hospitalization that included treatment with dobutamine or milrinone. Mean age was 62 years, 65.4% were male, the mean left ventricular ejection fraction was 42%, and 96% received an IV loop diuretic. More milrinone patients received concomitant vasodilators than dobutamine patients (38% vs 25%). After IP weighting, baseline characteristics were similar between the milrinone-treated (n = 258) and dobutamine-treated (n = 509) groups. In the IP weighted analysis, 30-day mortality was 4.4% for dobutamine compared with 1.2% for milrinone (OR 3.8, 95%CI 1.2 to 12, p = 0.02). The 30-day cardiovascular specific mortality was 4.2% for dobutamine as compared with 1.2% for milrinone (OR 3.64, 95%CI 1.1 to 12, p = 0.03). All-cause rehospitalization within 30 days was similar between treatment groups (OR 0.9, 95%CI 0.59 to 1.4, p = 0.68).

CONCLUSION: Among patients hospitalized for ADHF and prescribed an inotrope, dobutamine was associated with an increased risk of 30-day mortality compared with milrinone. These results should be confirmed in a randomized study to define evidence based pharmacotherapy for ADHF.

352. Initiation or Discontinuation of Guideline Directed Medical Therapy Among Hospitalized Patients with Heart Failure *Eliza Daubert,PharmD*[1], Khalid Alburikan,PharmD[1], Richard Tran, PharmD[1], Patricia Chang,MD, MS[2], Carla Sueta,MD, PhD[2], Brystana Kaufman,MSPH[3], Anna Kucharska-Newton,PhD[4], Orly Vardeny,PharmD[5], Sally Stearns,PhD[4], Jo E. Rodgers,PharmD, FCCP, BCPS (AQ Cardiology)[6]; (1) Division of Pharmacotherapy and Experimental Therapeutics, University of North Carolina Eshelman School of Pharmacy, Chapel Hill, NC (2) School of Medicine, University of North Carolina, Chapel Hill, NC (3)

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PURPOSE: Guideline directed medical therapies (GDMT) such as angiotensin-converting enzyme inhibitors/angiotensin receptor blockers (ACEI/ARB), beta blockers (BB), and aldosterone receptor antagonists (ARA) have been shown to improve outcomes in heart failure (HF). Often, one or more of these medications are modified during hospitalization. This study will investigate factors predicting inpatient initiation or discontinuation of GDMT and the association of changes in GDMT with mortality following discharge.

METHODS: Data from the community surveillance arm of the Atherosclerosis Risk In Communities (ARIC) Study was used to identify 6,959 HF hospitalizations (2005-2012) by ICD-9-CM codes. Trained abstractors reviewed medical charts with physician review and adjudication of all eligible cases. Sampled hospitalizations were classified as acute decompensated HF (ADHF) or chronic stable HF and typed as HF with reduced ejection fraction (HFrEF) or preserved EF (HFpEF). Predictors of GDMT modification, including various demographic characteristics and comorbidities, and one-year mortality will be estimated using logistic regression. Time to death will be estimated with a Cox proportional hazard model.

RESULTS: Patients were mean age of 74 years, 51% male, and 58% white; 79% had ADHF and 35% HFrEF. Common comorbidities were hypertension (85%), chronic kidney disease (65%), diabetes (48%), and respiratory disease (39%). Patients were receiving ACEI/ARB (57%), BB (66%), ARA (9%), and digoxin (15%). Discontinuation of GDMT occurred in 44% of those receiving ACEI/ARB, 8% BB, 27% ARA, and 20% digoxin. In patients not receiving GDMTs, initiation of GDMT occurred in 19% ACEIs/ARBs, 36% BBs, 5% ARAs, and 6% digoxin. More frequent initiation of select GDMT occurred in ADHF and HFpEF and discontinuation in HFrEF.

CONCLUSIONS: Preliminary results suggest GDMT modification occurs frequently during hospitalization. Final analyses of predictors of GDMT modification and related mortality are ongoing.

Community Pharmacy Practice

354. Implementation steps and strategies fostering success of medication management services in community pharmacies *Deborah Pestka,PharmD*[1], Caitlin K. Frail,PharmD, MS, BCACP[2], Jeannine Conway,PharmD[3], Bethany Von Hoff,PharmD[1], Laura Palombi, PharmD, MAT[4], Todd D. Sorensen,PharmD[2]; (1) Social and Administrative Pharmacy, University of Minnesota College of Pharmacy, Minneapolis, MN (2) Pharmaceutical Care and Health Systems, University of Minnesota College of Pharmacy, Minneapolis, MN (3) Experimental and Clinical Pharmacology, University of Minnesota College of Pharmacy, Minneapolis, MN (4) Pharmacy Practice and Pharmaceutical Sciences, University of Minnesota College of Pharmacy, Duluth, MN

PURPOSE: The purpose of this project was to determine what factors have led to the successful delivery of medication management services among community pharmacies with established medication management programs.

METHODS: Four organizations with community pharmacies in Minnesota were identified that have established patient-centered clinical services. Focus groups with pharmacists as well as interviews with management from each organization were carried out focusing on what has led to the success of their services. Transcripts from the focus groups and interviews were aggregated, coded, and emerging themes were defined.

RESULTS: Preliminary findings suggest that implementing and sustaining medication management services in a community pharmacy is a cyclical process that is continuously evolving and expanding. It begins with a decision to act and the steps that are necessary to lay the inital groundwork. Once the service is in place and pharmacies have identifed strategies to successfully engage patients, they then look for ways to improve and exand the services being offered. Data analysis will be complete by July 2015.

CONCLUSION: With quality measures continuing to have a greater impact on pharmacies, there is increased incentive for community pharmacies to offer patient-centered medication management services. The results of this study may serve as a road map for other community pharmacies looking to develop patient-care services.

Critical Care

355. Is the use of vasopressin during in-hospital cardiopulmonary resuscitation associated with improved return of spontaneous circulation? *Melissa Quinn, PharmD*[1], Matthew J. Korobey, PharmD, BCPS[2], Carmen B. Smith, PharmD, BCPS[1]; (1) St. Louis College of Pharmacy, St. Louis, MO, USA (2) Mercy Hospital St. Louis, St. Louis, MO, USA

PURPOSE: To determine if the addition of vasopressin compared to epinephrine alone is associated with improved return of spontaneous circulation (ROSC) during in-hospital cardiac arrest.

METHODS: A single center, case-control, retrospective review from July 2013 to December 2014 in patient's ≥18 years of age with documented in-hospital cardiac arrest who received vasopressin or epinephrine. The primary outcome was the incidence of ROSC in those who received vasopressin compared to those who received epinephrine alone. Secondary outcomes included percentage of vasopressin doses administered appropriately, effectiveness of vasopressin when administered appropriately, and subgroup analyses of the primary outcome according to presence of infectious process, initial arrest rhythm, survival to hospital discharge, and survivor's cerebral performance category score.

RESULTS: A total of 96 patients were included: 30 in the vasopressin group and 66 in the epinephrine alone group. No difference in rate of ROSC was found between patients who received vasopressin vs. epinephrine alone (68.1% vs 66.7%, $p = 1.0$). Vasopressin was administered appropriately 57% of the time. Achievement of ROSC within the vasopressin group was significantly higher when administered appropriately (88% vs 38%; $p = 0.007$). Patients who received epinephrine alone compared to those who received vasopressin were more likely to survive to hospital discharge (33.3% vs 5%, $p = 0.014$). However, survivors CPC scores at discharge were better in the vasopressin vs. epinephrine alone ($2 + 0.0$ vs $3.9 + 1.01$; $p < 0.001$). No difference in outcome based on the presence of infectious process or initial presenting rhythm were observed.

CONCLUSION: The use of vasopressin compared to epinephrine alone was not associated with improved ROSC during in-hospital cardiac arrests. A higher rate of ROSC was observed when vasopressin was administered appropriately as the first or second replacement dose of epinephrine. The use of epinephrine alone may be associated with higher survival to hospital discharge, but higher CPC scores compared to vasopressin.

356. Steady-state pharmacokinetic comparison of intermittent vs continuous infusion valproic acid therapy in non-critically ill and critically ill patients *Edward Van Matre,PharmD*[1], Meriem Bensalem-Owen,MD[2], Zafar Muhammad,MD[2], Sally Mathias,MD[2], Alejandra Stewart,MD[2], Ana Albuja,MD[2], Aaron Cook,PharmD[1]; (1) Department of Pharmacy, University of Kentucky HealthCare, Lexington, KY, USA (2) Department of Neurology, University of Kentucky HealthCare

PURPOSE: Valproic acid (VPA) is a broad-spectrum antiepileptic drug that can be used for acute seizures, status epilepticus, and other indications such as migraine. The relatively short half-life seen with traditional intermittent intravenous bolus doing

may lead to serum concentration variability. Continuous infusion VPA therapy is an approach to mitigate these pharmacokinetic and dynamic effects. The objective of this study is to characterize the pharmacokinetics of continuous infusion of VPA in acutely ill patients and to determine dosing regimens that most frequently obtain goal steady-state serum concentrations.
METHODS: This is a retrospective pharmacokinetics study in acutely ill adult patients receiving continuous infusion VPA per our institutional protocol for seizures or status migrainosus. Pharmacokinetic parameters were reviewed for 234 patients (25 critically ill) and compared between the two groups (non-critical care vs critical care) utilizing student t-test and Chi-squared tests where appropriate. Intermittent and continuous infusion dosing strategies were modeled utilizing Monte Carlo simulations for both cohorts. Frequencies of serum concentration attainment were reported.
RESULTS: The percent target attainment for the non-critically ill group and critically ill group were 69.4% and 58.3% (p = 0.282) post-loading dose and 69.7% and 37.5% (p = 0.004) steady state respectively. The volume of distribution was significantly different between the two groups (0.35 vs 0.68 L/kg, p = <0.0001). Highest frequency of target attainment (50–100 μg/ml) occurred in the continuous infusion 2 mg/kg/hr simulation for both critically ill (45.19%) and acutely ill (48.16%) groups.
CONCLUSION: Critically ill patients have an increased volume of distribution requiring higher doses of VPA to obtain therapeutic levels. Continuous infusion VPA provides more consistent serum steady-state concentrations while mitigating pharmacokinetic variability.

357. The effect of acetaminophen on acute kidney injury and mortality in patients with severe sepsis *Ohoud Aljuhani,PharmD*[1], Hussain Bakhsh,PharmD[1], Brian Erstad,PharmD[1], Scott Strassels, PharmD, PhD[2], Asad E. Patanwala,Pharm.D.[1]; (1) Pharmacy Practice and Science, The University of Arizona College of Pharmacy, Tucson, AZ (2) Health Economics & Outcomes Research, Mallinckrodt Pharmaceuticals, Hazelwood, MO
PURPOSE: Acetaminophen (APAP) has been shown to inhibit lipid peroxidation associated with cell-free hemoproteins. It is hypothesized that this effect of APAP may be renal protective and improve outcomes in patients with sepsis. The purpose of this study was to determine the effect of APAP on acute kidney injury (AKI) and mortality in patients with severe sepsis.
METHODS: This was a retrospective cohort study conducted at two affiliated academic medical centers in the United States. Consecutive adult patients who were admitted to the intensive care unit with a diagnosis of severe sepsis between November 1st, 2013 and September 1st, 2014 were included. Patients were categorized based on whether APAP was received within the first seven days of hospitalization (APAP or non-APAP groups). The primary outcome measure was occurrence or increase in AKI stage from admission, defined by the Kidney Disease Improving Global Outcomes guidelines. The secondary outcome measure was in-hospital mortality. The Fisher's exact test was used to compare outcomes between groups. Multivariate logistic regression analysis was used to adjust for Severity of Organ Failure Assessment and Charlson Comorbidity Index.
RESULTS: There were 238 patients who were included in the study cohort. The mean age was 59 ± 18 years and 54% were male. The occurrence or increase in AKI stage was similar between the APAP and non-APAP groups (16% versus 20%, $p = 0.505$, respectively). In-hospital mortality was lower in the APAP group (18% versus 36%, $p = 0.002$). After adjusting for pertinent confounders, in-hospital mortality remained lower in the APAP group (OR 0.48, 95% CI 0.26 to 0.92, $p = 0.013$).
CONCLUSION: The use of APAP in patients with severe sepsis did not prevent AKI, but may be associated with decreased in-hospital mortality

358. Dexmedetomidine vs. propofol in cardiac surgery patients *Eunbae Lee,PharmD*[1], Brian Kopp,PharmD[2], Robyn Basken, PharmD[2], Asad E. Patanwala,Pharm.D.[3]; (1) College of Pharmacy, The University of Arizona College of Pharmacy, Tucson, AZ (2) Department of Pharmacy, Banner University Medical Center Tucson, Tucson, AZ (3) Pharmacy Practice and Science, The University of Arizona College of Pharmacy, Tucson, AZ
PURPOSE: Objective of this study was to compare dexmedetomidine and propofol with regard to intensive care unit (ICU) length of stay, duration of mechanical ventilation, and total hospital costs in post-operative cardiac surgery patients.
METHODS: This was a retrospective cohort study conducted in adult cardiac surgery patients at an academic institution in the United States. Consecutive patients were included between September 2011 and October 2013. Patients were categorized into two groups based on whether they received dexmedetomidine or propofol for post-operative sedation. Patients who received both agents were excluded. Data collected included relevant past medical history, comorbidities, sedatives and analgesics received, intraoperative data such as cardiopulmonary bypass time, and outcome variables. ICU length of stay, duration of mechanical ventilation and total cost of hospitalization were compared between the two groups using the Wilcoxon rank sum test.
RESULTS: Of the 185 records reviewed, 64 patients in dexmedetomidine group and 17 patients in propofol group were included for the analysis. Median ICU length of stay was significantly shorter in dexmedetomidine group compared to that of the propofol group (3 days vs. 6 days; $p = 0.035$). Median duration of mechanical ventilation was also significantly shorter in the dexmedetomidine group (15 hours vs. 32 hours; $p = 0.003$). There was a trend toward decreased total hospital cost in the dexmedetomidine group compared to the propofol group (median $50539 vs. $61875; $p = 0.2146$).
CONCLUSION: Dexmedetomidine may be associated with decreased ICU length of stay, duration of mechanical ventilation, and total hospital cost compared to propofol in cardiac surgery patients. The study is limited by small sample size and the potential for selection bias. Larger prospective studies are needed to confirm these results.

359. Effect of abrupt discontinuation of antidepressant therapy in critically ill hospitalized adults *Taryn B. Satterwhite,Pharm.D.*[1], Krystal K. Haase,Pharm.D., FCCP, BCPS[2], Diana Mechelay,Pharm.D. Candidate[1]; (1) School of Pharmacy, Texas Tech University Health Sciences Center, Amarillo, TX (2) Texas Tech University Health Sciences Center School of Pharmacy, Amarillo, TX
PURPOSE: Antidepressant discontinuation syndrome (ADS) is a complication resulting from abrupt discontinuation of antidepressant medications. It causes a myriad of symptoms and negatively affects quality of life. Though well documented in the outpatient setting, the frequency and impact of ADS in hospitalized patients is unknown. We sought to determine if ADS symptoms occur more frequently in patients discontinued from chronic selective serotonin (SSRI) or serotonin norepinephrine reuptake inhibitors (SNRI) compared to those continued on therapy during hospitalization. We compared frequency of symptom-targeted treatment, length of stay (LOS), and excess days over the geometric mean length of stay (GMLOS). We also sought to identify patient and treatment characteristics that were associated with higher likelihood of ADS.
METHODS: We reviewed all adult patients admitted to the intensive care unit for ≥72 hours between 9/1/2013-8/30/2014 with documented SSRI/SNRI home medications. Patients with admitting diagnoses or symptoms that overlapped with ADS were excluded. Patients were categorized based on continuation of SSRI/SNRI therapy upon admission. Demographics, diagnosis, comorbidities, symptoms, and treatment characteristics were collected. The primary endpoint and categorical secondary endpoints were compared using chi-square or Fisher's exact test and length of stay endpoints were analyzed using Mann–Whitney *U*.

RESULTS: One hundred and six of 890 patients reviewed met inclusion/exclusion criteria. Therapy was continued in 61.3% of patients. ADS symptoms occurred at a higher rate in the discontinued group (43.9% vs. 23.1%, $p = 0.024$) and affective symptoms were most notable (34.1% vs. 10.8%, $p = 0.005$). This persisted when assessing the subgroup of patients who were intubated (57.9% vs. 14.3%, $p = 0.015$). Medication administration did not differ between groups though a trend toward increased use of antidiarrheals was seen in the continuation group. No differences were found in LOS endpoints.
CONCLUSION: Abrupt discontinuation of antidepressant therapy is frequent in ICU patients. This may result in ADS symptoms but larger studies are needed to determine impact on patient outcomes.

360. The influence of acid suppressants on oral and fecal microbiomes in critically ill patients *Lauren Roller,PharmD*[1], Robert MacLaren,PharmD[2], Tyree Kiser,PharmD[2], Scott Mueller, PharmD[2], Douglas Fish,PharmD[2], Paul Wischmeyer,MD[3]; (1) University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO (2) Department of Clinical Pharmacy, University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO (3) University of Colorado Health
PURPOSE: Histamine receptor-2 antagonists (H2RAs) or proton pump inhibitors (PPIs) are frequently administered to patients in intensive care units (ICUs) to prevent stress-related mucosal bleeding. These agents may alter the microbiome of the gastrointestinal tract (GIT) by limiting gastric acid production. This study assessed whether microbiomes are disturbed differently by H2RAs and PPIs in ICU patients.
METHODS: Patients were subjects of a prospective study that collected oral and fecal samples after 24 hours and 10 days of ICU admission. Phylogenetic analyses of small-subunit rRNA gene sequence profiled the operational taxonomic units (OTUs) of numerous bacterial sequences referenced against Greengenes 13_8. Clinical information was extracted retrospectively from existing medical records. The primary outcome used principle coordinate analyses (PCO) with distance matrices to compare the weighted relative abundance of OTUs for oral and fecal samples of each group over time.
RESULTS: Demographic parameters, admission characteristics, and nutrition variables of H2RA (n = 17) and PPI patients (n = 42) were similar. Overall, 30 (51%) were male, 35 (59%) were in the medical ICU, APACHE II score was 26 ± 6, and the duration of mechanical ventilation was 14 ± 7 days. PCO analyses revealed no delineated clustering of OTUs by acid suppressant groups for either oral or fecal samples. The fecal microbiome showed changes over time, irrespective of the acid suppressant group, that was driven by *Firmicutes* abundance.
CONCLUSION: H2RAs and PPIs did not differentially alter the microbiomes of oral or fecal samples in ICU patients. The study was not adequately powered to show a difference as it was a posthocexploratory analysis of a prospective study with the acid suppressant regimen chosen by the bedside clinician. Further studies are warranted to investigate the effect of acid suppressants on the microbiome of the upper GIT. The fecal microbiome is altered by ICU stay with *Firmicutes* abundance representing the driving influence.

361. Anticoagulation with Heparin during Therapeutic Hypothermia after Cardiac Arrest *Katy Allen,PharmD*, Lisa Hall Zimmerman,PharmD, Joshua Steelman,PharmD, Lesly Jurado, PharmD; New Hanover Regional Medical Center, Wilmington, NC
PURPOSE: Therapeutic hypothermia (TH) has been employed after out of hospital cardiac arrest (OOHCA) in patients after return of spontaneous circulation (ROSC). Therapeutic anticoagulation with intravenous unfractionated heparin (UFH) is used after OOHCA, and the metabolism of heparin during TH is not well defined. The purpose was to determine the appropriate dosing strategy with UFH therapy during TH in OOHCA patients.
METHODS: This retrospective cohort study included patients age ≥ 18 years from January 2012 to December 2014. Patients included received UFH during TH after OOHCA. Protocolized heparin dosing for acute coronary syndrome (ACS) was 60 units/kg followed by 12 unit/kg/hr with a target aPTT 57–89 seconds. Heparin dosing was divided into three dosing groups: 11.0–12.0, 9.0–10.9, and 6.0–8.9 units/kg/hr to evaluate resultant aPTT. Two phases of TH were evaluated: 0–24 hours cooling, 25–48 hours rewarming.
RESULTS: Of the 335 patients admitted after OOHCA with ROSC during the study period, 22 patients met inclusion. The mean age was 59 ± 13 years. During 0–24 hours of TH, resultant aPTTs were: 11.0–12.0 units/kg/hr provided aPTT 128.7 ± 54.0 sec; 9.0–10.9 unit/kg/hr provided aPTT 114.6 ± 57.0 sec; and 6.0–8.9 units/kg/hr provided aPTT 91.1 ± 41.3 sec. Heparin dosed at 11.0–12.0 units/kg/hr resulted in supra-therapeutic aPTTs 60% of the time. Overall, an initiation dose of UFH with 7 units/kg/hr provided a target aPTT of 57–89 sec during the 0–24 of TH. Evaluating 25–48 hours TH, aPTTs remained in target range with heparin dosing of 6.0–8.9 units/kg/hr. Nine patients received transfusions with only major bleeding occurred in 9%.
CONCLUSION: Therapeutic anticoagulation dosing of UFH can result in supra-therapeutic aPTT during the cooling phase of TH. A reduced initiation heparin dosing strategy should be employed during TH. Further investigation will help determine titration needs as temperatures change occur in the first 48 hours of acute care of the OOCA patient undergoing TH.

Drug Information

362. Evaluation of knowledge of Health care professionals on warfarin interactions with drug and herb medicinal in Riyad City *Mohamed Alarifi,PhD*; Clinical Paharmacy, College of Pharmacy, King Saud University, Riyadh, Saudi Arabia
PURPOSE: To evaluate health care professionals' knowledge on warfarin interactions with drugs and herbs.
METHODS: A self- administered questionnaire was developed to assess health care professionals' knowledge on warfarin interactions with drug and herb. Respondents were asked to classify 15 drugs that may effect on warfarin action as "enhance", "inhibit ", "no effect". A 6 question that measured HCPs' knowledge about warfarin – herb interactions. They were asked to identify herbs that effect on warfarin anticoagulants therapy as "yes" or "no". A response option of "don't know" also used. The study sample involved health care professionals (physicians, pharmacist sand nurses) from king Salman hospital, Saudi Arabia
RESULTS: The percent of health care professionals who correctly identified warfarin interactions with specific ranged from 4.4% forwarfarin and fluoxetine to 92.2% forwarfarin and aspirin. Warfarin and cardiac agents (atenolol) was correctly identified by 11.1% ofrespondents. In warfarin –herb interactions section, the majority of respondents (66.7%) identified the interaction between green tea and warfarin. More than half of respondents knew the interaction of warfarin with Ginkgo biloba and ginseng. Approximately one-third of respondents (n = 33) correctly classified warfarin interactions with cardamom.No significant difference was found between the health care professionals ($p = 0.49$) for warfarin-drug interactions knowledgescore and$p$= 0.52 for warfarin-herb interactions knowledge score.
CONCLUSION: This study suggests that health care professionals' knowledge of warfarin- drug-herb interactions was inadequate. Therefore, health care professionals should receive more education programsabout drug-drug/herb interactions to provide appropriate patient counseling and optimal therapeutic outcomes

Education/Training

363. Physical assessment simulations - a new teaching learning experience for Pharm. D Curriculum *Mukesh Kumar,Pharm.D*; Pharmacy Practice, Gulf Medical University, Ajman, United Arab Emirates
PURPOSE: To evaluate the teaching and learning outcomes of various simulation techniques used to teach physical assessment skills to Pharm. D students.
METHODS: A total of 42 students belonging to 3 batches of Pharm.D 8th semester registered for physical assessment course between 2012 1nd 2014 were provided training using various techniques for a period of 15 week. Simulation sessions like Intravenous cannulation, subcutaneous injection, and intranasal intubation, and other procedural skills were conducted using part task trainer. Full body mannequin was used to teach Basic Life Support (BLS), First aid and airway management. The training on systemic examination skills was provided using subject volunteers. The students were evaluated at regular intervals to assess their learning abilities and skills attained. Student feedback on simulation based teaching was also obtained using a structured questionnaire.
RESULTS: Majority of students (92%) strongly agreed that quality of training provided was excellent and students were very confident in practicing physical assessment skills on a simulation based training using mannequin. The high scores obtained during feedback response indicate that mannequin models offer higher quality of training in acquiring the physical assessment skills. As an advantage of this module, instructors were able to repeat experiments and adjust teaching environment suitably at different levels of understanding of the students.
CONCLUSION: This study indicates that training sessions with mannequin can serve as a better tool as compared to standardized patients to provide physical assessment training skills

364. Evaluation of nursing comprehension on high-alert medications following pharmacy education *Francis Zamora,Pharm.D.*[1], Rani Madduri,Pharm.D., BCPS, AAHIVP[1], Mona Patel,Pharm.D.[1], Philip Coco,Pharm.D., BCPS[1], Thom K. Nguyen,Pharm.D., BCPS, CTTS[2]; (1) Department of Pharmaceutical Services, Hunterdon Medical Center, Flemington, NJ (2) Department of Pharmacy Practice and Administration, Rutgers, The State University of New Jersey, Piscataway, NJ
PURPOSE: High-alert medications possess the risk of causing significant patient harm when utilized incorrectly. The Joint Commission mandates that each hospital must not only develop a list of high-alert medications but also establish processes to manage and implement them. The adherence by nursing staff to policies and procedures pertaining to these agents is an imperative component of safe medication practices. The purpose of this study was to evaluate the effectiveness of a pharmacy driven educational in-service to the nursing staff and assess their knowledge regarding the use of high-alert medications.
METHODS: Upon review of the institution's high-alert policies and procedures, the pharmacy resident developed and distributed a pre-assessment at various nursing staff meetings. Pre-assessments were graded and a data collection sheet was utilized to document the results and identify knowledge gaps. The resident then designed an in-service and presented it to the nursing staff throughout the hospital. A post-assessment was generated and distributed two weeks after the in-services to assess comprehension and retention of information. Statistical significance was established by comparing pre- and post-assessment average scores utilizing a Student's t-test. Average scores per question were also calculated and compared.
RESULTS: The post-assessment scores were found to be higher than the pre-assessment scores (66% vs. 85%, $p < 0.001$). While improvement was noted overall, assessment scores remained relatively unchanged in the following areas despite education: documentation of independent double-check prior to administration of high-alert medications and understanding of the high-alert medication list's applicability and customizability per nursing unit. Long term sustainability of comprehension of the information presented could not be assessed due to time constraints.
CONCLUSIONS: A pharmacist-driven nursing in-service resulted in a greater understanding of policies and procedures pertaining to high-alert medications. These results will be shared with Staff Development and Pharmacy Clinical Generalists to incorporate into routine educational activities.

365. Introducing simulation-based learning in pharmacy education in Singapore *Chai Ling Ong,BSc (Pharm) (Hons)*[1], Sandra L. Kane-Gill,PharmD, MSc, FCCM, FCCP[2], Lawrence R. Kobulinsky, CHSOS[1], Amy Lynn Seybert,PharmD[3]; (1) Department of Pharmacy and Therapeutics, School of Pharmacy, University of Pittsburgh, Pittsburgh, PA (2) Department of Pharmacy and Therapeutics, University of Pittsburgh School of Pharmacy, Pittsburgh, PA (3) School of Pharmacy, University of Pittsburgh, Pittsburgh, PA
PURPOSE: High fidelity human patient simulation (HPS) has been incorporated in various PharmD programs in the United States with favorable learning experiences, better knowledge retention and problem solving skills reported. In Singapore, high fidelity HPS is a novel learning technique for pharmacy education as it has not been utilized in the Bachelor of Science (Pharmacy) curriculum or for continuing professional education (CPE). We wanted to evaluate the acceptance of using high fidelity HPS in pharmacist education, beginning in the context of CPE. The purpose of this study was to compare participants'™ acceptance of HPS compared to online independent self-learning (ISL).
METHODS: There were nineteen pharmacists and pre-registration pharmacists recruited from the National Heart Centre Singapore and Singapore General Hospital. Informed consent was obtained prior to randomization into groups A and B. Group A completed ISL followed by a simulation-based activity (SBA), whereas group B completed them in reverse order to minimize sequential influence. Acceptance of teaching modalities was evaluated with a survey. Educational content for SBA and ISL was congestive heart failure that was evaluated by external reviewers for equivalency.
RESULTS: 16 (84.2%) participants were female and 11 (57.9%) aged 21 to 30 years old. All participants enjoyed the SBA compared to 13 (68.4%; $p = 0.0197$) for ISL. Sixteen (84.2%) and 17 (89.5%) agreed that SBA and ISL should be part of a CPE session respectively ($p = 1.0000$). Eighteen (94.7%) in both groups agreed SBA and ISL advanced their knowledge. Eighteen (94.7%) and 15 (78.9%) felt that SBA and ISL improved their critical and decision making skills respectively ($p = 0.3398$).
CONCLUSION: Simulation-based learning was well received by participants in Singapore and can be implemented in CPE.

366. Using Structured Simulations to Teach PharmD Students about the Drug Development Process *Hari Varun Kalluri,PharmD*, Kacey Anderson,BS, Randall Smith,PhD; Department of Pharmaceutical Sciences, School of Pharmacy, University of Pittsburgh, Pittsburgh, PA
PURPOSE: Drug development(DD) process is an important component of pharmacy education but is difficult to teach in a way that is interactive, meaningful, and realistic for students. We re-designed a core course in the first-year of PharmD program at the University of Pittsburgh to teach the DD process through highly-interactive exercises involving sophisticated simulations.
METHODS: This novel lesson plan was implemented over several consecutive practicum sessions in which students worked in groups as part of clinical DD teams. Student groups had the opportunity to design a first-in-human Phase-I trial based on preclinical data of a hypothetical drug. Simcyp®(Certara) was used to generate detailed individualized Phase-I trial output and Sim-Man-3G patient-simulator was used to visualize life-like pharmacodynamic(PD) reactions in a healthy volunteer based on each group's study design and dosing regimen. Each session was video recorded and student groups were evaluated using a pre-assigned

rubric. Debriefing sessions were held with each group to discuss the outcome of their clinical-trial design. In the following practicums, students calculated pharmacokinetic(PK)/PD parameters and total study cost based on simulation results. Similar simulations were performed for the Phase-II (disease state) and Phase-III studies (special populations). This practicum series were offered for 2 student batches (2014–2015).
RESULTS: Pre/post student surveys and final course evaluations were used to assess the impact of this initiative. 89.7% of students reported liking the learning experience with this hybrid format. 89.7% of students felt that the SimMan practicum session was helpful to learn clinical etiquette and felt that the PD monitoring exercise helped them gain a better understanding of first-in-human studies. Students reported feeling more confident in their ability to interpret and evaluate FDA-approved Phase-I/II/III clinical studies (74.7% increase).
CONCLUSION: Following the interactive DD practicums, pharmacy students felt they were better prepared to critically analyze Phase I/II/III results and design studies.

367. Assessment and survey of student pharmacists' knowledge and perceptions of an interactive pharmacology simulation session *Jasmine Reedus,B.S.*[1], Chasity Shelton, PharmD[2], Trevor Sweatman, PhD[3], Rennolds Ostrom, PhD[3], Sharon McDonough, PhD[2], Stephanie Phelps, PharmD[2]; (1) College of Pharmacy, The University of Tennessee Health Science Center, Memphis, TN (2) Department of Clinical Pharmacy, The University of Tennessee Health Science Center, Memphis, TN (3) College of Medicine, Department of Pharmacology, The University of Tennessee Health Science Center, Memphis, TN
PURPOSE: With increasing complexity of diseases, medications and cognitive load in the healthcare field, it is important for student pharmacists to effectively gather, interpret and evaluate drug related information. To address this issue, it is imperative that students demonstrate individual competence in order to provide care and participate in interprofessional collaborations. We assessed first year student pharmacists' abilities and confidence in solving medication problems by working in teams during an interactive pharmacology simulation. Students' perceptions of the effectiveness of team-based learning compared to reliance on their independent abilities were also examined.
METHODS: Both Individual Readiness Assurance Tests (IRAT) and Team Readiness Assurance Tests (TRAT) were completed. Each team consisted of 8–10 students. Three clinical cases were distributed and students observed video-recorded simulations of changes in the autonomic system following administration of various medications. Students analyzed the events individually before team discussions. A 5-point Likert scale (1 = strongly disagree and 5 = strongly agree) survey was created to evaluate the expectations and quality of the students' experience before and after the simulation. Survey questions focused on the learning experience, confidence in self- and team-based learning, and overall gain from the simulation. The survey was conducted using Qualtrics online survey software.
RESULTS: To date survey responses have been analyzed on 179 students. IRAT and TRAT data are currently being analyzed for descriptive statistics and comparisons. Preliminary assessment of survey responses revealed that students are more confident in their ability to assess a medication's therapeutic effects when working with their team with a mean $\pm$ SD (4.09 ± 0.83), as compared to individual ability (2.84 ± 0.92); $p < 0.05$.
CONCLUSION: Final data analysis to be completed in the summer/fall 2015 academic year and will be compared with previous data for final analysis.

368. Integrating rapid diagnostic testing and antimicrobial stewardship into a 24-hour pharmacy resident on-call program *Sarah J Tennant, PharmD*[1], Donna R Burgess, RPh[1], Julie Ribes, MD, PhD[2], Craig A Martin, Pharm.D., BCPS[3]; (1) Pharmacy Services, UK HealthCare, Lexington, KY (2) Department of Pathology and Laboratory Medicine, UK HealthCare, Lexington, KY (3) Department of Pharmacy Practice and Science, University of Kentucky College of Pharmacy, Lexington, KY
PURPOSE: Use of rapid identification systems by clinical microbiology labs for early identification of infectious pathogens has been shown to decrease time to appropriate antibiotics when implemented as part of an antimicrobial stewardship program. This study evaluated a pharmacy resident on-call response to rapid diagnostic test results and its impact on appropriateness of antibiotic prescribing.
METHODS: At UK HealthCare, pharmacy residents provide 24/7 pharmacist on call support. Beginning May 1, 2015, during the overnight hours of 19:00 to 07:00 on weeknights and for 24 hours on weekends, the PharmD-on-call (PDOC) received results of Verigene® Gram positive and Gram negative rapid identification system. The patient's clinical status was assessed to determine if they were on antibiotics active against the identified pathogen. If not, the PDOC contacted the physician to make recommendations for appropriate antibiotic therapy. Study investigators used a report of the previous day's activities to collect data on PDOC response including date and time of response, categorical Gram stain, organism identified, resistance mechanisms identified, patient care service the patient was admitted to, what the PDOC's response was, what the outcome of the response was, and duration of intervention.
RESULTS: In the first 31 days of the intervention, PDOC received 100 results from Verigene® rapid identification system. Seventy-four percent were Gram positive, 24% were Gram negative, and 2% were not identified by the system. Of the 98 positive results, antibiotics were appropriate in 75% of cases and antibiotic therapy required escalation in 6% of cases. The median time spent evaluating each patient was 5 minutes (range 2–67) minutes.
CONCLUSIONS: Pharmacist intervention in responding to rapid diagnostic tests ensures appropriate therapy for patients with bloodstream infections. Pharmacy residents can play an important role in this response and expand their experience in antimicrobial stewardship.

369. Educational outcomes associated with student pharmacist immersion in accountable patient-care roles in health-system practice *Kimberly A. Sanders, PharmD*[1], Kayla Waldron, PharmD, MS, BCPS[2], Ian Willoughby, PharmD, MS, BCPS[2], Jacqueline McLaughlin, PhD[1], Nicole R. Pinelli, PharmD, MS, CDE[1]; (1) University of North Carolina Eshelman School of Pharmacy, Chapel Hill, NC (2) Department of Pharmacy, University of North Carolina Medical Center, Chapel Hill, NC
PURPOSE: To assess the educational impact of engaging second professional year student pharmacists in active and direct patient care experiences in health-system practice.
METHODS: Student pharmacists in their second professional year in the Doctor of Pharmacy program completed a four-week introductory pharmacy practice experience in health-system practice. The immersion consisted of a two-week experience in both an operational and clinical pharmacy environment. This experience was modified to engage student pharmacists in accountable patient-care roles including the performance of sterile and non-sterile product preparation and dispensing and conductance of a comprehensive medication management process. A pre-post immersion survey assessing student pharmacist self-efficacy and knowledge of operational and clinical pharmacy practice and an overall program evaluation was conducted. Competency assessments in the performance of sterile and non-sterile product preparation and dispensing and medication history acquisition were collected. Microbiology sterility testing was also performed on sterile products prepared by the student pharmacists and will be compared to those compounded by pharmacy technicians employed at the institution. Data will be analyzed using a mixed methods approach.
RESULTS: Twenty-eight student pharmacists (23.4 ± 3.2 years, 82.1% white, 67.8% female, 14.3% prior hospital employment experience) were included; of those, 26 completed the pre-post

immersion survey (92.9% response rate). Significant increases from baseline were demonstrated in all clinical ($n = 10$) and 81.8% of operational ($n = 11$) median self-efficacy statements ($p < 0.05$). The number of students correctly identifying answers for knowledge-based questions regarding the medication use process was also increased from baseline. Data collection for overall program evaluation, competency checklist assessments, and microbiology sterility testing of 116 samples prepared by student pharmacists and pharmacy technicians has been completed. Analyses for these outcomes are ongoing and will be completed for presentation.
CONCLUSION: Data analyses are ongoing.

Emergency Medicine

370. Predictors of patient satisfaction with pain management in the emergency department *Echo Fallon, PharmD*, Sierra Fung, PSY2, Georgina Rubal-Peace, PharmD, Asad Patanwala, PharmD; Department of Pharmacy, Banner University Medical Center, South Campus, Tucson, AZ
PURPOSE: Pain is one of the most common symptoms in patients who present to the emergency department (ED). Patient satisfaction with pain management is important and used as a quality care metric. The purpose of this study was to identify predictors of pain satisfaction in patients discharged from the ED.
METHODS: This was a cross-sectional survey conducted in an academic ED in the United States. Patients were interviewed via telephone within 72 hours of discharge from the ED. A standardized questionnaire was used to obtain demographic and clinical information. The primary outcome of interest was patient satisfaction with pain management in the ED. Patients were asked, "how often was your pain well controlled?" (0–10 scale; 0 = never, 10 = always). Linear regression analyses were used to identify predictors of pain satisfaction. Variables with a $p < 0.2$ on univariate analysis were selected to create a multivariate model.
RESULTS: The study included 75 patients. The mean age was 43 and 63% were female. The most common race was Caucasian ($n = 33$, 44%), followed by Hispanic ($n = 31$, 41%), African American ($n = 8$, 11%), and Other ($n = 3$, 4%). Most patients reported no prior opioid use ($n = 59$, 79%), followed by intermittent use of opioids ($n = 10$, 13%), and daily use of opioids ($n = 6$, 8%). In the multivariate regression analysis, patient perception of enough pain medication provision (coefficient 3.10, 95% CI 1.61 to 4.59, $p < 0.001$), adequate staff responsiveness to their needs (coefficient 0.35, 95% CI 0.10 to 0.61, $p = 0.007$), and pain score upon ED discharge (coefficient −0.28, 95% CI −0.53 to −0.04, $p = 0.025$) were significantly associated with patient satisfaction (model $R^2 = 0.53$).
CONCLUSION: Patient perception of enough pain medication provision, improved staff responsiveness and lower discharge pain score may improve patient satisfaction in the ED.

371. Construction of a real-time emergency department-specific antibiogram *Adam MacLasco, Pharm.D.*, Kyle Gordon, Pharm.D., Renee Petzel Gimbar, Pharm.D.; Department of Pharmacy Practice, University of Illinois College of Pharmacy, Chicago, IL, USA
PURPOSE: Infections in the emergency department (ED) are managed with empiric antibiotics. Cultures drawn in the University of Illinois Hospital and Health Sciences ED are reviewed for appropriateness of treatment daily by clinical pharmacists. Therapy is guided by antibiogram data. Inpatient antibiograms do not always correlate with resistance patterns seen in the ED and lag in timeframe due to retrospective creation. Prior to October 2014, data was collected and stored in secure binders; after it was collected in an electronic database. The intent was to create a real-time ED-specific antibiogram, allowing a greater percentage of patients to receive appropriate empiric antibiotics.
METHODS: This was a retrospective review of a cohort of ED patients for whom a culture was drawn between October 2014 and March 2015. Data is stored in a secure electronic database. Patients were excluded if less than 18 years of age, pregnant, a prisoner, or if admitted to the hospital. The primary outcome was characterization of the data and creation of a real-time, ED-specific antibiogram.
RESULTS: A total of 286 cultures were included. The majority were isolated from the urine ($n = 218$) and wounds ($n = 50$). *Escherichia coli* constituted 70 percent of urine cultures with susceptibility percentages of 88, 85, 80, and 73 percent to nitrofurantoin, cefazolin, levofloxacin, and sulfamethoxazole/trimethoprim, respectively. The overall susceptibility for nitrofurantoin in all urine isolates was 74 percent. *Staphylococcus aureus* constituted 70 percent ($n = 34$) of wound isolates. Seven isolates were resistant to clindamycin; only one isolate was resistant to sulfamethoxazole/trimethoprim. Eighteen patients had methicillin-resistant *Staphylococcus aureus* isolates. Preliminary ED data was available to guide empiric treatment immediately.
CONCLUSION: Creation of a real-time ED-specific antibiogram updated an existing process and provided clinicians with additional information for empiric patient treatment. Further data collection will allow for a more robust comparison.

372. Pharmacist delivered discharge medication counseling in the emergency department and effect on 30-day emergency department and hospital reutilization rates *Joleen Bierlein, Pharm.D.*, Kelly Killius, Pharm.D., BCPS; Department of Pharmacy, Boston Medical Center, Boston, MA
PURPOSE: Pharmacist involvement in transitions of care (TOC) includes medication reconciliation, discharge counseling, and follow up phone calls. The TOC role of pharmacists providing discharge counseling in the emergency department (ED) has never been evaluated. The purpose of this analysis was to evaluate the impact of pharmacist delivered discharge medication counseling in the ED on 30-day reutilization rates.
METHODS: This was a single-center, retrospective review of patients discharged from the ED at Boston Medical Center comparing patients who received pharmacist medication counseling with those that did not. Subjects were included if they were prescribed one of the following upon discharge from the ED: oral or parenteral anticoagulants, EpiPen®, inhaler devices, antimicrobials, pain medications, or oral corticosteroids. The primary outcome was 30-day related ED and hospital reutilization rates. Secondary outcomes included pharmacist time spent counseling, number of medications addressed per patient, counseling for a previously or currently prescribed medication versus a new medication, and comparison of the therapeutic classes of medications.
RESULTS: Sixty-five subjects were included in each group. Thirteen (20%) and 12 (18.5%) subjects were readmitted to the ED or hospital within 30 days of discharge for a reason related to the index visit in the counseled and control groups, respectively ($p = 0.824$). Fifty-four and 50% of each group's related reutilizations were due to an infection-related complaint.
CONCLUSION: Discharge counseling by a pharmacist in the ED did not result in a reduction of 30-day ED or hospital revisits. The high proportion of infection-related reutilization provides a target for future focused intervention and investigation.

373. Drug-induced hypoglycemic events resulting in emergency department visits *Ayesha Ather, PharmD*[1], Melissa Saul, MS[2], Sandra Kane-Gill, PharmD, MSc, FCCM, FCCP[3]; (1) University of Pittsburgh Medical Center, Pittsburgh, PA (2) Center for Pharmacoeconomics and Outcomes Research, University of

Pittsburgh School of Pharmacy, Pittsburgh, PA (3) Department of Pharmacy and Therapeutics, University of Pittsburgh School of Pharmacy, Pittsburgh, PA
PURPOSE: Every year about 100,000 emergency department visits are due to adverse drug events (ADEs) in adults ≥ 65 years. Hypoglycemia, a drug related hazardous condition (DRHCs), can lead to ADEs including loss of consciousness, fall or seizures. We investigated the incidence of drug-induced hypoglycemia (DIH) resulting in emergency department (ED) visits and evaluated the outcomes.
METHODS: Subjects aged ≥ 65 years who visited the EDs of three UPMC hospitals January 1, 2014 - July 1, 2014 were included. Hypoglycemia was defined as a glucose level of ≤ 70 mg/dL upon arrival. De-identified patient notes were reviewed to determine DIH events by physician documentation or an anti-diabetic agent listed as a home medication. Outcomes of possible DIH events were also evaluated.
RESULTS: A total of 222 patients were reviewed, 94 (42.3%) had a possible drug-induced hypoglycemic event. For 91 (40.9%) it was unclear if the event was drug-induced. Clinical notes for 37 (16.7%) patients indicated that hypoglycemia was not drug-induced yet 18 were receiving anti-diabetic agents. Of the 203 patients, 88 were receiving a single agent only: 75 (36.9%) insulin, 6 (2.9%) sulfonylureas, 4 (1.9%) biguanides, 3 (1.5%) glinides. Nineteen patients were receiving 2 anti-diabetic agents including: insulin/biguanides (3.4%), insulin/sulfonylureas (2.9%), sulfonylureas/biguanides (1.9%), insulin/glinides (0.5%), and insulin/DPP-4 inhibitor (0.5%). Four patients were receiving 3 anti-diabetic agents including: insulin, biguanides and either a sulfonylurea (1.5%) or DPP-4 inhibitor (0.5%). One patient had an event attributed to an unknown anti-diabetic agent. There were 55 incidents involving hypoglycemia: 30 (13.5%) falls, 20 (9.0%) seizures and 5 (2.2%) unconscious events.
CONCLUSION: The number of hypoglycemic events due to suspected drug related causes resulting in an ED visit are high and unfortunately the related outcomes are serious. Developing a better education and surveillance system for patients on anti-diabetic agents could help to prevent ED visits.

374. Prospective evaluation of clinical cure rates for uncomplicated cystitis in the emergency department using oral cephalosporin *Tsz Yee Tsui, PharmD*[1], Christopher Edwards, PharmD[1], Colgan Sloan, PharmD[1], Daniel Jarrell, PharmD[1], Alice Min, MD, FACEP[2], Douglas Lee-Chan, PharmD Candidate[3]; (1) Emergency Department, Banner University Medical Center - Tucson, Tucson, AZ (2) Department of Emergency Medicine, University of Arizona College of Medicine, Tucson, AZ (3) College of Pharmacy, University of Arizona, Tucson, AZ
PURPOSE: According to Infectious Diseases Society of America (IDSA), beta-lactams are not recommended as the first line treatment for uncomplicated cystitis. However, oral cephalosporins are commonly prescribed at the Emergency Department (ED) for such indication due to local susceptibility pattern or patient's poor renal function. This study evaluates the current empiric antibiotic treatment of uncomplicated cystitis in the ED of a large, academic medical center in order to determine the clinical effectiveness of oral cephalosporins.
METHODS: This is a prospective, observational study that identifies patients in the ED with subsequent positive urine cultures. Seven and thirty days after the initial ED visit, telephone surveys are conducted to determine if 'clinical cure' (resolution of symptoms) was achieved; along with assessing if the patient experienced any adverse effects or encountered barriers to obtaining therapy.
RESULTS: Seven day and thirty day phone calls are completed for 53 patients. The percentage of patients in this study prescribed cephalexin and ciprofloxacin is 35.8% and 37.7% respectively. The 7 day and 30 day clinical cure rates for patients who receive cephalexin versus ciprofloxacin is 63% and 70% ($p = 0.43$); and 68.4% and 80% ($p = 0.41$) respectively.
CONCLUSION: The clinical cure rate of uncomplicated cystitis in the Emergency Department (ED) in patients who receive cephalexin and ciprofloxacin are similar. Cephalexin may be a reasonable alternative option for empiric treatment of uncomplicated cystitis.

Family Medicine

375. Meta-analysis of observational studies of the effectiveness of omalizumab in the control of severe allergic asthma *Abdulaziz Alhossan, Pharm.D*[1], Christopher Lee, PhD, RN[2], Karen MacDonald, PhD, RN[3], Ivo Abraham, PhD, RN[1]; (1) Center for Health Outcomes & PharmacoEconomic Research - HOPE Center, The University of Arizona - College of Pharmacy, Tucson, AZ (2) School of Nursing and School of Medicine, Oregon Health & Science University, Portland, OR (3) Matrix45, LLC, AZ
PURPOSE: Omalizumab is a recombinant humanized monoclonal anti-IgE antibody indicated as add-on treatment to inhaled corticosteroids (ICS) and long-acting β2-agonists (LABA). Phase III trials have shown omalizumab to reduce the frequency of asthma exacerbations and concomitant medication burden and improve symptom severity and quality of life, while also being safe. The purpose of this meta-analysis was to evaluate the one-year effectiveness of omalizumab in improving lung function and reducing exacerbations in patients with severe allergic asthma.
METHODS: A search of PubMed and Embase yielded 24 real-life studies with a total of 4117 unique patients from 32 countries. Of these, 8 reported lung function ($FEV_{1\%}$predicted) and 7 reported exacerbations (9 unique studies on 1759 unique patients). Heterogeneity was assessed using the I^2 statistic. Random-effects meta-analyses were performed to quantify pooled effectiveness estimates, considering both within-study (standard error) and between-study variance (τ^2). Studies were weighted by the inverse of within-study variance plus the between-study variance, and the pooled effect size and 95%CI estimated accordingly; this per the DerSimonian and Laird (DL) method. The Z-test was used to test against the null hypothesis of neutral effectiveness and to quantify the precision of the pooled effect estimate across studies.
RESULTS: Omalizumab treatment was associated with a one-year improvement of 10.7% (95%CI = 8.1–13.2%) in FEV_1 ($I^2 = 68.2\%$, $p < 0.003$). The associated DL pooled effect size was 0.505 (95%CI = 0.380–0.629; τ^2=0.0171; $I^2 = 67.2\%$, $p < 0.0001$). Annualized one-year exacerbation rates decreased by 2.4 episodes (95%CI = 1.69–3.05; $I^2 = 87.1\%$, $p < 0.0001$). The associated DL pooled effect size was 0.698 (95%CI = 0.447–0.949; τ^2=0.0978; $I^2 = 89.2\%$, $p < 0.0001$).
CONCLUSION: This meta-analysis of non-controlled studies documents the real-life one-year effectiveness of omalizumab, as add-on treatment to ICS or LABA agents, in improving lung function and decreasing exacerbations in patients with severe allergic asthma.

376. Naloxone counseling for harm reduction and patient engagement *Lucas Hill, PharmD*; College of Pharmacy, University of Texas at Austin, Austin, TX
PURPOSE: From 1999–2008, opioid prescribing and overdose deaths quadrupled in the United States. In 2009, drug overdose deaths surpassed motor vehicle crashes as the leading cause of injury death. In 2014, UPMC St. Margaret initiated a harm reduction strategy in three patient-centered medical homes. Goals of the project included increased naloxone prescribing, decreased opioid use, enhanced provider satisfaction, and prevention of overdose deaths.
METHODS: A naloxone counseling intervention was implemented in February 2014. An outreach letter was designed with input from clinic providers (physicians, pharmacists, social

workers), an order set was developed to facilitate naloxone prescribing, and intranasal naloxone kits were assembled for free dispensing. Patients were identified as high-risk if they admitted to past illicit opioid use or required opioids for chronic pain. Pharmacists or other trained providers demonstrated and discussed naloxone administration with patients and caregivers. Providers and staff received education about the naloxone counseling intervention from pharmacists before implementation and periodically thereafter. Physician residents were surveyed before and after the intervention to assess their attitudes. Patients who received naloxone kits were surveyed to assess their attitudes and use of opioids and naloxone.
RESULTS: From 2/1/14–5/31/15, 71 outreach letters were mailed or printed, and 97 naloxone kits were dispensed. Most kits (60%) were prescribed for illicit use, with 36% prescribed for chronic pain and 4% prescribed to concerned third parties. Physician resident surveys indicated improved satisfaction caring for patients requesting opioids. Surveyed patients endorsed high levels of comfort discussing opioid use with providers, and several stated they had discontinued opioid use. Five successful overdose reversals were reported to clinic providers.
CONCLUSION: A naloxone counseling intervention implemented in three patient-centered medical homes increased naloxone prescribing, decreased opioid use, enhanced provider satisfaction, and prevented overdose deaths. The interprofessional nature of the project provided unique opportunities for care integration and patient engagement.

Geriatrics

377. Caring for geriatric patients with diabetes at a family medicine teaching clinic: a continuous quality improvement project *Kyle Turner, Pharm.D.*[1], Lindsay Sorge, Pharm.D., MPH, BCACP[2], Chrystian R. Pereira, Pharm.D., BCPS[3]; (1) Department: Pharmaceutical Care & Health Systems, University of Minnesota College of Pharmacy, Minneapolis, MN (2) Pharmaceutical Care & Health Systems, University of Minnesota College of Pharmacy, Minneapolis, MN (3) Department of Pharmaceutical Care and Health Systems, University of Minnesota College of Pharmacy, Minneapolis, MN
PURPOSE: To create a system which provides safe diabetes care in geriatric patients through targeting A1c goals of < 8% while avoiding hypoglycemia.
METHODS: A pharmacist-led continuous quality improvement project (CQI) was conducted using the Model for Improvement (MFI), adopted by the Institute for Healthcare Improvement (IHI), in patients aged = 60 years with type 2 diabetes on a hypoglycemic agent and HgA1c values = 8% or = 6.5%. The population of focus consisted of one-third of the clinic patients meeting eligibility criteria. Using the MFI, drivers (e.g., patient engagement, appropriate medications, and status of laboratory tests) were identified as ways to impact clinic processes and PDSA cycles were used to test process changes implemented to contact and schedule patients with clinical pharmacists for comprehensive medication management.
RESULTS: Twenty patients were identified for the pilot. Twelve patients (60%) were seen by clinical pharmacists. Three patients (15%) were unable to be contacted, 4 (20%) were no longer clinic patients and 1 (5%) refused. Of patients seen, 9 (75%) had HgA1c = 8% and 3 (25%) had HgA1c = 6.5%. A series of PDSA cycles revealed that patient engagement was best accomplished through: 1) identification by pharmacists via clinic-generated patient lists, 2) initial contact through a mailed letter, and 3) follow-up phone calls from clinic staff to schedule the appointment. Of the patients seen, 2 (17%) were experiencing hypoglycemic episodes, 2 patients (17%) had their sulfonylureas stopped and one (8%) had an insulin dose reduced. Five (42%) patients were at goal after the intervention. Six (67%) patients were due for HgA1c tests at the clinic visit.
CONCLUSION: Identified drivers in a pharmacist-led CQI project positively influenced diabetes care in geriatric patients. Challenges exist in contacting and engaging all patients but are mitigated through team-based care and process improvement in a clinic setting.

378. Retrospective medication use evaluation of high-risk medications in the elderly Alexis Gaggini, Pharm.D.[1], *Amy M. Drew, Pharm.D., B.C.P.S.*[2], Carmen B. Smith,Pharm.D., B.C.P.S.[3]; (1) School of Pharmacy, Pharmacy Practice, St. Louis College of Pharmacy, St. Louis, MO, USA (2) Mercy Hospital St. Louis, MO, USA (3) St. Louis College of Pharmacy, St. Louis, MO, USA
PURPOSE: The objective of this study was to evaluate prescribing habits, in a family medicine clinic, of high-risk medications (HRM) in the elderly prior to initiation of a medical resident education intervention.
METHODS: A retrospective medication use evaluation was performed from June 2013 to May 2014. Patients 66 years of age and older prescribed at least one HRM during the twelve month study period were included. Data was collected on age, sex, race, number and class of HRM, office visits, and prescriber characteristics. The primary outcome was the percentage of patients 66 years of age and older who received a prescription for a HRM during an office visit. Secondary outcomes included percentage of HRM by medication class and percentage of patients prescribed two or more HRM.
RESULTS: A total of 150 patients were included. The percentage of patients prescribed at least one HRM during an office visit was 37.3% versus 62.7% prescribed outside of an office visit. Approximately 42% of patients received prescriptions for two or more HRM and 68% of patients had access to two or more fills of these medications. Non-benzodiazepine hypnotics and skeletal muscle relaxants were the most frequently prescribed classes.
CONCLUSIONS: The majority of HRM were initiated outside of an office visit. National quality standards aimed at reducing HRM include not only the original prescriptions but refills. Expanding the educational intervention and also targeting the intervention on limiting refills may decrease use of HRM and improve patient safety in this population.

379. Delirium associated with the use of zolpidem versus ramelteon in hospitalized elderly patients *Hannah Suh,Pharm.D.*[1], Mobolaji Adeola,Pharm.D., B.C.P.S.[1], Kathryn Agarwal,M.D.[2], Nicolin Neal, M.D.[2], George Taffet,M.D.[2], Rejena Azad,Pharm.D.[1], Rabia Kazim, M.D.[2], Michael Liebl,Pharm.D., B.C.P.S.[1]; (1) Department of Pharmacy, Houston Methodist Hospital, Houston, TX, USA (2) Baylor College of Medicine, Houston, TX, USA
PURPOSE: Medication-induced delirium is a frequent complication in hospitalized elderly patients. While sedative hypnotics are known precipitants, administration of a melatonin agonist may be protective. We aim to investigate the relationship between hospital acquired delirium and exposure to zolpidem versus ramelteon.
METHODS: Retrospective case-control study of hospitalized patients aged ≥ 70 years old admitted from June 2013 – June 2015. Cases were matched to controls in a 1:2 ratio by age and time to index date. Index date is defined as the first notation of new delirium ≥ 48 hours after admission.
RESULTS: Crude patient demographics from the two groups are presented in the table below. Cases and controls were comparable in terms of age, gender and medication use. The groups were different in their delirium risk level assessment and admission to an intensive care unit. Additional analysis is required to balance these factors and determine the validity of any observed differences in the primary and secondary outcomes (Table I).

Characteristic	Case (n = 170)	Control (n = 340)
Average Age (yrs.)	80.0 ± 7.1	79.3 ± 6.3
Male (%)	46	48
Tertiary site (%)	82	95
Admission Unit: Acute Care (%)	81	93
ICU (%)	19	7
Surgical Procedure (yes, %)	45	32
Class of medications received: Opioid (%)	58	63
Benzodiazepine (%)	20	22
Steroid (%)	25	24
Delirium Risk: Low (%)	8	46
Intermediate (%)	10	31
High (%)	82	23

CONCLUSION: Further data analysis will determine presence or absence of associations between delirium and exposure to zolpidem or ramelteon. Given the prevalence of delirium in hospitalized elderly patients and the existence of one international study supporting the role of scheduled ramelteon administration at reducing the incidence of delirium, our findings are expected to help clarify the impact of intermittent ramelteon exposure in lieu of zolpidem for sleep.

Health Services Research

380. Project collaborate: a student-led community outreach program *Jacqueline Argamany,Pharm.D.*[1], Sarah McDaniel,Pharm.D. Candidate[1], Kelly Reveles,Pharm.D., Ph.D.[1], Sharon Rush,B.S. Pharmacy[2], Christopher Frei,Pharm.D., M.S.[1]; (1) College of Pharmacy, The University of Texas at Austin, San Antonio, TX, USA (2) College of Pharmacy, The University of Texas at Austin, Austin, TX, USA

PURPOSE: Project Collaborate (PC) is a student-led community outreach program at The University of Texas at Austin College of Pharmacy. The mission of PC is to provide high-quality health care screening and education services to underserved communities, to enhance student pharmacists' patient interaction and clinical skills, and to promote interdisciplinary collaboration. The purpose of this study was to describe the communities served and lessons learned through PC.

METHODS: All participants provided consent, and those screened from January 1, 2013 to May 31, 2015 were included in this analysis. Pharmacy student volunteers cared for program participants under the supervision of a licensed preceptor. The following information was requested from each participant: age, height, weight, fasting status, blood glucose (BG), blood pressure (BP), total cholesterol (TC), body mass index (BMI), and body fat percentage. Participants were informed of their results, counseled on diet and lifestyle changes, and advised to follow-up with a health care provider, as indicated. Data were summarized descriptively.

RESULTS: A total of 2,727 participants were screened over the study period, primarily in Austin (78.7%) and San Antonio (21.3%), Texas. Participants had a median age of 45 years and a median BMI of 26.6 kg/m^2. Overall, 5.0% of participants could be classified as diabetic (fasting BG ≥126 mg/dL or random BG ≥200 mg/dL), 24.7% of participants were hypertensive (BP ≥140/90 mmHg), 27.9% of participants had evidence of hyperlipidemia (TC ≥200 mg/dL), and 31.0% of participants were considered obese (BMI ≥30 kg/m^2). Approximately 1 out of every 5 participants screened was referred to a health care provider for follow-up.

CONCLUSION: Over one-quarter of participants had results possibly indicative of hypertension, hyperlipidemia, and obesity. Unfortunately, it is unknown how many of these participants carried these diagnoses prior to being screened. These results indicate PC is serving a population in great need of health care intervention.

Hematology/Anticoagulation

381. Anticoagulation-related quality of life associated with extended-interval monitoring: a pre-specified analysis of the FADE-OUT study *Nicholas Carris,Pharm.D., B.C.P.S.*[1], Steven Smith, Pharm.D., M.P.H., B.C.P.S.[1], James Taylor, Pharm.D., C.D.E.[2], Karen Sando, Pharm.D., BCACP, C.D.E.[2], Jason Powell, Pharm.D.[2], Andrew Hwang,Pharm.D.[1], John Gums, Pharm.D., F.C.C.P.[1], Eric Dietrich, Pharm.D., B.C.P.S.[1], Katherine Vogel Anderson, Pharm.D., B.C.A.C.P.[3]; (1) Department of Pharmacotherapy & Translational Research; Department of Community Health & Family Medicine, University of Florida, Gainesville, FL (2) Department of Pharmacotherapy and Translational Research, University of Florida College of Pharmacy, Gainesville, FL (3) Department of Pharmacotherapy and Translational Research, Division of General Internal Medicine, University of Florida Colleges of Pharmacy and Medicine, Gainesville, FL

PURPOSE: Extended-interval monitoring of warfarin has been proposed to reduce burden on patients and improve quality-of-life (QoL). We aimed to assess anticoagulation-related QoL before and after an extended-interval warfarin monitoring intervention.

METHODS: Patients taking warfarin (stable INR ≥12 weeks at baseline) began extended-interval follow-up with visits occurring at week 6, week 14, and every 12 weeks thereafter. Maximum follow-up duration was 68 weeks. Patients were removed from the study earlier if they were no longer suitable for extended-interval follow-up. The Duke Anticoagulation Satisfaction Scale (DASS), a validated anticoagulation-related QoL tool, was administered at baseline and at study removal or end-of-study.

RESULTS: Forty-eight patients were enrolled and 47 had evaluable data: mean age 66.8 years, 47% male, and 75% white, most common indication atrial fibrillation/flutter (53%). Overall, patients completed a median 36 weeks (range, 1–64) of follow-up. Thirty-six patients had complete baseline and end-of-study DASS scores. Mean ± SD DASS score at baseline was 45.2 ± 14.2 versus 49.1 ± 14.9 at study end (mean change, +3.9 [95% CI, -0.6-8.4; p = 0.09]; range, -36 to +38), suggesting a possible decrease in anticoagulation-related QoL following extended-interval monitoring. This change was driven largely by the psychological impact sub-scale (+2.6 [95% CI, 0.6-4.5; p = 0.01]; range, -9 to +20), whereas neither the limitations or hassles/burdens sub-scales were appreciably changed over the study.

CONCLUSION: We observed substantial variation in DASS score change among individuals, with a non-significant trend towards worsening QoL overall, and a significant psychological impact following extended-interval monitoring. One plausible reason for the potential decrement is patient disengagement from self-management activities due to less frequent feedback. Additional research is needed to identify who extended-interval monitoring may benefit or impair with regards to QoL. QoL should be considered with clinical factors and shared-decision making when implementing extended-interval monitoring. Factors associated with DASS change will be analyzed prior to presentation.

382. Superwarfarin-induced coagulopathy *Robbie Kattappuram, Pharm.D.*[1], Joel Marrs,Pharm.D.[2], Sarah Anderson,Pharm.D.[2]; (1) Aurora Healthcare Metro Inc. (2) Department of Clinical Pharmacy, University of Colorado Skaggs School of Pharmacy & Pharmaceutical Sciences, Aurora, CO

PURPOSE: Superwarfarin-induced coagulopathy warrants emergent treatment and monitoring to mitigate fatal bleeding risks. With limited data on treatment options and various reasons for ingestion, each case must be treated individually for optimal outcomes. This is a case of a patient who presented to the emergency department (ED) with critically elevated INR after ingestion of d-CON® (brodifacoum), a rat poison and superwarfarin.

METHODS: This was a retrospective chart review of a 47-year-old female presenting to the ED approximately 1 week post ingestion of d-CON®.
RESULTS: The patient's medical history is significant for dissociative identity and bipolar mood disorders. On physical exam she had a right upper extremity bruise and absence of any other signs or symptoms of bleeding. Labs: PTT 74.5 seconds, INR 17.8, protime 109.1 seconds. Hemoglobin, hematocrit, and platelets were all within normal limits (13.6 g/dL, 42.1%, and 263 k/uL, respectively), as were her vitals, BMP, and LFTs. The patient was diagnosed with superwarfarin-induced coagulopathy. Patient was admitted and the toxicology consult service recommended initiation of oral vitamin K (phytonadione) 200 mg twice daily with serial PTT and INR throughout admission. Based on toxicokinetics of superwarfarins and the patient's psychiatric history, high dose vitamin K therapy was determined most appropriate due to risk of re-ingestion. The patient was discharged with an INR of 2.8 and prescribed vitamin K 200 mg three times daily (7.1 mg/kg/day) with referral to an outpatient adult medicine clinic for management of vitamin K titration. Her vitamin K dose was titrated weekly to biweekly based on INR and PTT results and tapered until discontinuation 7 months post-ingestion.
CONCLUSION: Diagnosis and treatment of coagulopathy should occur early and take into account the possibility of re-ingestion. Long-term evaluation incorporating trends in INR and PTT can aid in the titration of vitamin K therapy.

383. Utilization and prescribing patterns of novel oral anticoagulants *Maegan M. Patterson, Pharm.D.*[1], Eric J. MacLaughlin, Pharm.D., FASHP, FCCP, BCPS[1], Krystal K. Haase, Pharm.D., FCCP, BCPS[1], Rodney B. Young, M.D., FAAFP[2], Ravindra M. Bharadwaj, M.D.[2], Jacy Hodges, Pharm.D. Candidate[1]; (1) Texas Tech University Health Sciences Center School of Pharmacy, Amarillo, TX (2) Texas Tech University Health Sciences Center School of Medicine, Amarillo, TX
PURPOSE: Scant literature is available evaluating utilization patterns for novel oral anticoagulants (NOACs) in patients with venous thromboembolism (VTE) or nonvalvular atrial fibrillation (NVAF) in primary care clinics. Determining utilization within a broader population may improve health outcomes and costs. The primary objective was to assess utilization and prescribing of NOACs in patients with NVAF and VTE in outpatient teaching clinics. Secondary objectives included assessment of differences in prescribing between family medicine (FM) and internal medicine (IM) clinics, characterization of potentially inappropriate prescribing, and identification of factors associated with undesirable treatment outcomes.
METHODS: This was a retrospective cohort study of adults with NVAF or VTE who received a NOAC and had a documented visit at TTUHSC IM or FM clinics between October 19, 2010 and October 23, 2014. Descriptive statistics were utilized for analysis of the primary aim. Fisher's exact test was used to evaluate whether differences existed between IM and FM prescribers using an adapted medication appropriateness index. Logistic regression will be used to evaluate factors associated with an increased likelihood of inappropriate use or adverse events.
RESULTS: Preliminary analysis has been completed for 146 patients. At least one inappropriate criterion was met in 70.9% of patients. The most frequent inappropriate criteria were therapeutic duplication (36.8%), inappropriate dose (33.4%), and suboptimal drug selection (21.4%). No difference was found between FM and IM clinics within each category of appropriateness. A trend towards greater inappropriate choice was observed in patients with preserved versus impaired renal function (30.5% vs 14.9%, $p = 0.069$). Appropriateness of dose did not differ based on renal function.
CONCLUSIONS: Inappropriate prescribing of NOACs is frequent in primary care teaching clinics, and the most common errors are choice, dosage, and concomitant antithrombotic therapy. These results underscore the importance of pharmacists' involvement in the management of NOAC patients.

384. Anticoagulation prescribing practices in patients with venous thromboembolism and malignancy *Eunice Boo, Pharm.D.*, Lindsay Arnold, Pharm.D., Radhika Sane, Pharm.D.; Department of Pharmacy, Boston Medical Center, Boston, MA
PURPOSE: This study evaluated real-world anticoagulation prescribing practices in patients with venous thromboembolism (VTE) and malignancy to compare the efficacy and safety of low-molecular weight heparin (LMWH) use versus non-low-molecular weight heparin (non-LMWH) use.
METHODS: Medical records of 309 patients with active cancer who received either LMWH therapy (enoxaparin or dalteparin) or non-LMWH therapy (warfarin, dabigatran, apixaban, rivaroxaban, or fondaparinux) after their first pulmonary embolism or deep vein thrombosis between January 1, 2009 to April 30, 2014 were reviewed. The incidence of recurrent VTE at 6 months, appropriateness of anticoagulant dosing, incidence of major bleeding events, and time to recurrent VTE were documented.
RESULTS: After the initial VTE event, 149 patients were prescribed a LMWH and 160 patients were prescribed a non-LMWH. The incidence of VTE recurrence at 6 months was higher in the LMWH group versus the non-LMWH group (19.4% vs 10.6%, $p = 0.029$). A total of 6 patients in the LMWH group experienced a major bleeding event associated with anticoagulation versus 4 patients in the non-LMWH group (4% vs 2.5%, $p = 0.449$). There was no difference in the mean time to a recurrent VTE for patients who received a LMWH versus a non-LMWH (50.7 versus 47.9 days, $p = 0.33$).
CONCLUSION: There was a high incidence of non-LMWH use for the treatment of VTE in patients with malignancy in this study. Despite previous randomized controlled trials demonstrating greater efficacy of LMWH in cancer patients, LMWH use has several limitations and patients may still fail long-term treatment. Multivariate analyses are ongoing to determine whether the use of prothrombotic chemotherapy or metastatic disease impacted VTE recurrence rates. In patients with cancer who are not candidates for LMWH, non-LMWH have acceptable rates of VTE recurrence and may be an appropriate treatment alternative.

HIV/AIDS

385. Maternal and infant outcomes in HIV positive mothers treated with integrase inhibitors compared to guideline recommended protease inhibitor regimens *Monique Mounce,Pharm.D.*[1], Jessica Adams,Pharm.D.[1], Laura Pontiggia,Ph.D.[2]; (1) Philadelphia College of Pharmacy, University of the Sciences, Philadelphia, PA (2) University of the Sciences, Philadelphia, PA
PURPOSE: Although integrase strand transfer inhibitors (INSTI) have become a mainstay of therapy for the treatment of HIV in the adult population, currently there is limited evidence supporting INSTIs as safe and efficacious agents for use in pregnancy. The purpose of this study is to evaluate the differences in maternal and infant outcomes in HIV positive mothers treated with INSTI containing regimens during pregnancy compared to the guideline recommended protease inhibitor (PI) containing combination antiretroviral therapy (cART).
METHODS: A retrospective, cohort study of INSTI versus guideline recommend PI based cART in pregnancy was performed. The two arms were matched 1:2 INSTI to PI on the basis of the presence or absence of viremia at the time of pregnancy determination. The primary objective endpoint was the achievement of VL suppression prior to delivery. Secondary endpoints included time to VL suppression, duration of VL suppression, and safety parameters in both the mothers and infants.
RESULTS: Twenty-one patients were matched (7 INSTI and 14 PI). There were no significant differences between groups with

respect to the proportion of patients achieving VL suppression prior to delivery (71.4% vs 92.9%, $p = 0.247$), although INSTI were added more often late in pregnancy. There were no significant differences in any of the secondary endpoints. Patients with documented adherence issues were statistically more likely to not achieve VL suppression prior to delivery ($p = 0.049$). All infants tested negative for HIV. There was a trend towards infants in the PI arm having an elevated total bilirubin level after delivery (0% vs 42.9%, $p = 0.475$) that can be attributed to the use of atazanavir. There were no differences in other safety parameters assessed.
CONCLUSION: There were no observed differences in efficacy or safety in mothers or infants exposed to INSTI based cART compared to guideline recommended PI based cART during pregnancy.

386. Dietary supplement and HIV medication interactions: a systematic review *Mohamed Jalloh,Pharm.D.*[1], Darren Hein, Pharm.D.[2]; (1) Center for Drug Information and Evidence Based Practice, Creighton University, Omaha, NE (2) School of Pharmacy and Health Professions, Creighton University, Omaha, NE
PURPOSE: The purpose of this systematic review was to identify published, human-based clinical investigations addressing dietary supplement-HIV medication interactions and to describe the mechanisms of such interactions and therapeutic approaches for managing a patient taking an HIV medication and an interacting dietary supplement.
METHODS: A systematic search was conducted utilizing PubMed, Google Scholar, Cochrane Library, Natural Medicines Comprehensive Database, and Facts and Comparisons. Clinical studies addressing dietary supplement-drug interactions with HIV medications were selected for inclusion. Studies with human pharmacokinetic data were selected for inclusion. In-vitro or animal studies were excluded.
RESULTS: The systematic search resulted in 23 studies assessing dietary supplement-HIV medication interactions, with study durations ranging from 1 day to 8 weeks. Dietary supplements evaluated in clinical studies included: Calcium carbonate, *Echinacea purpurea*, fish oil, ferrous fumarate, garlic, ginkgo biloba, goldenseal, grapefruit, *Hypoxis hemerocallidea*, milk thistle, St. John's wort, and vitamin C. The HIV medications evaluated belonged to either the protease inhibitor, non-nucleoside reverse transcriptase, or integrase inhibitor drug classes. The majority of interactions were related to cation chelation or CYP3A4 induction/inhibition. Dietary supplementation with calcium carbonate, ferrous fumarate, garlic, St. John's wort, and vitamin C significantly reduced HIV medication levels. Co-administration with grapefruit extracts significantly increased HIV medication levels; therefore, co-administration with these supplements with the respective HIV medications or classes should be discouraged if possible. Continued co-administration may result in adverse effects, resistance, or treatment failure.
CONCLUSION: Clinical evidence suggests that co-administration of certain dietary supplements with HIV medications, at specific doses and formulations, produces significant changes in HIV medication levels. Pharmacists should continue to investigate the use of dietary supplements in HIV patients to validate if they are taking supplements with a potential to interact with their antiretroviral therapy.

387. The impact of a clinical pharmacist on HIV treatment adherence and outcomes in a veterans affairs specialty clinic *Autumn D. Bagwell,Pharm.D., BCPS*[1], Todd Hulgan, M.D., MPH[2], Marguerite Callahan, N.P.[3], Paula Newberry, Pharm.D., BCPS, CGP, AAHIVP[3], M Shawn McFarland, Pharm.D., BCPS, BC-ADM[1]; (1) Veterans Affairs Tennessee Valley Healthcare System, Nashville, TN (2) Department of Mecicine, Division of Infectious Disease, Vanderbilt University School of Medicine, Nashville, TN (3) Tennessee Valley Healthcare System Veterans Administration, Nashville, TN
PURPOSE: Advances in the treatment of human immunodeficiency virus (HIV) have led to improved viral suppression and immunologic response. However engagement in care and adherence to medications continues to limit HIV treatment success. The objective of this study was to assess and analyze the impact of implementing an HIV Pharmacotherapy Clinic and clinical pharmacy services in conjunction with the Infectious Disease HIV Clinic at the TN Valley Healthcare System (TVHS) Veterans Affairs Medical Center (VAMC).
METHODS: A single-center, investigational study performed at TVHS over 28 weeks. Patients were enrolled if they met one of the following criteria: detectable HIV viral load within the last six months from study initiation, initiated ART during the study period, or upon referral from an Infectious Disease provider. The pharmacist, working in a multidisciplinary team made patient-specific interventions based on an initial evaluation. The primary endpoint of the study was the percentage of patients achieving an undetectable HIV viral load, defined as <20 copies/mL, after the clinical pharmacistÕs involvement in care. The secondary endpoints included change from baseline in CD4 + count and CD4% as well as self-reported adherence, assessed by the Morisky Medication Adherence Scale-8¨ (MMAS-8) and a Visual Analogue Scale (VAS).
RESULTS: Following clinical pharmacist involvement in care, there was a significant decrease in viral load and improvement in immune response. At study completion, 70% of patients achieved the primary endpoint of viral suppression ($p < 0.0001$). The average CD4% increased by ~6% ($p = 0.0881$). Self-reported adherence, measured by MMAS-8¨ increased by 30% ($p = 0.0001$) and 28% per VAS, from an average of 71.6% to 99.6% ($p = 0.0006$).
CONCLUSION: This study evidenced the benefit of a pharmacistÕs involvement in the care of patients with HIV by improved clinical outcomes and increased care engagement. Future directions for research include reaching those patients with limited resources and access to care.

Infectious Diseases

388. Evaluating use of MALDI-TOF for blood culture isolate identification in a four hospital system *Adrienne Kercsak, Pharm.D.*, Eva Sullivan, Pharm.D., Harminder Sikand, Pharm.D.; Department of Pharmacy, Scripps Mercy Hospital, San Diego, CA, USA
PURPOSE: Matrix-assisted laser desorption ionization-time of flight (MALDI-TOF) is utilized in healthcare settings to analyze blood, respiratory, wound, and urine samples. MALDI-TOF can be used to identify the organism, followed by Verigene® Gram-Positive Blood Culture Test (BC-GP) to identify resistance markers for *Staphylococcus aureus* and *Enterococcus* spp, with significant shortened total time to identification. Average time to identification and susceptibility results is 48-72 hours for Phoenix™, 2.5 hours for identification and resistance markers using Verigene® BC-GP, and 30 minutes with MALDI-TOF. Cost to run one sample using Verigene® BC-GP is $70, whereas MALDI-TOF is $5.50 per sample. We validated MALDI-TOF against Phoenix™ using blood samples and determined if MALDI-TOF is effective in impacting patient care and being cost-effective.
METHODS: Retrospective, descriptive, observational study analyzing 113 blood samples collected from October 2014 through April 2015. Positive blood samples identified by traditional culture method Phoenix™, then analyzed using MALDI-TOF within 48 hours of confirmed positive gram-positive (GP), gram-negative (GN), anaerobe or yeast organism. Reference used to analyze samples is integrated into the BioTyper software version 3.1.0.4 and compared to a research use only database. Each isolate given a spectral score, evaluated using software, and confirmed correct identification if score value > 2.0 at species level or > 1.7 but < 2.0 at genus level.

RESULTS: Total of 113 (48GP, 40GN, 14 anaerobe, and 11 yeast) analyzed using MALDI-TOF. Thirty-six (90%) GN, twenty-nine (60%) GP, nine (64%) anaerobe, and three (27%) yeast organisms were correctly identified using MALDI-TOF. Time to identification per organism using MALDI-TOF was 30 minutes.
CONCLUSION: Achieved 90% concordance with GN, 60% with GP, 64% with anaerobes, and 27% with yeast organisms. Annual cost savings using MALDI-TOF for initial gram-positive identification is approximately $57,000 and dramatically shortens time to identification. This has a direct positive impact on patient care.

389. Implementation and outcomes of fecal microbiota transplantation in a four hospital system *Adrienne Kercsak, Pharm.D.*, Eva Sullivan, Pharm.D., Harminder Sikand, Pharm.D.; Department of Pharmacy, Scripps Mercy Hospital, San Diego, CA, USA
PURPOSE: Incidence of *Clostridium difficile* infection (CDI) in the U.S. in 2011 was 453,000. Despite antimicrobial treatment, recurrence rates of CDI is 20%, with 45% having a second recurrence. The Gastroenterology Guidelines recommend FMT for third occurrence after failure of pulsed vancomycin therapy. The average cure rate using FMT for CDI is greater than 90%. We evaluated use of FMT in a four hospital system for use in recurrent CDI.
METHODS: Retrospective review of 24 charts with collection period from December 2011 through May 2015. Data collection included demographics, date of each positive CDI, antibiotic use 3 months prior to first episode, length of stay, 30 day mortality, donor stool type, and method of administration.
RESULTS: Mean age for FMT was 71 years old with 54% female. Most common method of FMT administration: colonoscopy (71%), endoscopy (17%), nasogastric tube (12%). Most common donor type: related donor (63%) followed by OpenBiome (37%), commercialized stool bank product. Nineteen (79%) were on multiple antibiotics prior to FMT, including cephalosporin (29%), fluoroquinolone (26%), penicillin (15%), macrolide (9%), monobactam (3%), and tetracycline (3%). Five (21%) of the 24 relapsed; two had repeat FMT, one which received two repeat FMTs. One of the five CDI relapse had antibiotic use prior to relapse; unclear cause in other four.
CONCLUSION: Effective FMT defined as no recurrence of CDI, or if recurrence, causal event was antibiotic use. Effective FMT seen in 20(83%) of the patients. A 22% recurrence rate of CDI post FMT; one patient with multiple recurrences. Majority of patients (79%) received antibiotics within 3 months prior to CDI. No mortality 30 days post FMT (3 excluded because no data 30 days post-transplant). FMT shows promise in preventing recurrent CDI infections and prospective analysis of efficacy, safety, cost, and timing would be valuable to CDI prevention in the future.

390. Topical vancomycin for prophylaxis of surgical site infections in patients undergiong multi-level spinal fusion surgery *Marian Gaviola, Pharm.D.*[1], Wesley McMillian, Pharm.D.[1], Jeffrey Endicott, Pharm.D.[1], Elizabeth Ames, M.D.[2], W Kemper Alston, M.D., M.P.H.[3]; (1) Department of Pharmacy, UVM Medical Center, Burlington, VT, USA (2) Department of Orthopedics and Rehabilitation, UVM Medical Center, Burlington, VT, USA (3) Department of Medicine, Infections Disease Unit, UVM Medical Center, Burlington, VT
PURPOSE: The primary objective of this study was to evaluate the impact of topical vancomycin on the incidence of SSI in instrumented, multi-level spinal fusion (MLSF) surgery. The secondary objective was to evaluate risk factors of SSI in this cohort.
METHODS: This was a retrospective cohort study involving patients age 18 or older undergoing instrumented MLSF, who received cefazolin preoperatively between January 1, 2010 to July 31, 2014. Excluded patients were those who underwent anterior cervical discectomy and fusion, had spine surgery within 3 months prior to index case, received antibiotics other than cefazolin prior to surgery and had preoperative length of stay greater than five days. SSIs were identified using Centers for Disease Control and Prevention National Healthcare Safety Network definitions. Summary statistics for clinical and demographic variables were computed. Variables found to be associated with increased risk of SSI through univariate analysis were included in the multivariate analysis.
RESULTS: Among 326 patients included, 29 (8.9%) developed SSI. Univariate analysis showed a trend towards decreased SSI incidence in the cohort receiving topical vancomycin compared to intravenous cefazolin alone ([23/210]11.0% vs [6/116] 5.2%, $p = 0.08$). Topical vancomycin was associated with a protective effect against SSI in the multivariate analysis (OR 0.26, $p = 0.01$). Significant risk factors for the development of SSI include female sex (OR 3.3, $p = 0.01$) and diabetes mellitus (OR 5.1, $p < 0.01$).
CONCLUSION: Topical vancomycin, in addition to intravenous cefazolin, was associated with decreased risk of SSI in high-risk MLSF patients. Female patients and those with diabetes mellitus were at higher risk of developing postsurgical infection. Further prospective studies are needed to confirm these results and to define the most clinically effective dose of topical vancomycin in this patient population.

391. Development of a combination antibiogram for pseudomonas aeruginosa infections *Bayan Alnamnakani, Pharm.D Candidate*[1], John A. Bosso, Pharm.D.[2]; (1) South Carolina College of Pharmacy (2) Clinical Pharmacy and Outcome Sciences, SCCP, Medical University of South Carolina Campus, Charleston, SC
PURPOSE: *Pseudomonas aeruginosa* often expresses multiple resistance mechanisms making empiric antibiotic selection challenging. Therefore, it is common to prescribe two antibiotics empirically to broaden coverage and increase the likelihood of a more effective therapy. This analysis was conducted with the purpose of determining the best two-drug combination for empiric treatment of known or suspected *P. aeruginosa* infection based on recent antibiograms from our institution.
METHODS: Isolates collected between 2009 through 2012 and tested for susceptibility to various antibiotics were included. Isolates from patients with cystic fibrosis were not included. The antibiotic combinations assessed included a μ-lactam (piperacillin/tazobactam, cefepime, or meropenem) with an aminoglycoside or fluoroquinolone. Year-to-year variations were assessed in best combination were also assessed. Further, best combinations for isolates cultured from day three of hospitalization and beyond were compared to those for all isolates.
RESULTS: Best combinations were defined as the highest percentage of coverage. It was found that the best combinations in the year of 2009 were (piperacillin/tazobactam-amikacin) and (meropenem-gentamicin) with 98% coverage. For the years 2010 and 2011 (piperacillin/tazobactam-amikacin) and (cefepime-gentamicin) combinations resulted in 96% coverage. For the year 2012 (cefepime-tobramycin) combination resulted in 98% coverage. There was minimal variation from year-to-year. Of interest, the best combinations for years 2011 and 2012 were (cefepime-gentamicin) and (meropenem-amikacin) with 100% coverage for isolates that were collected after $\geq$ 3 days of hospitalization.
CONCLUSION: These results indicate, the best secondary antibiotic to use with beta-lactams for patients suspected with *P. aeruginosa* at our institution is an aminoglycoside. Based on the minimal variation in susceptibility results, the choice would be based on patient factors. These results will aid clinicians in selection of empiric antibiotic combinations for suspected or proven *P. aeruginosa* infections at our hospital.

392. Azithromycin Pharmacodynamics against Persistent Non-Typeable Haemophilus influenzae (NTHI) Isolates from COPD Patients *Raheal Boadi-Yeboah, Pharm.D Candidate*[1], James Fisher, MPH Candidate[2], Melinda Pettigrew, PhD[2], Amanda Marrocco, B.S.[1], Patricia N. Holden, B.S.[1], Sanjay Sethi, M.D.[3], Timothy Murphy, M.D.[3], Brian T. Tsuji, Pharm.D.[1]; (1) Laboratory for Antimicrobial Pharmacodynamics, University at Buffalo School of Pharmacy and Pharmaceutical Sciences, Buffalo, NY, USA (2) Yale School of Public Health, New Haven, CT, USA (3) University at Buffalo School of Medicine, Buffalo, NY, USA

PURPOSE: Chronic Obstructive Pulmonary Disease (COPD) is the third leading cause of death in the US. Significant clinical disease in COPD patients has been tied to NTHI. However, it is largely unknown why some NTHI strains persist despite antimicrobial therapy. Our objective is to characterize the pharmacodynamics of azithromycin against a persistent pair of NTHI strains.

METHODS: A persistent pair of NTHI isolates (5P28H1 & 5P54H1) cultured at the 28th and 54th week clinic visits from the sputum of an adult with COPD were determined to be the same strain by multilocus sequence type. The MIC's were determined according to CLSI for 5P28H1 ($MIC_{azithromycin}$=2.0) and 5P54H1 ($MIC_{azithromycin}$=16.0). Time kill experiments in log phase growth at 10^8 CFU/ml were performed for azithromycin at 0.5, 2, 4, 8, 16, 32 and 64 mg/L. Serial samples were collected at 0, 1, 2, 4, 6, 8, 24, 28, 32, and 48 h.The log reduction and integrated log ratio area=$\log_{10}$ (AUCFUdrug/AUCFUcontrol) over 48 h were calculated and fit to a Hill-Type model.

RESULTS: Azithromycin displayed differential killing against 5P28H1 and 5P54H1. For 5P28H1, Azithromycin demonstrated dose-dependent bactericidal killing with complete killing by 24 hrs at concentrations ≥ 16 mg/L. At 24 hrs, mean log reduction from baseline in CFU/ml at 2, 4, 8, 16, 32 & 64 mg/L was -4.9, -5.6, -6.3, -8.4, -8.4 and -8.5. Beneath its MIC, 5P54H1 was not completely killed at 48 h; a phenomenon unobserved in 5P28H1. At 24 hrs, corresponding log reductions for 5P54H1 were -0.1, -1.1, -6.2, -8.4, -3.6, -8.5, -8.5. Pharmacodynamic analysis revealed a right shift in the comparative dose response curves. Model fits were excellent (R^2>0.99).

CONCLUSION: Bactericidal activity was achieved for 5P28H1 at lower concentration compared to 5P54H1, which demonstrated an attenuated killing profile. The differential pharmacodynamics of Azithromycin suggests antimicrobial pressure plays a role in counter selection of resistance for NTHI.

393. Identification and comparison of risk factors for daptomycin non-susceptible S. aureus (DNS) and daptomycin non-susceptible Enterococcus (DNE) *Christo Cimino, Pharm.D.*[1], Douglas Slain, Pharm.D., BCPS, FCCP[2], Paul LaSala, M.D., D(ABMM)[3], Lisa Keller, Pharm.D., BCPS[4]; (1) Department of Pharmacy, WVU Healthcare, Morgantown, WV, USA (2) West Virginia University School of Pharmacy, Morgantown, WV, USA (3) Department of Pathology, WVU Healthcare, Morgantown, WV, USA (4) WVU Healthcare

PURPOSE: Daptomycin is a potent gram-positive agent with activity against methicillin resistance *Staphylococcus aureus* (MRSA) and vancomycin-resistant *Enterococcus* (VRE). Recent reports have proposed a variety of risk factors for daptomycin non-susceptibility. The purpose of this study is to identify and compare risk factors for DNS and DNE.

METHODS: This was a case-control study involving patients with documented MRSA or VRE infection at a 531 bed academic medical center from 2010 to 2014. The primary endpoint was the identification of risk factors for daptomycin non-susceptibility. Multi-logistic regression analysis was used to identify the potential impact of variables which included co-morbidities, microbiology data, and antimicrobial exposure within the past 6 months. Patients in the MRSA and VRE groups with daptomycin non-susceptible (NS) infection were matched to patients with daptomycin susceptible (S) infection in a 1:2 ratio.

RESULTS: Of the 63 patients with daptomycin NS infection, 29 with MRSA were matched to 58 controls and 34 with VRE were matched to 68 controls for a total of 189 patients. Baseline demographics were similar for those with daptomycin NS and daptomycin S infection within the MRSA and VRE groups. In the VRE group, DNE was associated with extensive (≥7 days) daptomycin exposure (p = 0.0092, OR 7.07 [1.34 – 37.20]) and extensive tigecycline exposure (p = 0.0039). In the MRSA group, DNS was associated with vancomycin MIC ≥1.5 (p = 0.0149, OR 6.52 [1.22 – 34.81]) and MIC ≥2 (p = 0.004, OR 13.30 [1.50 – 116.93]). DNS was also associated with extensive exposure to vancomycin, daptomycin, penicillins, carbapenems, and fluoroquinolones within the previous 6 months.

CONCLUSION: Our results suggest that an elevated vancomycin MIC to MRSA is a risk factor for DNS. The only common risk factor identified for non-susceptibility in both the MRSA and VRE groups is extensive daptomycin exposure.

394. Timeliness of targeted antifungal therapy in candidemia after implementation of PNA FISH testing *Keaton Smetana, Doctor of Pharmacy*; University of Kentucky HealthCare, Lexington, KYTimeliness of Targeted Antifungal Therapy in Candidemia after Implementation of PNA FISH Testing. Keaton S. Smetana, PharmD, Craig A. Martin, PharmD, Matthew G. Browning, MS, Harrison Bachmeier, PharmD, Donna Burgess, RPh, Dominique Zephyr, MS, David S. Burgess, PharmD; University of Kentucky HealthCare and University of Kentucky College of Pharmacy, Lexington, KY; Virginia Commonwealth University, Department of Kinesiology & Health Sciences, Richmond, VA

PURPOSE: The purpose of the current study was to determine if PNA FISH could reduce the time to targeted antifungal therapy in candidemia patients.

METHODS: This was a single-center, retrospective study performed at a tertiary medical center. All candidemia patients from January 1, 2008 Ð December 31, 2013 were identified from the microbiology laboratory database. Time to targeted therapy was compared between those who did and did not receive PNA FISH testing. Targeted therapy was defined as the utilization of micafungin or amphotericin B for C. glabrata or C. krusei and fluconazole for C. albicans, C. parapsilosis, or C. tropicalis.

RESULTS: Overall, 145 candidemia patients were included. C. glabrata was the most commonly isolated organism (53%) followed by C. albicans (29%), C. parapsilosis (10%), C. tropicalis (4%), and C. krusei (4%). Of the 145 candidemia patients, only 53% underwent PNA FISH testing and 64% received targeted therapy initially. Of the 52 patients that did not receive targeted therapy initially, PNA FISH reduced the time to targeted therapy by 29.2 hrs (91.2 + 35.3 hrs vs 120.4 + 61.1 hrs, p = 0.260). A subgroup analysis revealed de-escalation of therapy from micafungin or amphotericin B to fluconazole occurred in only 23% of our total patient population, and on average occurred 40.5 hrs earlier using PNA FISH (97.3 hrs+40.1 hrs vs 137.8 + 54.1 hrs, p = 0.024).

CONCLUSION: The use of PNA FISH was not associated with a faster time to targeted therapy in the setting of candidemia.

395. Characterization of Clostridium difficile infection treatment during the use of concomitant antibiotics *Ryan D'Angelo, Pharm.D.*[1], Jeffrey Gonzales, PharmD, BCPS, FCCM[1], Asha Tata, PharmD, BCPS[2], Emily Heil, PharmD, BCPS AQ-ID AAHIVP[2]; (1) University of Maryland School of Pharmacy, Baltimore, MD, USA (2) University of Maryland Medical Center, Baltimore, MD, USA

PURPOSE: The current Infectious Diseases Society of America Clostridium difficile infection (CDI) guidelines acknowledge that patients who require concomitant antibiotics may necessitate extended durations of CDI treatment, but offer no recommendations for these situations. The purpose of this study was to characterize practices for the management of CDI, when concomitant antibiotics are required.

METHODS: A retrospective chart review was conducted for patients admitted to the University of Maryland Medical Center (UMMC) between 06/1/2013 and 05/31/2014. Inclusion criteria were: documented CDI and concomitant antibiotic(s) during the treatment period for CDI. Data collection included: subject demographics, concomitant antibiotic class, CDI severity, duration of concomitant antibiotic(s) and CDI treatment, and CDI recurrence.
RESULTS: Ninety-eight patients were included in the study with a mean age of 57 ± 15.9 years. Leukocytosis, ≥15,000 cells/mL^3, was identified in 54.1% of patients. The incidence of mild/moderate and severe CDI was 31.6% and 55.1% respectively, whereas 13.3% of patients developed complicated CDI. 89% of patients had CDI treatment extended at least to the end of their concomitant antibiotics, and 72% of those patients had extended treatment, beyond concomitant antibiotics. Patients with severe or complicated CDI received longer courses of treatment, compared to those with mild or moderate disease, with a mean of 18.6 ± 11.2 and 15.1 ± 4.6 days respectively ($p = 0.029$). CDI treatment that extended past concomitant antibiotics was similar in patients with mild/moderate vs. severe/complicated therapy (12.9 ± 4.1 vs. 10.9 ± 6.0 days; $p = 0.1$). Of the 90 patients who survived, 22.7% of patients with extended CDI treatment developed recurrence over a minimum 12 month follow up period, similar to 26.6% of patients with treatment continued to the end of concomitant antibiotics ($p = 0.38$).
CONCLUSION: There is little consensus regarding management of CDI when patients are receiving concomitant antibiotics. Further prospective studies are warranted for this topic.

396. Identifying factors impacting recurrent Clostridium difficile infection and development of a risk evaluation tool *Bethanne Carpenter, Pharm.D.*[1], Erin K. Hennessey, Pharm.D., BCPS[1], Alex M. Bryant, Pharm.D.[2], Jad Khoury, M.D.[2], Andrew Crannage, Pharm.D., BCPS[1]; (1) St. Louis College of Pharmacy, St. Louis, MO, USA (2) Mercy Hospital St. Louis, St. Louis, MO, USA
PURPOSE: The objective of the study was to determine which factors influence the recurrence of *Clostridium difficile* infection (CDI) and to develop an evaluation tool to stratify risk.
METHODS: Patients were included for evaluation if they were readmitted to our institution within 10 weeks of positive *C. difficile* polymerase chain reaction (PCR) with symptoms between January 1, 2010 to October 30, 2014. The primary outcome was analyzed via univariate regression analyses of the independent factors including age, gender, number of CDI episodes, location (s) during admission, time factors, administration of acid blocking agents, antibiotics or chemotherapy, Charlson Comorbidity Index, gastrointestinal conditions, and exposure to healthcare facilities.
RESULTS: Recurrent CDI was identified in 44 of 220 patients meeting inclusion criteria. In the univariate analysis, the following factors were associated with the development of recurrent CDI: exposure to antibiotics (p 0.02, OR 2.51) and inflammatory bowel disease (p 0.025, OR 5.76). An evaluation tool was created from a well-fit model including age ≥ 75 years, antibiotic exposure, active chemotherapy, proton pump inhibitor use, inflammatory bowel disease, and healthcare exposure to determine risk of recurrent CDI. Additional factors included in the tool were chosen based on evaluation of findings from existing literature.
CONCLUSION: Similar to previous literature, exposure to antibiotic therapy and inflammatory bowel disease were found to be associated with the development of recurrent CDI. Although a statistically significant association with recurrent CDI was not found for other factors in this study, this is likely related to small sample size. The creation of an evaluation tool using specific patient factors will help determine the risk of recurrent CDI and provide guidance for the use of prophylactic vancomycin therapy. Future studies may include validation of this tool for this purpose.

397. Molecular mechanisms of Azole Resistance (AR) in clinical isolates of Candida tropicalis (Ct) *Jeffrey Rybak, Pharm.D.*[1], Kayihura Manigaba, B.S.[2], Elizabeth Berkow, M.S.[2], Josie Parker, Ph.D.[3], Steven Kelly, D.Sc.[3], P. David Rogers, Pharm.D., Ph.D.[2]; (1) Department of Clinical Pharmacy, University of Tennessee, Memphis, TN, USA (2) University of Tennessee College of Pharmacy, Memphis, TN, USA (3) College Of Medicine, Swansea University, UK
PURPOSE: Invasive candidiasis (IC) remains the predominant cause of invasive fungal infections in North America. As fluconazole remains the most utilized antifungal in the treatment of IC, the growing incidence of fluconazole-resistant *Candida* is of clear concern. While much is now understood about the molecular mechanisms of AR in *C.albicans* (Ca), little is known about mechanisms in non-albicans species, where rates of AR are significantly higher.
METHODS: Fourteen clinical Ct isolates with reduced fluconazole susceptibility (MIC>1 mg/L) and 5 susceptible clinical control isolates were obtained from the University of Iowa repository. Fluconazole MICs were determined using Clinical Laboratory and Standards Institute methodology. Genes possessing the highest degree of sequence homology with those known to be associated with AR among Ca were identified in a Ct reference genome. Using qPCR, the expression of mRNA transcripts for these genes was measured. Additionally, the constituent sterol-profile of each isolate was assessed by gas chromatography-mass spectrometry. Evaluation for mutations in ergosterol biosynthetic genes was performed based upon sterol-profile abnormalities.
RESULTS: Among isolates with reduced susceptibility to flucoanzole, MICs ranged from 2-256 mg/L (median MIC=32 mg/L). MIC for control isolates ranged from 0.5-1 mg/L. Orthologs of Ca *CDR1*, *TAC1*, *MDR1*, *MRR1*, *ERG11*, and *UPC2* were identified. Relative mRNA expression levels for *CDR1*, *MDR1*, and *ERG11* were obtained for each isolate and ranged from 0.4-10.1, 0.1-305, and 0.2-2.7 respectively. Sterol-profiles revealed dramatically varied ergosterol content among both fluconazole susceptible and resistant isolates (35-78%). In some isolates, the proportion of ergosterol precursors also varied greatly. Sequencing revealed mutations in a number of genes including *TAC1, MRR1*, *ERG11* and *ERG24*.
CONCLUSIONS: While orthologs of genes known to influence fluconazole MIC in Ca were identified, and some also expressed at levels known to increase fluconazole MIC, these alone do not explain the AR across this collection. Further data analysis is ongoing.

398. Vancomycin versus daptomycin for treatment of Staphylococcus aureus bacteremia and endocarditis in a cohort of drug users *Sarah J Tennant, Pharm.D.*[1], W Cliff Rutter, Pharm.D.[2], David S Burgess, Pharm.D.[3]; (1) Pharmacy Services, UK 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
PURPOSE: Infective endocarditis (IE) in intravenous drug users (IVDU) has increased in the last 10 years, and *Staphylococcus aureus* is the predominant causative organism. IVDUs comprise a large subpopulation of patients enrolled in S. aureus bacteremia and IE clinical studies, but studies conducted exclusively in this population are lacking. This study aimed to compare treatment outcomes of patients with IE and a history of IVDU who received daptomycin or vancomycin.
METHODS: This study analyzed a treatment period between January 1, 2010 and December 31, 2014. Patients were identified through the use of International Classification of Disease 9 codes: illicit drug use and endocarditis. Of these encounters, adult patients with positive blood cultures for *S. aureus* and who were treated with either vancomycin or daptomycin for at least 5 days were included in this analysis. Data evaluated include gender, race, age, intensive care unit (ICU) status on admission, length of stay, concomitant antimicrobial use, and mortality data.
RESULTS: One hundred twenty-nine patients were identified for analysis. Males comprised 66% of the cohort. The majority

(96%) of patients were Caucasian. Forty-nine percent of patients were admitted to the ICU. The median age was 38 years (IQR 29-54) and median length of stay was 24 days (IQR 12-47). Sixty-eight (53%) patients had methicillin-resistant *S. aureus* (MRSA). Eighty-seven (68%) patients received vancomycin and 42 (32%) patients received daptomycin. Sixty-nine percent of vancomycin patients were male compared with 60% of daptomycin patients. Thirty-seven (42%) vancomycin patients had MRSA and 31 (72%) daptomycin patients had MRSA. Fifteen (17%) vancomycin patients and nine (21%) daptomycin patients expired.
CONCLUSIONS: Understanding the clinical characteristics and outcomes of these patients may have implications on treatment decisions and outcomes. Further analysis of clinical outcomes in this cohort is ongoing.

399. Evaluation of real-world use of fosfomycin for urinary tract infections *Megan Patch, M.S., Pharm.D.*[1], Sonal Patel, Pharm.D.[2], Chris Bland, Pharm.D., BCPS[3], Sandy Estrada, Pharm.D., BCPS, AQ-ID[4]; (1) Pharmacy, Lee Memorial Health System, Fort Myers, FL (2) Pharmacy, Georgia Regents Medical Center, Augusta, GA (3) Clinical and Administrative Pharmacy, University of Georgia College of Pharmacy, Savannah, GA (4) Lee Memorial Health System, Fort Myers & Cape Coral, FL
PURPOSE: Fosfomycin is a bacterial wall synthesis inhibitor effective against many Gram-negative and Gram-positive microorganisms including multi-drug resistant strains. Advantages of fosfomycin include excellent tolerability, favorable side effect profile, one-time dosing, and high urinary concentrations for extended time periods. A one-time dosing strategy for uncomplicated urinary tract infections (UTIs) makes it a desirable choice for outpatients and ensures compliance in the emergency department. Duration of therapy in complicated UTIs is unclear especially in the inpatient setting. We sought to ascertain dosing strategies of fosfomycin in both uncomplicated and complicated UTIs across two health systems.
METHODS: A retrospective chart review was performed system-wide at two health systems between May 2011 and November 2014 for patients receiving at least one dose of fosfomycin. Data collected included patient demographics, hospital location, indication (cystitis vs pyelonephritis), complicated versus uncomplicated UTI, pathogen isolated, dosing regimen, readmission within 30 days or death, and antimicrobial use within the prior 90 days.
RESULTS: Complicated cystitis was diagnosed in 134/180 patients (uncomplicated 43/180, unknown 3/180). Pyelonephritis was diagnosed in 16 patients. Extended dosing was prescribed in 38% of pyelonephritis versus 31% in cystitis, $p = 0.58$. Patients receiving one dose of fosfomycin had no difference in readmission rates or death compared to patients receiving multiple doses (22% vs 24%, respectively, $p = 0.85$). Cultures were positive for vancomycin-resistant Enterococcus (VRE) species or extended-spectrum beta-lactamase (ESBL)-producing strains in 82/180 patients (56%).
CONCLUSION: Current use of fosfomycin extends beyond the approved indication for treatment of uncomplicated UTIs in women. Concentration-dependent killing of fosfomycin against Gram-negative organisms coupled with high urinary concentrations has led to extrapolation of one-time dosing of fosfomycin to every 24 to 72 hour dosing in patients with severe or multi-drug resistant urinary cultures. More data is needed to determine optimal duration for multi-drug resistant pathogens such as VRE.

400. Microbiological and clinical efficacy of fosfomycin for complicated and uncomplicated urinary tract infections at a large academic medical center *Travis Jones, Pharm.D.*, April Miller Quidley, Pharm.D., BCPS, FCCM, Kathey Fulton Rumley, Pharm.D., Michael Gooch, M.S. Pharm; Vidant Medical Center, Greenville, NC
PURPOSE: A single dose of fosfomycin is recommended for uncomplicated cystitis due to minimal resistance and reduced collateral damage, but there are limited data on its clinical use in urinary tract infections (UTI). The aim of this study is to evaluate microbiological and clinical efficacy of fosfomycin in uncomplicated and complicated UTIs.
METHODS: This is a retrospective, single-center cohort study of adult patients receiving at least one dose of fosfomycin in the emergency department (ED) or while hospitalized during 2014. Baseline demographics, documented symptoms, antibiotic therapy, microbiology, and urinalysis results were collected. Follow-up data within 30 days of initial treatment included microbiology, documented symptoms, readmission rates, and urinalysis. The primary endpoint was microbiological success, defined as a sterile repeat urine culture within 30 days. Secondary outcomes included clinical success, relapse, and reinfection.
RESULTS: Data were collected on 127 hospitalized and 204 ED patients. Initial urine cultures were positive in 74 hospitalized and 70 ED patients; 47 (63.5%) hospitalized and 24 (34%) ED patients were treated for complicated UTIs. The most frequent causative pathogens included Enterococcus spp. (36.5%) (hospitalized) and Escherichia coli (52.8%) (ED). Patients received an average of 1.2 fosfomycin doses per treatment course. Preliminary results demonstrate microbiological success in 17 of 28 hospitalized patients and 5 of 7 ED patients with follow-up cultures. The follow-up cultures of hospitalized patients showed relapse with the same organism in 4/17 or a new organism isolated in 7/17 patients. Clinical success, defined as symptom resolution, occurred in 55 of 64 (86%) hospitalized patients and 15 of 19 (79%) ED patients.
CONCLUSIONS: Data collection and analysis is expected to be complete by presentation date. Based on preliminary results, microbiological success appears to be less than reported previously for uncomplicated UTIs; however, the observed clinical success rate of fosfomycin therapy is similar to available literature.

Medication Safety

401. Nephrotoxic medication use in the community-acquired acute kidney injury (CA-AKI), elderly population *Cory Weaver, Pharm.D.*[1], Melissa Saul, M.S.[2], Sandra Kane-Gill, Pharm.D., M.Sc., FCCM, FCCP[3]; (1) Department of Pharmacy and Therapeutics, UPMC Presbyterian Shadyside, Pittsburgh, PA (2) Center for Pharmacoeconomics and Outcomes Research, University of Pittsburgh School of Pharmacy, Pittsburgh, PA (3) Department of Pharmacy and Therapeutics, University of Pittsburgh School of Pharmacy, Pittsburgh, PA
PURPOSE: The majority of literature on acute kidney injury (AKI) focuses on hospital-acquired AKI, with less known about AKI developing in the community (CA-AKI). Known risk factors for AKI include increased age and nephrotoxic medication use. The goal of this study was to identify CA-AKI and describe nephrotoxic medication use in this population.
METHODS: Patients ≥65 years old presenting to the emergency department (ED) with CA-AKI during a six-month period at three UPMC hospitals were evaluated. CA-AKI was defined as presentation with a creatinine of 1.5 times baseline, using the lowest creatinine within 1-year as a baseline. When unavailable, baseline creatinine values were estimated using the Modification of Diet in Renal Disease (MDRD) equation. Patients with chronic kidney disease were excluded. A random sample of 200 patients was selected for chart review. Drug-associated AKI was identified through physician notation and home medication summaries. Frequency of nephrotoxic medication use from home medication summaries was recorded.
RESULTS: A total of 9,237 patients were evaluated, with 5,236 (56.7%) patients having baseline creatinine available; 774 met criteria for CA-AKI. A total of 4,001 (43.3%) patients required use of the MDRD equation; 475 met criteria for CA-AKI. In total, 1,249 (13.5%) patients presented with CA-AKI. Less than 1% (5/200) of patients were noted to have a drug-induced CA-AKI. Approximately 50% (101/200) of patients were taking a known

nephrotoxin at home. The most common nephrotoxins included aspirin, furosemide, and lisinopril. The most common nephrotoxins by class included non-steroidal anti-inflammatory drugs (NSAIDS), loop diuretics, and ace-inhibitors.
CONCLUSIONS: Nephrotoxic medications were used in roughly half of the CA-AKI population studied. This discovery emphasizes opportunity for pharmacist intervention in both outpatient and inpatient settings to limit use of nephrotoxic medications in the elderly population. Screening and early intervention may improve patient outcomes and decrease healthcare costs associated with CA-AKI.

Nephrology

402. Evaluation of antihypertensive use in ESRD patients with intradialytic hypotension in the inpatient setting *Andrew Nishimoto, Pharm.D.*[1], Benjamin T. Duhart,Jr, M.S.[2], David Shoop, Pharm.D.[3], Robert Canada, M.D.[4], Joanna Q. Hudson, Pharm.D., BCPS, FASN, FCCP, FNKF[2]; (1) Pharmacy Department, University of Tennessee Health Science Center / Methodist University Hospital, Memphis, TN, USA (2) Department of Clinical Pharmacy, The University of Tennessee College of Pharmacy, Memphis, TN, USA (3) Pharmacy Department, University of Tennessee / Methodist Le Bonheur Germantown Hospital, Germantown, TN, USA (4) College of Medicine, University of Tennessee, Memphis, TN
PURPOSE: Intradialytic hypotension (IDH) is the most common complication of hemodialysis (HD). Administration of antihypertensive medications (AHTs) in the inpatient setting often occurs prior to dialysis; however, the influence on the rate of IDH is unclear. This study evaluated the association of AHT, nitrates, and other factors with IDH.
METHODS: A single-center, retrospective chart review was performed to identify hospital patients with ESRD requiring HD from August 2011 to August 2013. The study population was divided into IDH and non-IDH cohorts. We evaluated a maximum of five dialysis sessions per patient, comparing AHTs and nitrate use within twelve hours prior to each HD session. The potential association between the development of IDH and serum albumin, pre-HD blood pressure, serum sodium, and the ultrafiltration rate during HD was also evaluated.
RESULTS: In 104 patients studied (50 IDH, 54 non-IDH), the proportion of patients receiving AHTs was higher in the IDH group compared to the non-IDH group (82% vs. 65%). Additionally, a greater percentage of the IDH cohort (26% vs. 5%) had an arteriovenous (AV) graft as their HD access and had a higher mean pre-dialysis systolic blood pressure (SBP) (141 vs. 134 mm Hg). IDH was also associated with AHT usage, although subanalysis of IDH dialysis sessions demonstrated a negative correlation between total AHT/nitrate doses received and IDH. Higher admission hemoglobin was also associated with IDH in subgroup analysis.
CONCLUSIONS: This study suggests that in addition to the timing of administration of AHTs, other factors including pre-dialysis SBP and hemoglobin are important to consider when evaluating risk of developing IDH.

403. Mortality in patients with chronic kidney disease using sevelamer or calcium-containing phosphate binders: a systematic review and meta-analysis Marisa Schauerhamer, Pharm.D.[1], Rishi Deka, M.S.[1], Lara Senekjian, M.D.[2], Austin Reese, Pharm.D. Candidate[1], *Jordan King, Pharm.D.*[1]; (1) Department of Pharmacotherapy, University of Utah, Salt Lake City, UT, USA (2) School of Medicine, University of Utah, Salt Lake City, UT, USA
PURPOSE: Calcium-free phosphate binders have demonstrated improved mortality relative to calcium-based agents for treatment of hyperphosphatemia in patients with chronic kidney disease (CKD). However, it is unclear if this benefit differs by type of calcium-free binder. The purpose of this study was to determine the effect of sevelamer, a calcium-free phosphate binder, relative to calcium-based agents on all-cause mortality in patients with CKD.
METHODS: A systematic review was performed to identify all randomized and quasi-randomized controlled trials published between January 1, 2008 and October 28, 2014 that compared sevelamer vs calcium-based phosphate binders on mortality in adult patients with CKD. Embase, Cochrane Central, Medline, Scopus and Clinicaltrials.gov were searched. Previous meta-analyses and kidney-related journals not included in searched databases were also reviewed. Non-randomized trials and trials with a treatment duration less than 2 months were excluded. Pooled treatment effect was evaluated using a random effects model.
RESULTS: The search identified 236 unique studies that underwent abstract review. An additional 24 studies were identified from previous meta-analyses, which included articles published prior to 2008. After abstract review, 46 articles underwent full text review. Ten studies evaluated sevelamer vs calcium-containing binders, included a mortality endpoint, and were included in the analysis. The random effects model showed a significant reduction in overall risk of mortality with sevelamer compared to calcium-based agents (risk ratio [95% CI]: 0.54 [0.32, 0.90]). There was substantial heterogeneity between studies (I^2= 80.4%), primarily attributed to trial duration. No significant differences in all-cause mortality were observed when studies were sub-grouped by duration of trial (24 months or less: 0.58 [0.30, 1.12]; more than 24 months: 0.53 [0.26, 1.09]).
CONCLUSION: Sevelamer is associated with a decreased risk in all-cause mortality relative to calcium-based phosphate binders. Substantial heterogeneity between trials was observed, which may be attributable to differences in trial duration.

404. Evaluation of 30-Day hospital readmissions for patients with end stage renal disease *Cassandra Dees, Pharm.D.*[1], Joanna Q. Hudson, Pharm.D., BCPS, FASN, FCCP, FNKF[2], Alison Apple, D.Ph., M.S.[1], Robin Womeodu, M.D., FACP[3], Benjamin T. Duhart, Jr, M.S., Pharm.D.[2]; (1) Pharmacy Department, Methodist Le Bonheur Healthcare–University Hospital, Memphis, TN (2) Department of Clinical Pharmacy, The University of Tennessee College of Pharmacy, Memphis, TN (3) Methodist Le Bonheur Healthcare–University Hospital, Memphis, TN
PURPOSE: To evaluate reasons for 30-day hospital readmissions for end-stage renal disease (ESRD) patients and whether there were modifiable risk factors that may help minimize readmissions.
METHODS: This was a retrospective chart review of adult inpatients with ESRD on hemodialysis (HD) admitted over a 2-year period. Patients with a history of kidney transplant within 6 months and new HD patients were excluded. Patients were divided into two groups: those not readmitted within 30 days (control group) and those readmitted within 30 days (study group). Reasons for the index hospitalization and rehospitalization were determined. Differences in patient demographics, comorbid conditions, number and type of admission and discharge medications prescribed, and length of stay were compared between groups.
RESULTS: 201 patients were included (control=122, study=79). The primary reasons for index admission were vascular access complications (9% vs. 30%; $p < 0.05$) and cardiovascular events (25% vs. 8%; $p < 0.05$) for the study and control groups, respectively. The primary reason for 30-day readmissions was cardiovascular events (21.5%) with 48% of study patients readmitted for the same reason as the index admission. Significantly more patients in the study group were admitted to the ICU (18% vs. 8%), had congestive heart failure (CHF) (42% vs. 28%), liver disease (8% vs. 1%), and longer median lengths of stay on index admission (4.3 vs. 2.4 days). Fewer study patients were prescribed vitamin D analogs on index admission compared to the control group, while on discharge more study patients were prescribed ACE inhibitors. Fewer study patients received antiplatelet therapy

on both admission and discharge. There were no differences in the total number of medications prescribed.
CONCLUSIONS: Patients with ESRD on HD who are admitted with cardiovascular events should be more closely monitored as they have a higher probability of readmission. Additional research is needed to further evaluate whether pharmacologic therapy impacts readmission.

Neurology

405. Evaluation of the effect of a neurology specific heparin protocol on time to goal PTT range: a pre-and post protocol implementation study *Prachi Bhatt, Pharm.D.*[1], Anna Cervantes, M.D.[2], Lindsay Arnold, Pharm.D.[1]; (1) Department of Pharmacy, Boston Medical Center, Boston, MA (2) Department of Neurology, Boston Medical Center
PURPOSE: Literature on heparin infusion titrations as well as target PTT ranges in ischemic stroke is sparse, though research suggests PTT ranges above twice baseline value are associated with increased risk of hemorrhage. This study evaluated use of a neurology-specific protocol with more frequent PTT monitoring and a narrower goal PTT.
METHODS: This is a retrospective cohort study evaluating patients before and after implementation of a neurology specific heparin protocol. Outcomes are compared in patients who received heparin prior to (October 2011-September 2013) and after protocol (October 2013-September 2014) implementation. The primary objectives are time to first therapeutic PTT and time to therapeutic PTT range. Secondary objectives include, hemorrhagic conversion, ischemic expansion, protocol compliance, number of sub-therapeutic and supra-therapeutic PTT values, time to initiation of oral anticoagulation, duration of heparin infusion, and number of heparin infusion titrations. All patients >18 years of age, receiving intravenous heparin and admitted with a primary or secondary diagnosis of ischemic stroke will be evaluated for inclusion.
RESULTS: Time to first PTT was 4.4 hours in the pre-protocol group ($n = 4$) and 4 hours in the post-protocol group ($n = 16$). The time to first therapeutic PTT was 16.7 hours and 10 hours, respectively. The time to therapeutic PTT range was 27 hours and 18 hours ($p = 0.404$). Protocol compliance was 38.4% (± 26.7%) in the post-protocol group and 94.8% (± 10.1%) of heparin infusion actions were appropriate. The percentage of PTT values in therapeutic range was 60% in the pre-protocol group and 55.1% in the post-protocol group.
CONCLUSION: Preliminary analysis shows the institution of a neurology specific heparin protocol led to improved time to therapeutic PTT, though given a limited sample size, this difference was not statistically significant. Closer PTT monitoring occurred after implementation of the protocol. Expanded data collection and analysis is ongoing.

Oncology

406. Iron deficiency anemia evaluation in a hematology-oncology population at a large academic medical center *Tracy Harlan, Pharm.D.*, Jill Stein, Pharm.D., BCOP, Susan Fajardo, Pharm.D., Deanna McDanel, Pharm.D., BCPS, BCACP, Susan Sorenson, RPh, BCOP; Department of Pharmaceutical Care, University of Iowa Hospitals and Clinics, Iowa City, IA
PURPOSE: Anemia is a common complication found in many patients with cancer. This study assessed adherence with the National Comprehensive Cancer Network (NCCN) guidelines for evaluation of iron deficiency anemia (IDA) to determine if opportunities exist for pharmacist involvement in an outpatient cancer center clinic.
METHODS: A retrospective analysis of adult patients seen over a six month time frame with active, non-myeloid malignancy was performed. Records were reviewed to determine the percentage of patients who received iron studies upon meeting criteria for microcytic anemia (hemoglobin ≤ 11 g/dL and mean corpuscular volume ≤ 80 fL). If iron studies were obtained, an analysis was performed to determine if the patient met criteria for IDA. Further data collection included type of iron therapy received (if any) and incidence of blood transfusions.
RESULTS: A total of 120 patients were evaluated. Iron studies were obtained in 59 patients (49%) that met criteria for evaluation. Of the 59 patients who received iron studies, 48 (81%) met laboratory criteria for IDA. Among these, 19 (40%) received oral iron, 3 (6%) received parenteral iron, 8 (17%) received a combination of oral and parenteral iron, and 18 (37%) received no iron. The prevalence of blood transfusions in iron deficient patients who received iron compared to those that did not was 33% in both groups. In the patients that had no iron studies performed, a similar percentage of blood transfusions were received in those who were given iron therapy versus those that did not (47% and 48%, respectively).
CONCLUSION: Nearly half of the patients included met criteria for evaluation of IDA, but received no laboratory studies for further IDA workup. Opportunities for further research and pharmacist involvement exist to improve guideline adherence to IDA evaluation and management.

Other

407. Implementation of a computerized prescriber order entry system in a community hospital from a pharmacy perspective *Anand Patel, Pharm.D.*[1], Navin Philips, Pharm.D., BS[2], Ashmi Philips, Pharm.D., AAHIVP[3], Mini Varghese, Pharm.D., BCPS[1]; (1) Department of Pharmaceutical Services, Hunterdon Medical Center, Flemington, NJ (2) Hunterdon Medical Center, Flemington, NJ (3) Department of Pharmacy Practice and Administration, Rutgers, The State University of New Jersey, Piscataway, NJ
PURPOSE: Medication errors cause significant morbidity and mortality in hospitalized patients but computerized prescriber order entry (CPOE) implementation has been associated with a decrease in such inaccuracies. This study evaluated the implementation of a CPOE system in a community hospital and assessed trends of reported errors.
METHODS: This was a mixed retrospective and prospective, single center, observational study that was IRB exempt. We evaluated the number and type of medication errors reported by pharmacists in an institutional quality and risk database prior to CPOE implementation retrospectively (February to April 2014) and prospectively (February to April 2015) at our institution. The primary outcome was to compare the number and type of medication errors reported before and after the transition to CPOE.
RESULTS: Among 566 total errors identified, 271 met the inclusion criteria (152 errors in the pre-implementation phase and 144 errors in the post-implementation phase). After CPOE implementation, there was a statistically significant reduction in incomplete/incorrect PRN indications ($p = 0.04$), incomplete/incorrect route ($p = 0.009$) and drug-allergy interactions ($p = 0.023$). There were also reductions in errors related to duplicate therapy, incomplete/incorrect dose, incomplete/incorrect dosage form, incomplete/incorrect rate, incomplete/incorrect medication, contraindicated medications and illegible orders. Certain errors were found to increase after the implementation of CPOE, the most apparent being incomplete/incorrect frequency or timing. Other errors noted to increase included incomplete/incorrect duration and drug to drug interactions, however none were found to be statistically significant.
CONCLUSION: Implementation of CPOE led to a statistically significant decrease in drug-allergy interactions, incomplete/incorrect PRN indications and incomplete/incorrect route. Increase in incomplete/incorrect frequency or timing could be attributed to the newly added responsibilities of the physicians with selecting appropriate medication administration timing. Through this study areas requiring additional prescriber training and pharmacist vigi-

lance were identified, which will be utilized in future phases of CPOE.

408. Towards a philosophy of risk *Maresca Attard Pizzuto, B.Pharm (Hons), M.Sc (Clinical Pharmacy)*[1], Claude Mangion, B.A (Hons), M.A (Sussex), Ph.D[2], Anthony Serracino-Inglott, B.Pharm., Pharm.D. (Cinc.), MACCP, MRPharmS[1], Lilian M. Azzopardi, B.Pharm (Hons), MPhil, Ph.D, MRPharmS[1]; (1) Department of Pharmacy, Faculty of Medicine and Surgery, University of Malta, Msida, Malta (2) Department of Philosophy, Faculty of Arts, University of Malta, Msida, Malta

PURPOSE: Pharmacists constantly encounter situations which lead to a dilemma regarding the best possible outcome for the patient. When faced with these situations, pharmacists often ask themselves "What should I do?" This research aims to propose different approaches that pharmacists can take prior to deciding what action they are going to take based on philosophical principles and theories and the risk associated with taking that decision.

METHODS: An extensive literature review was conducted to evaluate the different areas of philosophy related to morality and decision-making processes, after which, potential decisions taken by pharmacists were evaluated and assessed by different philosophical approaches.

RESULTS: Two approaches can be considered to answer this question, namely, the utilitarian approach and the deontological approach. The utilitarian approach states that an action is right if it promotes happiness and well-being in the majority of the population. The deontology approach states that an action is right or wrong depending on the inherent nature of the action, irrespective of its consequences. For example, if on the one hand, the pharmacist decides to dispense a valid, legal prescription for the oral contraceptive pill irrespective of his/her beliefs, the stakeholders involved, namely the pharmacy, the drug manufacturing company, the prescribing physician and the patient are going to benefit and only the pharmacist is going to be inconvenienced. This decision follows the utilitarian approach. If on the other hand, the pharmacist decides not to dispense the prescription because s/he thinks that this action is contradicting the purpose of the pharmaceutical profession that of respect of human life, then this decision follows the deontological approach.

CONCLUSION: Approaches like utilitarianism and deontology cannot be the only principles guiding decisions, but they certainly play a role in the daily decisions and in the evaluation of how much risk a pharmacist is willing to take.

409. Twitter evaluation and extension of pharmacy study (TWEEPS): an evaluation of hydrocodone *Gabrielle Furgiuele, Pharm.D. Candidate 2016*[1], Meagan Miles, Pharm.D. Candidate 2016[1], Daniel Connor Smith, Pharm.D. Candidate 2016[2], Bryan L. Love, Pharm.D., BCPS[3], P. Brandon Bookstaver, Pharm.D., BCPS (AQ-ID), AAHIVP[4], Andrew Sides, M.D.[5]; (1) University of South Carolina, South Carolina College of Pharmacy, Columbia, SC (2) South Carolina College of Pharmacy, Columbia, SC (3) Clinical Pharmacy and Outcomes Sciences, South Carolina College of Pharmacy, Columbia, SC (4) Department of Clinical Pharmacy & Outcomes Sciences, South Carolina College of Pharmacy, University of South Carolina, Columbia, SC (5) University of South Carolina School of Medicine, Columbia, SC

PURPOSE: Social media may be a useful tool in assessing public attitudes and expression. This study aimed to determine the tone and type of tweet on Twitter¨ regarding the controlled substance hydrocodone during the schedule Class III to II change.

METHODS: Tweets were collected from October 7, 2014 to January 28, 2015 via an analytical program Tweet Archivist. All tweets included the key words hydrocodone, Lortab¨, or Vicodin published by Twitter users with public profiles. Retweets of an original tweet and those unable to translate to English were excluded. Using a pre-defined algorithm developed by the study team, tweets were categorized by tone (positive, negative, or neutral), and type (patient question, misuse/abuse/diversion, appropriate use, informational/educational, adverse events/side effects/drug-drug interactions, general comment, or other). Inter-rater agreement between 2 data collectors was assessed using Cohen' kappa statistic. A comparison of tone categories and type will be described. All data analyses performed using Stata, version 13.0 (Stata Inc., College Station, Texas). Final data will be analyzed by 2-tailed independent t-test for normally distributed continuous data. Non-parametric tests will be used to identify any associations between ordinal and non-normally distributed responses. An a priori level of less than 0.05 will be used to determine significance.

RESULTS: There were 1,631 tweets containing Lortab¨ during the study period. 1,431 were analyzed after exclusion. Tweets were primarily neutral (47.5%) or negative (41.4%) in tone. Categorization results are available in table below. Analysis of hydrocodone and Vicodin¨ containing tweets pending. Analysis of tweets containing hydrocodone and Vicodin is currently in process. Comparative analysis to follow.

Tweet Category	Number of Tweets (%), n = 1,431
Misuse/Abuse/Diversion	413 (28.9)
General Comment	342 (23.9)
Appropriate Use	197 (13.8)
Adverse Events/Side Effects/ Drug-Drug Interactions	188 (13.1)
Informational/Educational	139 (9.7)
Other	125 (8.7)
Patient Questions	27 (1.9)

CONCLUSIONS: Pending.

Pain Management/Analgesia

410. Outcomes associated with a multidisciplinary pain oversight committee to facilitate appropriate management of chronic opioid therapy in Veterans *Ryan Schell, Pharm.D., BCPS*[1], Anthony Abramcyzk, Pharm.D., BCPS[1], Cory Fominaya, Pharm.D., BCPS[1], Robert Friedman, M.D.[2], Sharon Castle, Pharm.D., BCPS[1]; (1) Pharmacy Service, Ralph H. Johnson VA Medical Center, Charleston, SC (2) Department of Anesthesiology, Ralph H. Johnson VA Medical Center, Charleston, SC

PURPOSE: Long-term opioid therapy to treat chronic non-cancer pain has become increasingly common, despite a lack of evidence regarding its efficacy and a growing body of literature describing its adverse effects. The Ralph H. Johnson VAMC created a multidisciplinary Pain Oversight Committee (POC) to improve opioid prescribing habits and to increase monitoring in patients receiving chronic opioid therapy (COT). The purpose of this study was to characterize interventions implemented by the POC and to evaluate the impact of these interventions on safe prescribing and appropriate monitoring of COT in Veterans.

METHODS: This was an IRB-approved, retrospective analysis of all adult patients enrolled at the Ralph H. Johnson VAMC who received COT between April 1, 2012 and March 31, 2015. A high-risk subgroup included patients who received opioid(s) where the daily dose in morphine equivalents (MEDD) was ≥ 200 in a fiscal quarter, or patients who received opioid(s) and benzodiazepine(s) (BZD's) in the same quarter. The primary endpoint was a description of the interventions implemented by the POC during the study period. Secondary endpoints were annual urine drug screen (UDS) rates, annual Prescription Drug Monitoring Program (PDMP) query rates, and clinically significant interventions within the high-risk subgroup.

RESULTS: During the study period, there were 22 POC interventions spanning 19 months. Interventions were categorized into four groups: Targeted Patient Intervention, Informatics Tools, Provider Education, and Patient Education. Annual UDS and PDMP query rates increased 56.7% and 324.4%, respectively. In the high-risk

subgroup, the percent of patients receiving concomitant opioid / BZD therapy and ≥ 200 MEDD decreased 47.1% and 29%, respectively. Statistical analysis and evaluation of clinically significant interventions in the high-risk subgroup are ongoing.
CONCLUSION: POC interventions were successful in achieving pre-specified POC goals. Future studies should evaluate changes in patient-centered (pain scores) and clinical (overdose) outcomes.

411. Implementation and evaluation of a pharmacist-managed chronic pain clinic in a primary care setting *Jessica Norman, Pharm.D.*[1], Miranda Kroehl, M.S., Ph.D.[2], Cindy O'Bryant, Pharm.D.[3], Huong Mindy Lam,M.D.[1], Carmen Lewis, M.D., M.P.H.[1], Chelsea Mitchell, Pharm.D. Candidate[3], Katy E. Trinkley, Pharm.D.[3]; (1) University of Colorado Hospital, Aurora, CO (2) University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO
PURPOSE: To implement and evaluate a pharmacist-managed chronic pain clinic in a primary care setting. The objectives of the clinic are to improve patient-reported pain scores, patient-reported satisfaction with pain management, patient-reported compliance to opioid and non-opioid pain regimens, to decrease total daily opioid burden, and to increase use of non-opioid adjunctive medications.
METHODS: This is a prospective, observational pre/post study. Patients are eligible for inclusion if they have chronic pain and are taking an opioid for at least three months. The intervention is pharmacist-led chronic pain management. At each visit the pharmacy team does a comprehensive pain assessment and manages medications using a collaborative drug therapy management (CDTM) protocol. Patients are seen on a day when their PCP is in clinic to allow for interdisciplinary collaboration and prescribing of controlled medications.
RESULTS: Thirty-nine patients have been seen for at least one visit. The patients' mean age is 55.4 ± 12.8 years and 23.1% are male. Mean number of days between visits is 43.2 ± 32 and the median number of visits per patient is 2. Of the 25 patients who were seen for at least 2 visits, patient-reported pain scores and satisfaction with pain management, both measured on a 0 to 10 scale, improved (mean: 6.2 ± 2.0 vs. 5.8 ± 2.0 and 6.6 ± 2.3 vs. 7.3 ± 2.7, respectively). After 2 visits, there were improvements in mean total daily opioid burden, measured in oral morphine equivalents (decreased from 70.6 ± 62.3 mg to 66.6 ± 53.5 mg), mean number of non-opioid adjunctive medications (increased from 1.8 ± 1.2 to 2 ± 1.2), and patient-reported compliance to non-opioid regimens (increased from 76% to 87.5%). However, patient-reported compliance to opioid regimens decreased from 80% to 68.8%.
CONCLUSION: Preliminary data demonstrates a pharmacist-managed pain clinic is effective in improving chronic pain-related outcomes.

Pediatrics

412. Medication regimen complexity index tool in pediatric cardiac patients *Ellie Hendricks, Pharm.D.*, Ada Koch, Pharm.D., MBA, BCPS; Department of Pharmacy, Children's Hospital Colorado, Aurora, CO
PURPOSE: Published medication regimen complexity index (MRCI) tools have only been validated in adult patients, and may not accurately assess the complexity of pediatric medication regimens. The purpose of this study was to design an MRCI tool specifically for pediatric cardiac patients at Children's Hospital Colorado (CHCO), and validate the tool's utility in identifying patients at high risk of hospital readmission within 30 days of discharge.
METHODS: This study was completed as a retrospective chart review, with data collected for CHCO Heart Institute patients admitted or readmitted from January 1, 2013 to December 31, 2013. The MRCI tool was designed by incorporating components of medication regimen complexity from the literature as well as components specific to pediatric cardiac patients, per CHCO provider and pharmacist input. The tool was validated against two cohorts of pediatric cardiac patients: unplanned readmission within 30 days of discharge (n = 86), no unplanned readmission within 30 days of discharge (n = 90). MRCI scores were assessed for each patient based on their discharge medication regimen.
RESULTS: MRCI tool sensitivity = 0.63, specificity = 0.53, and receiver operating curve (ROC) AUC = 0.623 (p = 0.003). Data collection is still in progress, in an effort to increase the patient population size used for validation and optimization of MRCI tool metrics.
CONCLUSION: Current results indicate that this novel MRCI tool stratifies CHCO Heart Institute patients' medication regimens into risk categories which correlate with their 30 day hospital readmission risk, and identifies patients with medication regimens that may contribute to an increased overall hospital readmission risk. Sensitivity and specificity of the tool is limited due to multiple non-medication factors involved in unplanned readmissions. Final results and conclusions to be presented.

413. Efficacy and Safety of Antiretroviral Therapies in Children with Perinatally Transmitted HIV *Titilola Afolabi,*[1], Katalin Koranyi,[2], Milap C. Nahata,[1]; (1) Ohio State University College of Pharmacy, Columbus, OH (2) Nationwide Children's Hospital, Columbus, OH*Dr. Titilola Afolabi, PharmD, BCPS*[1], Dr. Katalin Koranyi, MD[2], Dr. Milap C. Nahata, MS, PharmD, FCCP[1]; (1) Ohio State University College of Pharmacy, Columbus, OH; (2) Nationwide Children's Hospital, Columbus, OH
PURPOSE: This study determined the efficacy and safety of antiretroviral therapies (ART) in children with perinatally transmitted HIV.
METHODS: This retrospective review of medical records evaluated a cohort of pediatric patients less than 13 years of age with perinatal HIV exposure. Data obtained between January 2008 and December 2013 were included. Primary efficacy outcomes included virologic (viral load - VL) and immunologic (absolute CD4 count and CD4%) markers. Other outcomes included presence of AIDS-defining illnesses and development of adverse events.
RESULTS: Twenty-four patients (mean age 7.25 years; 6 M, 18 F) met inclusion criteria. Seven had a history of AIDS-defining illnesses including *pneumocystis jiroveci* pneumonia, candidiasis, and neurological deficits secondary to HIV encephalopathy. All patients received ART with the combination of zidovudine, lamivudine and boosted lopinavir being the most common (9/24). At the end of the study period, 20 patients achieved undetectable VL (<40 copies/mm^3). In patients with detectable VL, the mean VL was 1157 copies/mm^3 (n = 4; range: 51–2446 copies/mm^3). The mean absolute CD4 count was 1400 cells/mm^3 (range: 657–3404 cells/mm^3). Mean CD4% was 36% in patients less than 5 years (n = 4) and 37% in all patients (range: 19.9–47.2%). Ten patients maintained undetectable VL throughout the study period. In fourteen patients with at least one detectable VL, the mean number of days to achieve undetectable VL was 397 days (range: 93–1493 days). Undetectable VL was attained in 156 of 276 measurements (57%). The most common adverse events reported were gastrointestinal; less commonly reported adverse events included sleep disturbances, bilateral leg tremors and elevated triglyceride levels.
CONCLUSION: Use of ART resulted in undetectable VL in 83% of patients. In patients with detectable VL, mean number of days to achieve undetectable VL was 397 days. ART regimens appeared to be well tolerated in most patients.

414. Efficacy and safety of antiretroviral therapies in adolescents and young adults infected with HIV *Titilola Afolabi, Pharm.D., BCPS*[1], Katalin Koranyi, M.D.[2], Milap C. Nahata, M.S., Pharm.D.[1]; (1) Ohio State University College of Pharmacy, Columbus, OH (2) Nationwide Children's Hospital, Columbus, OH

PURPOSE: This study determined the efficacy and safety of antiretroviral therapies (ART) in adolescents and young adults with HIV.
METHODS: This retrospective review of medical records evaluated a cohort of patients, ages 13-19 years with HIV. Data obtained between January 2008 and December 2008 were included for analysis. Primary efficacy outcomes included virologic (viral load - VL) and immunologic (absolute CD4 count and CD4%) markers. Other outcomes included presence of AIDS-defining illnesses and development of adverse events.
RESULTS: Nineteen patients (mean age 17 years; 12 M, 7 F) met inclusion criteria. Routes of acquiring HIV included perinatal exposure (n = 10), sexual contact (n = 8) and transfusion (n = 1). Six patients had a history of AIDS-defining illnesses including *pneumocystis jiroveci* pneumonia, *mycobacterium avium* complex infection, cryptosporidiosis and severe malnutrition. All patients received ART with the combination of tenofovir, emtricitabine and efavirenz being the most common initial regimen (8/20). At the end of the study period, 18 patients achieved undetectable VL (<40 copies/mm^3). Mean CD4% was 37% (range: 27.3–55%) and mean absolute CD4 count was 763 cells/mm^3 (range: 405–1256 cells/mm^3). Six patients maintained undetectable VL throughout the study period. In thirteen patients with at least one detectable VL, the mean number of days to achieve undetectable VL was 209 days (range: 66–560 days). Undetectable VL was attained in 94 of 138 measurements (68%). The most common adverse events reported were gastrointestinal; less commonly reported adverse events included rash, night-sweats and altered mental status. One patient required a change in ART regimen due to persistent vomiting.
CONCLUSION: Use of ART resulted in undetectable VL in 95% of patients. In patients with detectable VL, the mean number of days to achieve undetectable VL was 209 days. ART appeared to be well tolerated in most patients.

415. Effects of N-Acetylcycstine on Cysteine Protein Binding in Boys with Cerebral Adrenoleukodystrophy *Mary Walters, Bachelor of Arts: Chemistry, PharmD Candidate*[1], Lisa Coles, Ph.D.[2], Usha Mishra, M.S.[2], Paul Orchard, M.D.[3], James Cloyd, Pharm.D.[4]; (1) College of Pharmacy, Department of Experimental and Clinical Pharmacology, University of Minnesota, Minneapolis, MN (2) Center for Orphan Drug Research, Department of Experimental and Clinical Pharmacology, University of Minnesota College of Pharmacy, Minneapolis, MN (3) Division of Pediatric Hematology-Oncology, Blood and Bone Marrow Transplant, Department of Pediatrics, University of Minnesota, Minneapolis, MN (4) Center for Orphan Drug Research, Department of Experimental and Clinical Pharmacology, University of Minnesota College of Pharmacy, Minneapolis, NE
PURPOSE: Cerebral adrenoleukodystrophy (cALD) is a devastating, rare, X-linked genetic disorder affecting adolescent boys. Oxidative stress has been shown to be a key pathological feature mediating the rapid neurological decline observed. Adjuvant N-acetylcysteine (NAC) therapy has been shown to improve survival, but the mechanism of action in this disease is still unknown. The objective of this study is to determine if NAC dissociation of plasma protein-bound cysteine (Cys) increases glutathione (GSH) in boys with cALD.
METHODS: Plasma samples were collected from 12 late-stage cALD patients pre-NAC dose and at various time points post-NAC infusion 7 and 21 days after hematopoietic stem cell transplantation. Unfiltered and filtered portions were prepared and analyzed via HPLC/MS. Total and unbound plasma concentrations of NAC, Cys, and GSH were determined.
RESULTS: The pharmacokinetic profile for 7 patients demonstrated linear first order kinetics for NAC. Unbound Cys plasma tmax was 30 minutes post-infusion, 15 minutes after tmax of total NAC. Plasma GSH remained constant near the lower limit of quantitation (~1 μg/mL). Peak and trough unbound Cys and total NAC were greater at 15 minutes post-infusion compared to 5 hours on both days 7 and 21. No difference in total Cys was observed between 15 minutes and 5 hours for both day 7 and 21. Tmax of percent unbound Cys also corresponded to the tmax for percent unbound NAC.
CONCLUSION: Significant increases in unbound Cys concentrations in accordance with increases in total NAC indicate that NAC is increasing unbound Cys in the plasma of boys with cALD. Non-significant changes in total Cys levels suggest that NAC metabolism does not play a significant role in the observed increases in Cys available for GSH synthesis. Increases in this endogenous antioxidant could contribute to the improvements in therapeutic outcomes observed in this patient population treated with adjuvant NAC.

Pharmacoeconomics/Outcomes

416. Health economic outcomes evaluation of liposomal bupivacaine use for orthopedic procedures *Yin Wong, Pharm.D.*, Heather Weese, Pharm.D., BCPS, Trent Beach, Pharm.D., M.B.A., M.H.A., BCPS, FASHP, FACHE, Beverly Bowman, R.N., MNSc, Kimberly Wellborn, P.T., MBA, Robert Fink, Pharm.D., MBA, FACHE, FASHP, BCNSP, BCPS; Department of Clinical Services, Community Health Systems, Franklin, TN
PURPOSE: To determine whether the use of liposomal bupivacaine in patients undergoing orthopedic procedures would lead to favorable clinical and financial outcomes
METHODS: We conducted a multicenter retrospective-prospective observational case-control study of 2,465 patients undergoing orthopedic procedures (hip, knee and/or ankle replacement and/or reattachment) defined by diagnosis-related group (DRG) 469 and 470 during the study period of July 1, 2014 to October 31, 2014. Of those patients, 1287 patients with DRG 469 and/or 470 received liposomal bupivacaine comprised of the case group and 1178 patients who did not receive liposomal bupivacaine comprised of the control group.
RESULTS: The primary endpoints were the DRG-based drug cost per case and the overall hospitalization length of stay (LOS). Secondary endpoints included the total analgesic consumption throughout hospitalization, postoperative highest daily pain intensity score from numeric rating scale (NRS) and postoperative ambulation distance from end of surgery to postoperative day (POD) 3. The DRG-based drug cost per case was significantly higher in the case group in comparison to the control group, $499.41 and $205.26, respectively (95% CI 285.38 – 331.67, $p < 0.0001$). The average LOS was 2.81 ± 1.28 days in case group vs. 3.04 ± 1.60 days in control group. The mean difference in LOS was 0.23 days or 5.5 hours ($p < 0.0001$). With consideration of LOS reduction cost savings, the annualized healthcare cost associated with liposomal bupivacaine use was an estimate of $1.86 million within our health-system. No significant differences were noted for secondary endpoints.
CONCLUSION: The use of liposomal bupivacaine for orthopedic procedures was associated with significantly higher DRG-based drug cost per case. While patients who received liposomal bupivacaine had a shorter LOS, the economic impact did not reach breakeven. There were no difference between patients' total analgesic consumption, pain control and ambulation distance between the two groups.

Pharmacogenomics/Pharmacogenetics

418. Comparison between a point-of-care and a laboratory-based CYP2C19 genotyping assay for pharmacist-led personalisation of antiplatelet therapy *Francesca Wirth, B.Pharm. (Hons.), MPhil*[1], Graziella Zahra, D.MedSc.[2], Robert G. Xuereb, M.D., FRCP, FASA, FESC, FACC[3], Christopher Barbara, M.D., MS.c. (Lond), DLSHTM[2], Albert Fenech, M.D., M.D. (Aberd.), FRCP (Glas.), FRCP (Lond.)[3], Lilian M. Azzopardi, B.Pharm (Hons), MPhil, Ph.D, MRPharmS[1]; (1) Department of Pharmacy, Faculty of Medicine and Surgery, University of Malta, Msida, Malta (2)

Molecular Diagnostics Unit, Department of Pathology, Mater Dei Hospital, Msida, Malta (3) Cardiac Catheterisation Suite, Department of Cardiology, Mater Dei Hospital, Msida, Malta
PURPOSE: To apply a point-of-care (POC) assay to identify presence of the CYP2C19 loss-of-function (LoF) *2 allele in patients undergoing percutaneous coronary intervention (PCI) and to compare it to a laboratory-based assay. The laboratory-based assay selected uses a reverse hybridisation technique which is reported to be robust and accurate.
METHODS: Patients who were prescribed clopidogrel therapy post-PCI were recruited by non-probability sampling. After obtaining informed written consent, CYP2C19 *2 allele genotyping was performed with the POC Spartan™ RX system (Spartan Bioscience, Canada) and GenID® RDB 2070X strip assay (Autoimmun Diagnostika GmbH, Germany). Genotype results were classified as non-carrier of *2 allele, carrier of one *2 allele or carrier of two *2 alleles. Comparison between assays was undertaken.
RESULTS: Out of a total of 34 patients, 25 were male, mean age was 66 years (range 49-75 years) and all patients were Caucasian. With the POC assay, 21 patients were non-carriers of the *2 allele, 12 patients were carriers of one *2 allele and 1 patient was a carrier of two *2 alleles. With the laboratory-based assay, 21 patients were non-carriers of the *2 allele and 13 patients were carriers of one *2 allele, however no patients were identified as carriers of two *2 alleles. Agreement in genotype results between assays was 97% (Kappa statistic=0.939, p = 0.000).
CONCLUSIONS: The single mismatched result does not impact personalisation of antiplatelet therapy since an alternative to clopidogrel is recommended for both carriers of one and two *2 alleles. When compared to the laboratory-based assay, the POC assay is reliable, provides faster results, requires minimal training to perform the test and is non-invasive, however the tests are more expensive (estimated direct cost per test for POC assay is € 200 higher). Internal controls are incorporated, results interpretation is user-friendly and no sample batching is required for both assays.

Pharmacokinetics/Pharmacodynamics/Drug Metabolism/Drug Delivery

419. Evaluating drugged driving: A comparison of the pharmacodynamic effects of two central nervous System Stimulants on Common Driving Performance Measures *Andrew Spurgin, Pharm.D.*[1], Timothy Brown, Ph.D.[2], John Gaspar, Ph.D.[2], Gary Gaffney, M.D.[3], Robin Johnson, Ph.D.[4], Gary Milavetz, Pharm.D.[1]; (1) Pharmacy Practice and Science, University of Iowa College of Pharmacy, Iowa City, IA (2) National Advanced Driving Simulator, Iowa City, IA (3) University of Iowa Carver College of Medicine, Iowa City, IA (4) Clinical Research, Advanced Brain Monitoring, Carlsbad, CA
PURPOSE: Central nervous system stimulants improve performance through increasing alertness and decreasing drowsiness. The objective of this study was to determine the effect of stimulants on driving performance and whether different mechanisms of action influence performance.
METHODS: Data from two separate drugged driving studies were collected using the National Advanced Driving Simulator (NADS) miniSim™ Research Driving Simulator. Caffeine (200 mg) was administered in a non-blinded manner and mixed amphetamine salts (MAS) (30 mg) was administered in a blinded capsule with a placebo control. Caffeine data (9 participants) were collected in a baseline-controlled session while MAS data (20 participants) were collected across two sessions separated by at least three days. The same urban, interstate, and rural driving scenario was completed during the peak effect of the drugs. Data collection for both studies consisted of common measures of driving performance including: average speed, standard deviation of speed, average longitudinal acceleration, standard deviation of lane position (SDLP) and lane departure count. Driving measures were analyzed using repeated-measures ANOVAs and Cohen's d test for effect size.
RESULTS: Both drugs enhanced lateral lane keeping, as evidenced by a reduction in SDLP relative to the baseline/placebo (caffeine p = 0.01; MAS p = 0.001). These effects were evident on both straight and curved roadway segments. MAS significantly reduced the frequency of lane departures across road segments (p = 0.004), while caffeine resulted in a nominal but non-significant decrease in lane departures (p = 0.21). Longitudinal vehicle control, as measured by speed and speed variability, was unaffected by either caffeine or MAS.
CONCLUSION: Caffeine and MAS improved lateral vehicle control during non-drugged drives. The magnitude of these reductions (i.e., benefits) in lane position variability was equivalent for caffeine and MAS (d = -.45, -.47, respectively). Neither stimulant resulted in observable costs to driving performance, including longitudinal vehicle control.

420. Physiologically based pharmacokinetic modeling approach to estimate changes in renal organic anion transporters based secretion in transplanted kidneys *Hari Varun Kalluri, Pharm.D.*, Raman Venkataramanan, Ph.D.; Department of Pharmaceutical Sciences, School of Pharmacy, University of Pittsburgh, Pittsburgh, PA
PURPOSE: Renal transplantation is the treatment of choice for patients with ESRD. Since kidney is the primary excretory organ for various drugs and their metabolites, changes in renal filtration, secretion, or reabsorption capacity would significantly alter the clearance (CL) and exposure (AUC) of renally filtered or secreted drugs. Kidneys that are transplanted into the recipients normally undergo numerous insults including prolonged cold ischemia and tacrolimus induced nephrotoxicity. These physiological and pharmacological stresses can differentially alter the expression and functional capacity of renal drug transporters. Recent observations in our lab showed a significant down-regulation (3-14.5 fold) in the m-RNA expression of several renal transporters(Oat1, Oat3, Oct2, Mdr1a, and Mate1) following 24 hr prolonged cold ischemia and 4-weeks of tacrolimus treatment in a syngeneic rat kidney transplant model. Reduced expression and activity of organic anionic transporters (OAT1/3 and MRP2/4) can increase the systemic exposure of several anionic drugs that are primarily secreted into urine through this pathway. The objective of this study is to optimize dosing of organic anionic prescription medications(Acyclovir, Cidofovir, Cephalosporins, Fluoroquinolones, etc) that are primarily renally secreted in kidney transplant recipients by estimating renal transplant recipient organic anion secretory capacity.
METHODS: In order to better understand changes in renal OAT/MRP secretory capacity of renal transplant recipients, we developed and validated a physiology based pharmacokinetic (PBPK) model for cefoxitin(OAT1/3: Clint = 65 uL/min/million-cells; MRP2/4: Clint = 50 uL/min/million-cells).
RESULTS: The percent change between predicted and reported Cefoxitin PK parameters were within acceptable range(CL_{total}: 1.08%, CL_{Renal}: 2.60%, AUC: 0.87%, and $T_{1/2}$: 2.50%). This PBPK approach gave us the ability to not only study cefoxitin AUC and $CL_{Secretion}$ at varying expression and activity levels of OAT/MRP transports, but also gave us an understanding of population variability in cefoxitin PK characteristics.
CONCLUSION: Using the validated cefoxitin PBPK approach we developed a micro-dosing (200 mg) and minimal-sampling (3) strategy to estimate the renal organic anionic transport capacity of renal transplant recipients.

Psychiatry

421. Pharmacist intervention in patient monitoring in a psychiatric setting *Maria Mamo, B.Pharm.(Hons), M.Pharm., M.Sc. Student*[1], Lilian M. Azzopardi, B.Pharm.(Hons), MPhil, Ph.D., MRPharmS[2], Anthony Serracino-Inglott, B.Pharm., Pharm.D. (Cinc.), MACCP,

MRPharmS[2]; (1) Department of Pharmacy, University of Malta, Msida, Malta (2) Department of Pharmacy, Faculty of Medicine and Surgery, University of Malta, Msida, Malta
PURPOSE: To develop a 'Patient Monitoring Tool' to evaluate the quality of pharmaceutical care provided to patients in a psychiatric setting and to determine benefit from ward-based pharmacist services in this setting.
METHODS: A 'Patient Monitoring Tool' consisting of 'Patient Monitoring Guidelines' and a 'Pharmaceutical Care Issues Documentation Sheet' was developed. It was tested for validity, applicability, practicality and inter-observer reliability and then used to monitor 30 patients in an acute psychiatric ward. The tool was implemented and evaluation was carried out after 4 weeks through a self-administered evaluation questionnaire.
RESULTS: Validation of the tool was beneficial since useful suggestions emerged resulting in improvement of the tool with respect to comprehensiveness, layout and presentation. The tool was found to be applicable and practical for use in a psychiatric setting. Inter-reliability testing resulted in a Kappa value of 0.574 showing moderate agreement between the Pharmaceutical Care Issues (PCIs) identified by the 2 pharmacists carrying out patient monitoring. A total of 75 pharmaceutical care issues were identified, 55 of these issues involved psychiatric medications whilst the other 20 involved somatic medications. The most common PCIs captured included: long term use of benzodiazepines, clinically significant interactions and improper drug selection. Post-implementation evaluation by pharmacists carrying out patient monitoring on a weekly basis was positive.
CONCLUSIONS: This study demonstrated that the tools proposed can be implemented in the psychiatric in-patient setting. Pharmacist intervention in patient monitoring of psychiatric in-patients may lead to optimisation of patient care and safer use of medications. Integrating the pharmacist into the multidisciplinary health care team (especially during ward rounds) and direct patient involvement may further enhance the value of such services.

Pulmonary

422. Evaluation of asthma knowledge in a remote community of honduras *Rebecca Cope, Pharm.D.*[1], Lauren J. Jonkman, Pharm.D., MPH, BCPS[2], Sharon E. Connor, Pharm.D.[2], Mark Meyer, M.D.[3]; (1) University of Pittsburgh School of Pharmacy, Pittsburgh, PA (2) School of Pharmacy, University of Pittsburgh, Pittsburgh, PA (3) University of Pittsburgh Medical Center, Pittsburgh, PA
PURPOSE: As asthma is often under-diagnosed and under-treated in resource limited settings, Shoulder to Shoulder Pittsburgh-San José (STS) implemented a community-based asthma treatment program in the spring of 2014 utilizing a clinical pharmacist to educate a community nurse to operate under an asthma treatment protocol. The objective of this sub-study was to assess the level of asthma knowledge and program satisfaction for parents of participating children with asthma. It is hypothesized that high levels of each will lead to improved asthma self-management and may inform the successful implementation of similar models in other rural areas.
METHODS: During the fall 2014 medical brigade, the primary investigator met with one parent for each of the six participating families during their routine asthma visit to complete a 22-item survey including demographic information, an abbreviated version of the Asthma Knowledge Questionnaire (AKQ), and a program satisfaction evaluation. This research study was approved by the University of Pittsburgh Institutional Review Board and endorsed by the San José health committee. Data was analyzed using descriptive statistics.
RESULTS: All six families completed the survey. On average, the respondent parent had completed 5.7 years of education (range 3–9). On the AKQ, respondents received 26 out of 40 possible points (range 23–34), with higher scores indicating higher levels of knowledge. More than 50% of respondents incorrectly answered questions regarding medication adherence, appropriate medication use, and lifestyle limitations in asthma. 100% of families reported to have "great" overall satisfaction.
CONCLUSION: Results indicate satisfaction with the program, but poor asthma knowledge. Basic understanding of asthma and its treatment is critical for parents to manage their child's asthma independently. Educational materials and programs will be designed by a clinical pharmacist for distribution in the fall of 2015.

423. Evaluation of antibiotic management in the reduction of recurrent chronic obstructive pulmonary disease (COPD) exacerbations *Laura Hunt, Pharm.D., B.S.*[1], Jason Lancaster, Pharm.D., MEd[2], Elizabeth O'Gara, Pharm.D.[3], Leslie Mitchell, Pharm.D.[4], Henri Balaguera, M.D.[4], Timothy Liesching, M.D.[4], Yuxiu Lei, Ph.D.[4]; (1) Inpatient Pharmacy, Lahey Hospital and Medical Center, Burlington, MA (2) School of Pharmacy, Northeastern University, Boston, MA (3) Lahey Hospital & Medical Center, Burlington, MA (4) Lahey Hospital and Medical Center, Burlington, MA
PURPOSE: To assess 30-day readmission rates in hospitalized patients diagnosed with a COPD exacerbation stratified by receipt of antibiotics. Secondary objectives include 90-day readmission, length of hospital stay, and time to next COPD exacerbation.
METHODS: This is a retrospective evaluation of hospitalized patients admitted to a 335-bed tertiary academic medical center with a primary or secondary diagnosis of COPD exacerbation between 01/01/2013 and 12/31/2014. Patients greater than or equal to 18 years-old admitted to non-intensive care nursing units were screened for inclusion. Patients were excluded if they were transferred from an outside hospital, presented with evidence of acute decompensated heart failure, were immunocompromised by medication or disease-state, were diagnosed with pneumonia and/or influenza during admission, had a history of tuberculosis, cystic fibrosis or other lung disease(s), were hospitalized within the past 90 days, had a code status of comfort measures only or expectation of death within 48 hours of admission, were pregnant or lactating, incarcerated, and/or had miscoded records. A sample size of 500 subjects is needed to provide a power of 80%.
RESULTS: A total of 322 patients have been screened and 100 patients included, thus far. Interim analysis has shown no difference in the rates of 30-day readmission for those who received, and did not receive, antibiotic therapy (12.7% vs 10.3%, $p = 1.00$). No significant differences exist with regards to 90-day readmission rate (11.3% vs 13.8%, $p = 0.74$) or time to next COPD exacerbation (104.7 days vs 138.1 days, $p = 0.41$). A trend towards significance has been seen relative to length of hospital stay (3.6 days vs. 3.0 days, $p = 0.06$).
CONCLUSION: The benefit of antibiotics on the reduction of readmission rates for a recurrent COPD exacerbation and length of stay is uncertain. Continued data collection will hopefully elucidate these clinical questions.

424. A retrospective evaluation of inhaled corticosteroid use for COPD patients receiving systemic corticosteroids *Taylor Steuber, Pharm.D.*; Indiana University Health/Butler University College of Pharmacy and Health Sciences, Indianapolis, IN
PURPOSE: The objective of this medication use evaluation was to determine the frequency of inappropriate inhaled corticosteroid (ICS) therapy and to identify cost savings potential in the setting of COPD exacerbations.
METHODS: Patients admitted for COPD exacerbations treated with systemic corticosteroids (equivalent to at least 30 mg of oral prednisone) between July 1, 2013 and June 30, 2014 were included in a retrospective chart review analysis. Endpoints to be assessed included number of ICS, with or without long acting beta-2 agonists (LABA), respiratory medications wasted due to

inappropriate overlap therapy with systemic corticosteroids, as well as overall wasted cost attributed to drug product, administration products, and respiratory therapy labor cost from inappropriate overlap therapy. Results were extrapolated based on the number of encounters within the specified time period.
RESULTS: A total of 10,710 encounters were identified and 74 charts were reviewed. Forty-six (62%) of patients received at least one dose of overlapping ICS or ICS/LABA. One hundred forty-two nebulized budesonide vials were wasted along with 43 ICS or ICS/LABA inhalers. A total cost of $8152.75 attributed to drug product, administration products, and respiratory therapy labor cost was calculated from the charts reviewed. Extrapolating this data to the 10,710 encounters, there would potentially be 20,551 wasted budesonide vials and 6,223 wasted ICS or ICS/LABA inhalers as well as an estimated annual cost savings of $1,180,090.03 for the health system.
CONCLUSION: Significant annual cost savings could be accomplished through intervention and appropriate utilization of ICS or ICS/LABA therapy in patients admitted for COPD exacerbations treated with systemic corticosteroids.

Substance Abuse/Toxicology

425. Fixed-schedule versus symptom-triggered benzodiazepine administration in alcohol withdrawal syndrome using CIWA *Audrey Littlefield, Pharm.D.*, Kenneth Lupi, Jr, Pharm.D., Mojdeh Heavner, Pharm.D., Martha Stutsky, Pharm.D.; Department of Pharmacy Services, Yale-New Haven Hospital, New Haven, CT
PURPOSE: In patients with alcohol withdrawal syndrome (AWS), use of symptom-triggered benzodiazepine regimens compared to fixed-schedule regimens has been shown to decrease cumulative benzodiazepine dose and hospital length of stay (LOS). There is lack of consensus on the optimal benzodiazepine regimen despite this evidence. The purpose of this study was to compare outcomes for patients prescribed symptom-triggered versus fixed-schedule benzodiazepine regimens.
METHODS: This was a retrospective review of 200 non-ICU patients older than 18 years prescribed the Clinical Institute Withdrawal Assessment (CIWA) protocol. The primary endpoints were cumulative benzodiazepine dose and duration of benzodiazepine use. Secondary outcomes were need for ICU admission for AWS, nursing protocol compliance, prescriber adherence to hospital guidelines, LOS, and treatment complications.
RESULTS: This study demonstrated that a symptom-triggered benzodiazepine regimen was associated with significant reduction in cumulative benzodiazepine dose (28 mg vs. 3 mg; $p < 0.01$), duration of CIWA therapy (2.6 days vs. 1.8 days; $p < 0.01$), and incidence of hallucinations (12% vs. 1%; $p < 0.01$). There was no significant difference in ICU transfer, incidence of seizures, falls, aspiration pneumonia, delirium tremens, or LOS between groups. In a sub-group analysis, patients with a history of delirium tremens or withdrawal seizures who received a symptom-triggered regimen had a shorter LOS (1.87 days vs. 4.9 days; $p = 0.02$) without an increase in withdrawal complications compared to patients who received the fixed-schedule regimen.
CONCLUSION: Use of a symptom-triggered benzodiazepine regimen versus a fixed-schedule regimen resulted in decreased LOS and total benzodiazepine requirement. These results remained consistent with the use of a symptom-triggered regimen in patients with a history of complicated alcohol withdrawal.

Transplant/Immunology

426. Safety and efficacy of direct oral anticoagulation agents in heart and lung transplant recipients Alicia Lichvar, Pharm.D.[1], *Cody Moore, Pharm.D.*[1], Christopher R. Ensor, Pharm.D., BCPS, AQ-CV[1], Jeffrey Teuteberg, M.D.[2], John McDyer, M.D.[3], Michael Shullo, Pharm.D.[1]; (1) Department of Pharmacy and Therapeutics, University of Pittsburgh Medical Center, Pittsburgh, PA (2) Heart and Vascular Institute, University of Pittsburgh Medical Center, Pittsburgh, PA (3) Division of Pulmonary, Allergy, and Critical Care Medicine, University of Pittsburgh Medical Center, Pittsburgh, PA
PURPOSE: The primary objective of this study was to describe the thoracic transplant patient population initiated on direct oral anticoagulation (DOAC) therapy (rivaroxaban, apixaban, and dabigatran). The secondary outcomes of the study were to assess adverse reactions, venous thromboembolism (VTE) recurrence, and drug-drug interactions during DOAC therapy.
METHODS: Medical records of thoracic transplant recipients initiated on DOAC therapy from 05/2011 to 03/2015 were retrospectively reviewed. Patient demographics, transplant information, medications, and laboratory values were obtained. VTEs, major and minor bleeding events, and adverse drug effects were collected to assess clinical outcomes of therapy. Major bleeding events were defined as a decrease in hemoglobin >2 mg/dL, transfusion, critical bleeding, or bleed-associated fatality.
RESULTS: A total of 37 thoracic transplant recipients were initiated on DOAC therapy. A majority of the patients were lung transplant recipients (86.4%), predominantly male (73%), and Caucasian (86.5%) with a median age of 60.7 years. The primary indication for DOAC initiation was due to VTE (86.5%). A majority of the patients were maintained on rivaroxaban (78.4%) and a majority also required dose reductions for major drug interactions (37.8%), renal insufficiency (10.8%), or both (8.1%). Most patients were warfarin experienced (78.4%), and antiplatelet therapy was maintained in some patients (21.6%). Two patients had breakthrough VTE during DOAC therapy. Eight bleeding events were reported, with one major bleed. There was no difference in the incidence of bleeding in patients with major drug-drug interactions and those with no drug-drug interactions with the selected DOAC therapy (26.0% vs. 7.1%, $p = 0.15$). One bleeding event resulted in discontinuation of DOAC therapy.
CONCLUSIONS: Overall, thoracic transplant recipients tolerated DOAC therapy well. Drug interactions and renal dose adjustments are common in this patient population. However, DOAC therapy appears to be an effective and safe alternative for thoracic transplant that merits further investigation.

427. A clinically significant drug interaction between clotrimazole and tacrolimus in pancreas transplant recipients and its associated risk of allograft rejection *Christopher Viesselmann, Pharm.D.*, Jillian Descourouez, Pharm.D., Margaret Jorgenson, Pharm.D., BCPS, Nancy Radke, R.N., David Hager, Pharm.D., Jon Odorico, M.D.; University of Wisconsin Hospital and Clinics, Madison, WI
PURPOSE: To clarify the clinical significance of prophylactic clotrimazole troche discontinuation on serum tacrolimus levels in pancreas transplant recipients.
METHODS: Data was collected via retrospective chart review of 79 patients treated with tacrolimus for the prevention of rejection and clotrimazole troche for the prophylaxis of oral mucosal candidiasis (thrush) following simultaneous pancreas-kidney transplant (SPK) (48 patients), pancreas transplant alone (PTA) (27 patients), or pancreas after kidney transplant (PAK) (4 patients). Patient records were reviewed for 1 year following transplant.
RESULTS: For the primary outcome, the mean tacrolimus level after protocol discontinuation of clotrimazole at 3 months post-transplant was significantly lower than the pre-protocol discontinuation level (7.2 ± 2.8 ng/mL vs 9.4 ± 3.1 ng/mL, respectively; $p = 0.000004$). For secondary outcomes, mean tacrolimus level difference pre- and post-discontinuation remained significant in both the No Rejection Group (7.4 ± 2.7 ng/mL vs 9.2 ± 3.0 ng/mL, respectively; $p = 0.00007$) and Rejection Group (4.1 ± 2.5 ng/mL vs 10.9 ± 3.3 ng/mL, respectively; $p = 0.0008$). Between groups, the mean tacrolimus serum level post-clotrimazole discontinuation was lower in the Rejection Group (4.1 ± 2.5 ng/mL) compared to the No Rejection Group (10.9 ± 3.3 ng/mL; $p = 0.009$). Similarly, the difference in mean tacrolimus serum level between pre- and post-protocol discontinuation was greater

in the Rejection Group (6.8 ± 1.5 ng/mL) compared to the No Rejection Group (1.8 ± 3.6 ng/mL; $p = 0.004$). A tacrolimus serum level of <7 ng/mL (n = 30) at the post- discontinuation of clotrimazole time point was associated with an increased incidence of rejection episodes within the 3–12 month post-transplant period compared to a level of greater than or equal to 7 ng/mL (n = 48) at the same time point (OR 9.4, 95% CI 1.04–84.94, $p = 0.046$).
CONCLUSION: Discontinuation of clotrimazole prophylaxis at 3 months post-transplant not only has the potential to cause significant reductions in tacrolimus serum concentrations, but if reductions exceed 6 ng/mL, these serum fluctuations can contribute to the occurrence of allograft rejection.

428. A cross-sectional study of measles, mumps, and rubella antibody concentrations post-vaccination among lung transplant patients compared to healthy individuals Kelsey Henriquez, B.S.[1], Trevor Konkle, Pharm.D.[1], Sarah Niemi, Pharm.D.[1], *Daniel Felix, Pharm.D.*[2], Mary Hayney, Pharm.D., MPH[1]; (1) School of Pharmacy, University of Wisconsin- Madison, Madison, WI (2) Department of Pharmacy, University of Wisconsin Hospital and Clinics, Madison, WI
PURPOSE: Widespread immunization has led to the elimination of measles and rubella and rendered mumps a rare infection. Though assumed to confer life-long protection, no measles, mumps, and rubella serologic studies have been done in solid organ transplant patients. The primary objective of this study was to compare measles, mumps, and rubella antibody concentrations in lung transplant versus healthy subjects.
METHODS: Serum samples from 47 individuals born in 1957 or later (n = 19 healthy; n = 28 lung transplant) were used. Measles, mumps, and rubella antibody concentrations were measured using ELISA methods.
RESULTS: No statistically significant differences in median measles (lung transplant 25 U/mL (65 U/mL interquartile range (IQR)) vs. healthy 5 U/mL (35 U/mL IQR) $p = 0.14$), mumps (lung transplant 47 U/ml (60 U/ml IQR) vs. healthy 33 U/mL (57 U/ml IQR) $p = 0.44$), or rubella (lung transplant 78 IU/ml (109 IU/ml IQR) vs. healthy 23 IU/mL (155 IU/mL IQR) $p = 0.12$) antibody concentrations were found between the groups. Seroprevalence rates for measles (lung transplant 64% vs. healthy 37%), mumps (lung transplant 89% vs. healthy 74%), and rubella (lung transplant 93% vs. healthy 74%) were not statistically significantly different. There was no antibody correlation with age or time since transplant.
CONCLUSION: The responses to rubella and mumps are likely protective from infection. The measles antibody concentrations and seroprevalence rates in both groups leave open the question of protection from infection.

429. Association of Fc gamma receptor genetic polymorphisms with donor specific antibodies in kidney allograft recipients *Youngil Chang, M.S., Pharm.D.*[1], Tariq Shah, M.D.[2], David I. Min, M.S., Pharm.D.[3]; (1) Mendez National Institute of Transplantation Foundation, Mendez National Institute of Transplantation Foundation, Los Angeles, CA (2) Multi-Organ Transplant Center, St Vincent Medical Center, Los Angeles, CA (3) College of Pharmacy, Western University of Health Sciences, Pomona, CA
PURPOSE: It is known that detection of donor specific antibodies (DSA) is associated with antibody mediated rejection (AMR), which results in unfavorable outcomes in kidney allograft. The AMR is considered as the leading cause of chronic rejection and allograft failure in later years of kidney transplantation. Fc gamma receptors (FcγR) are antibody receptors on monocytes, macrophages, and NK cells, which are known to facilitate antibody dependent cell mediated cytotoxicity.
METHODS: Total of 296 renal transplant patients between 2008 and 2012 at St. Vincent Medical Center were studied in a retrospective study design. DSAs were determined by Luminex assay. Single nucleotide polymorphisms of FcγRIIIa (rs396991) and FcγRIIa (rs1801274) are determined by the real time PCR with sequence specific primers. Fisher's exact test with odd ratio were done with the p value of less than 0.05 of statistical significance.
RESULTS: Statistical differences were found in genetic polymorphisms of FcγRIIIa in regard to the detection of DSA among tested patients. The rs396991 (C/A mutation) alleles showed significant difference between DSA negative and positive groups (AA vs. CA, OR=1.828, $p = 0.045$). This trend was maintained after 1 year of renal transplantation with non-significant p value (AA vs CA, OR=1.883, $p = 0.057$). Among this group, the detection of class II DSA was significantly associated with this allele (AA vs CA, OR=2.331, $p = 0.019$), but class I DSA was not (AA vs. CA, OR=1.216, $p = 0.61148$). The FcγRIIa (rs1801274) did not show significant association with the detection of DSA or type of DSA.
CONCLUSION: This study suggests that the presence of C alleles of rs396991 of FcγRIIIa is associated with increased risk of DSA detection which may be more significant with class II DSA than class I DSA.

430. Incidence of BK viremia in sequential transplant recipients *Anh Vu, Pharm.D.*[1], Kristine Schonder, Pharm.D.[2], Michael Shullo, Pharm.D.[2], Amit Tevar, M.D.[1]; (1) University of Pittsburgh Medical Center, Pittsburgh, PA (2) Department of Pharmacy and Therapeutics, University of Pittsburgh Medical Center, Pittsburgh, PA
PURPOSE: Post-transplant, patients are at an increased risk of developing infections including BK virus. Immunosuppression is considered a major risk factor for reactivation of this viral infection. The objective of this study is to determine the incidence of BK viremia and BK related complications in kidney transplant recipients who previously received a non-renal transplant compared to recipients receiving a de novo kidney transplant.
METHODS: A retrospective, cohort study design was used to compare all adult kidney transplant recipients at a single center. Recipients were divided into two different cohorts depending on previous transplant status. The study cohort included patients that had received a previous non-renal transplant at least one year prior and the control cohort included only de novo kidney transplant recipients. The study cohort was matched 1:2 with the control cohort based on age at time of kidney transplant and induction. The primary endpoint was the incidence of BK viremia (plasma BKV DNA ³ 10,000 copies/mL) between groups.
RESULTS: The study included 147 previously transplant patients and 281 de novo kidney transplant recipients. Incidence of BK viremia was not different between the study and control cohorts (6.1% vs 3.2%, $p = 0.203$). Induction regimen and age did not impact BK viremia in either cohort (p=NS). At 12 months, patients with clinical BK viremia had higher median serum creatinine compared to patients without clinical BK viremia ($p = 0.036$).
CONCLUSIONS: The incidence of BK viremia does not differ in sequential transplant recipients. BK viremia had an impact on serum creatinine at 12 months post-renal transplant. Additional studies evaluating risk factors on the incidence of BK viremia in sequential transplant recipients are warranted.

431. Association of macrophage migration inhibitory factor genetic polymorphisms with donor specific antibodies in kidney allograft recipients *Youngil Chang, M.S., Pharm.D.*[1], Tariq Shah, M.D.[2], David I. Min, M.S., Pharm.D.[3]; (1) Mendez National Institute of Transplantation Foundation, Mendez National Institute of Transplantation Foundation, Los Angeles, CA (2) Multi-Organ Transplant Center, St Vincent Medical Center, Los Angeles, CA (3) College of Pharmacy, Western University of Health Sciences, Pomona, CA

PURPOSE: It is known that detection of donor specific antibodies (DSA) is associated with antibody mediated rejection (AMR), which results in unfavorable outcomes in kidney allograft. The AMR is considered as the major cause of allograft failure in later years of kidney transplantation. Macrophage migration inhibitory factor (MIF) is multifunctional cytokine that is produced by innate and adaptive immunity cells which can directly interact with DSA. This study aims to determine the association of MIF gene polymorphisms with the detection of DSA in kidney allograft recipients.
METHODS: A total of 304 renal transplant patients between 2008 and 2012 at St. Vincent Medical Center were studied in a retrospective study design. DSAs were determined by Luminex assay. Single nucleotide polymorphisms of MIF (rs1007888, rs755622) are determined by the real time PCR with sequence specific primers. Fisher's exact test with odd ratio were done with the p value of less than 0.05 of statistical significance.
RESULTS: Statistical differences were found in genetic polymorphisms of MIF in regards to the detection of DSA among tested patients. The rs1007888 (C/T missense mutation) alleles showed significant difference between DSA negative and positive groups (TT vs. CC, OR=2.204 $p = 0.042$). Interestingly, statistical significances still found in the later DSA detection group after 1 year of transplant (TT vs. CC, OR=2.745, $p = 0.023$) and class I DSA showed statistical significance while class II DSA did not (TT vs. CC, OR=3.971 $p = 0.008$, OR=2.471 $p = 0.50$, respectively). However, rs755622 showed no significant association with DSA detection.
CONCLUSION: This study suggests that the presence of CC allele of rs1007888 is associated with increased risk of DSA detection which maintained after 1 year of transplantation and is more associated with class I DSA than class II DSA.

432. Association of genetic polymorphisms of angiopoietin-like 4 with proteinuria in kidney allograft recipients *Youngil Chang, M.S., Pharm.D.*[1], Tariq Shah, M.D.[2], Ya-Ting Chuang, M.S.[3], David I. Min, M.S., Pharm.D.[4]; (1) Mendez National Institute of Transplantation Foundation, Mendez National Institute of Transplantation Foundation, Los Angeles, CA (2) Multi-Organ Transplant Center, St Vincent Medical Center, Los Angeles, CA (3) College of Pharmacy, School of pharmacy, Taipei City, Taiwan (4) College of Pharmacy, Western University of Health Sciences, Pomona, CA
PURPOSE: Proteinuria is a hallmark of glomerular injury, and persistent proteinuria is associated with graft failure in kidney transplant patients. Recently, it is known that the level of circulating angiopoietin-like 4 (ANGPTL4), which is secreted from skeletal muscle, heart, and adipose tissues, is elevated in the patients with nephrotic syndrome. In this model, ANGPTL4 is responsible for reducing proteinuria with accompanied rise in free triglycerides. The purpose of this study is to determine the effect of genetic polymorphisms of ANGPTL4 on proteinuria after kidney transplantation.
METHODS: A total of 305 renal transplant patients between 2008 and 2012 at St. Vincent Medical Center were studied in a retrospective study design. The level of proteinuria was estimated by random urine protein to creatinine ratio (UPC ratio), and divided into four groups (Normal: UPC less than 150 mg/day, Mild: between 150 and 1000 mg/day, Moderate: between 1000 and 3500 mg/day, and Severe: more than 3500 mg/day). Single nucleotide polymorphisms of ANGPTL4 gene (rs1044250, rs2278236, rs116843064, rs11672433, rs4076317) were determined by real time PCR with sequence specific primers.
RESULTS: Statistical differences were found in genetic polymorphism of ANGPTL4 (rs1044250, rs2278236) in regards to proteinuria among tested patients. rs1044250 (C/T missense mutation) alleles showed multiple significant differences between severe proteinuria group and other groups (normal vs. severe: CC vs. CT+TT, OR=0.362, $p = 0.031$, mild vs. severe: CC vs. CT+TT, OR=0.361, $p = 0.030$). Similar trends were found in rs2278236 (A/G) alleles with statistical significances. Other SNPs (rs116843064, rs11672433, rs4076317) did not show statistically significant differences between different proteinuria groups.
CONCLUSION: This study suggests that the presence of T allele of rs1044250 and A allele of rs2278236 of ANGPTL4 is associated with lower risk of proteinuria in renal transplant patients.

433. Medications and clinical features associated with neutropenia following kidney transplantation *Brooke Hofmeyer, Pharm.D., MPH*, Robert Shaw, Pharm.D., MPH, BCPS, BCNSP, Brian Lund, Pharm.D., M.S., Shannon Heintz, Pharm.D., BCPS; Iowa City Veterans Affairs Healthcare System
PURPOSE: Neutropenia following kidney transplantation is associated with infection and organ rejection. There is variability in how neutropenia is defined in clinical studies, complicating assessments of risk. The primary objective is to identify medications and clinical features associated with first episode of neutropenia following kidney transplant.
METHODS: A multi-center retrospective cohort was received from the Veterans Affairs Surgery Quality Improvement Program (VASQIP). A total of 1129 veterans transplanted at one of four Veterans Affairs (VA) kidney transplant centers were matched with data from VA health systems nationwide through VA Informatics and Computing Infrastructure (VINCI). Separate multiple logistic regression analyses investigated associations with induction phase and maintenance phase neutropenia.
RESULTS: Antithymocyte globulin (O.R. 1.97, 95% C.I. 1.43, 2.73), alemtuzumab (O.R. 2.22, 95% C.I. 1.48, 3.33), and a baseline leukocyte count ² 4500 cells/μL (O.R. 3.61, 95% C.I. 2.36, 5.51) or 4501 to 6000 cells/μL (O.R. 2.22, 95% C.I. 1.65, 2.98) were factors associated with neutropenia during the induction phase. Alemtuzumab (O.R. 1.89, 95% C.I. 1.23, 2.90), valganciclovir 900 mg daily (O.R. 3.12, 95% C.I. 2.01, 4.85), valganciclovir 450 mg daily (O.R. 2.68, 95% C.I 1.58, 4.56), CMV disease (O.R. 2.59, 95% C.I. 138, 4.87), and baseline leukocyte count ² 4500 cells/ μL (O.R. 2.82, 95% C.I. 1.77, 4.50) or 4501 to 6000 cells/ μL (O.R. 2.03, 95% C.I. 1.49, 2.78) were significantly associated with maintenance phase neutropenia. Mycophenolate mofetil equivalent dosing of ² 1500 mg/day was used in 299 patients and was protective (O.R. 0.59, 95% C.I. 0.41, 0.85) against neutropenia.
CONCLUSION: Patients with white blood cell count < 6,000 cells/μL at baseline or who receive induction immunosuppression with alemtuzumab may require more aggressive surveillance of white blood cell count following kidney transplantation. Measured variables were unable to account for differences in neutropenia rates between transplant centers.

434. Impact of on-demand intravenous immunoglobulin therapy on the burden of infection and rejection in lung transplant recipients with hypogammaglobulinemia *Alicia B. Lichvar, Pharm.D., BCPS*[1], Christopher R. Ensor, Pharm.D., BCPS, AQ-CV[1], Andrej A. Petrov, M.D.[2]; (1) Department of Pharmacy and Therapeutics, University of Pittsburgh Medical Center, Pittsburgh, PA (2) Department of Pulmonary, Allergy, and Critical Care Medicine, University of Pittsburgh Medical Center, Pittsburgh, PA
PURPOSE: The purpose of this study was to evaluate infection and rejection in lung transplant recipients (LTRs) with secondary hypogammaglobulinemia (HGG) receiving intravenous immunoglobulin (IVIG) therapy on-demand compared to a control group of LTRs without HGG.
METHODS: This was an IRB-approved, single-center, retrospective cohort of adult LTRs from 01/01/2007 to 12/31/2014. Enrollment was defined as date of first IVIG dose or an indexed time of 300 days post-transplantation. Parametric and non-parametric tests were used to describe the population. Median number of infections at 5 years and Composite Rejection Standardization Scores (CRSS) were compared with the Mann-Whitney U test. A

multivariate logistic regression model identified risk factors for HGG development.
RESULTS: A total of 292 LTRs (no HGG n = 76 and HGG+I-VIG n = 216) were included in the analysis. Patients were mostly male (56.6%) and Caucasian (90.3%) with the most common antecedent disease of COPD (31%). Median IgG levels post-IVIG replacement were 631 mg/dL. Risk factors for HGG were Caucasian race (OR 2.89, 95% CI 1.40–5.95), age > 55 years (OR 1.86, 95% CI 1.1–3.4), and mycophenolate immunosuppression (OR 2.16, 95% CI 1.2–3.9). Infection incidence was not different at 5-years post-enrollment ($p = 0.255$). Death due to infection was similar between groups (non- HGG 27.5% vs. HGG +IVIG 34.1%, $p = 0.341$). CRSS scores were lower in non-HGG LTRs at 2-years (0.4 vs. 0.5, $p = 0.03$) and at 5-years (0.4 vs. 0.5, $p = 0.02$) post-enrollment. Death due to rejection was higher in the HGG+IVIG LTRs (3.4% vs. 26.8%, $p = 0.004$). All-cause 5-year survival was lower in HGG+IVIG LTRs (32.8% vs. 43.9%, $p = 0.037$).
CONCLUSION: HGG is a complication in LTRs associated with older age, Caucasian race, and mycophenolate immunosuppression. While there was no difference in infection rate, LTRs with HGG had more rejection and worse mortality compared to non-HGG controls despite treatment with IVIG therapy on-demand.

435. Use of chronic sublingually administered tacrolimus in ambulatory lung transplant recipients *Esther Liu, Pharm.D., BCPS*; Department of Pharmacy, Tampa General Hospital, Tampa, FL
PURPOSE: Sublingual tacrolimus administration has been demonstrated as an effective alternative to enteral and intravenous tacrolimus, however there are no reports on the implications of its chronic use. This study describes the efficacy and safety of sublingual tacrolimus administration in the ambulatory setting of lung transplant recipients.
METHODS: A retrospective, single center evaluation of all lung transplant recipients (LTR) transplanted between 1/2012 and 12/2013 and maintained on sublingually administered tacrolimus for at least 3 months post-discharge was conducted. Ambulatory tacrolimus levels were assessed until post-op day 90; biopsy-proven acute rejection (BPAR) was evaluated within the first post-transplant year. Demographics that may affect tacrolimus variability were assessed, and intra-patient variability in tacrolimus troughs was calculated using a coefficient of variance (CV), with high variance defined as a CV greater than 25%.
RESULTS: Of 67 LTRs transplanted during the study period, 39 patients were included in this study. The majority of patients were Caucasian, male, and recipients of bilateral lung transplants. The mean coefficient of variance (CV) was 31.6%. Demographic data, education level, socioeconomic status, and incidence of BPAR between low and high variance patients were not significantly different. Three LTRs in the high variance group (11.1%) had documented incorrect sublingual self-administration. Mean CV between LTRs on concomitant azole antifungals, non-dihydropyridine calcium channel blockers, or no interacting medications was 40.5%, 30.7%, 36.4%, respectively ($p = 0.17$). Dose reductions for supra-therapeutic trough levels >15 ng/mL were common at both the first ambulatory visit (28.2%) and the 3 month ambulatory visit (18%) and concomitant CYP3A4 inhibitors did not significantly impact this ($p = 0.8$ and $p = 0.77$, respectively). Six patients reported adverse events with sublingual administration; the most common reason for switch from sublingual to oral tacrolimus administration was development of peppery taste.
CONCLUSION: This study demonstrates that sublingual tacrolimus administration may result in high intra-patient variability of trough levels. The most commonly reported adverse event with sublingual administration was change in taste.

Students Research in Progress
ADR/Drug Interactions

436. Evaluation of adverse drug reactions in an outpatient HIV clinic in Manila, Philippines Natalie Valentino, B.Sc.(Pharm)[1], Lauren Cirrincione, B.Sc.(Pharm)[1], Cara Mazzarisi, B.Sc.(Pharm)[1], *Trey Draude, B.Sc.(Pharm)*[1], Lauren J. Jonkman, Pharm.D., MPH, BCPS[1], Sharon E. Connor, Pharm.D.[1], Sandra L. Kane-Gill, Pharm.D., M.Sc., FCCM, FCCP[2], Edsel Salvana, M.D., DTM&H[3]; (1) School of Pharmacy, University of Pittsburgh, Pittsburgh, PA (2) Department of Pharmacy and Therapeutics, University of Pittsburgh School of Pharmacy, Pittsburgh, PA (3) University of the Philippines Manila, Manila, Philippines
PURPOSE: HIV infection rates in the Philippines have increased, resulting in extensive use of antiretroviral medications (ARVs). Most ARV post-marketing surveillance has been conducted in high-income countries, and generalizability of this data to low- and middle-income countries is limited. The purpose of this study is to systematically assess the frequency and types of adverse drug reactions (ADRs) among HIV-infected and HIV/TB co-infected patients at an outpatient HIV clinic at the Philippine General Hospital (PGH) in Manila.
METHODS: This is a retrospective chart review of HIV outpatients at PGH of adults with more than 2 clinic visits between January 1, 2008 to April 1, 2014. The first 100 charts of outpatients on ARVs were included in group 1; the first 100 charts of outpatients on ARVs and antitubercular agents were included in group 2. The following information was recorded from each included chart: medications, suspected ADRs, comorbid conditions, and relevant labs. Descriptive statistics were used for preliminary data analysis. An expert panel will evaluate each potential ADR using the Naranjo ADR Probability Scale.
RESULTS: In group 1, 69 potential ADRs from 9 different medications were identified; in group 2, 105 potential ADRs from 14 medications were identified. ADRs included rash, hyperlipidemia, anemia, lactic acidosis, myalgia, hepatotoxicity, dizziness, insomnia, and heartburn. Additional analysis will determine the frequency, severity, and probability of all potential ADRs.
CONCLUSION: Pharmacovigilance allows healthcare providers to identify patients at high risk for medication complications. Increased knowledge about incidence and severity of ADRs in this population can enhance monitoring and risk assessments for patients, improving overall tolerability of ARVs. Results from this study will be utilized to create new treatment protocols that will reduce the occurrence of ADRs at PGH.

Adult Medicine

437. Medication use evaluation on the inappropriate use of stress ulcer prophylaxis in general medicine and surgical patients *Cindy Boulton, Pharm.D. Candidate*[1], Susan Miller, Pharm.D., MBA, BCPS, FCCP[2]; (1) Eshelman School of Pharmacy, University of North Carolina, Chapel Hill, NC (2) Southern Regional Area Health Education Center
PURPOSE: ASHP Guidelines do not recommend stress ulcer prophylaxis for general medicine or surgical patients. Long term usage of acid-suppression therapy is associated with many risks. The rising occurrence of stress ulcer prophylaxis in non-ICU settings presents an opportunity to review the appropriateness of stress ulcer prophylaxis in these patients. This study's purpose is to retrospectively investigate the prevalence of patients inappropriately on stress ulcer prophylaxis on a general medicine or surgical floor at Cape Fear Valley Medical Center.
METHODS: A report was generated of all patients admitted to six general medicine or surgical floors at Cape Fear Valley Medical Center from July 1 to October 31, 2014, who were prescribed stress ulcer prophylaxis medications. From this report, 200 patients were randomly selected for a retrospective chart review. In addition to demographic information, data collected included:

home, hospital, and discharge stress ulcer prophylaxis therapies and indications. A predefined criteria for appropriate stress ulcer prophylaxis indications and dosing was defined for the chart review. Lastly, the hospital drug cost for inappropriate stress ulcer prophylaxis in hospital was calculated.
RESULTS: The data reveals 102 of the reviewed patients were on home acid-suppression therapy of which 51% were classified as inappropriate therapy. During admission, approximately 58% of the patients were inappropriately prescribed stress ulcer prophylaxis. Of the 200 reviewed patients, 117 were discharged on stress ulcer prophylaxis of which 43.6% were classified as inappropriate therapy. Total cost burden of inappropriate stress ulcer prophylaxis in hospital was $737.67.
CONCLUSION: This medication use evaluation revealed there is an inappropriate usage of stress ulcer prophylaxis in the general medicine and surgical population. The implementation of a pharmacy driven intervention for stress ulcer prophylaxis in general medicine and surgical patients within the institution could be instrumental in reducing unnecessary use and decrease costs.

438. Medication utilization review of calcitonin use in a hospital setting *Sora Vysotski, Pharm.D. Candidate*[1], Aleks Ilchekes, Pharm.D.[1], Adewale Omoloju, Pharm.D.[2]; (1) School of Pharmacy, Touro College of Pharmacy, New York, NY (2) Department of Pharmacy, The Brooklyn Hospital Center, Brooklyn, NY
PURPOSE: The purpose of the study is to review calcitonin indications and determine appropriateness of its use in The Brooklyn Hospital Center.
METHODS: This drug utilization review was conducted through retrospective chart review of patients admitted to The Brooklyn Hospital Center from August, 1st 2014 to November, 30th 2014. Eleven patients who received calcitonin during that time were identified through electronic medical records system and dispensing reports. Data collected included indication for calcitonin use, calcitonin dose, relevant past medical history, calcium levels lab results, albumin levels, and length of calcitonin therapy. Appropriate use of calcitonin was determined by corrected calcium levels of more than 14 mg/dL, calcitonin dose of 4-8 units/kg every 6-12 hours, and length of calcitonin therapy more than 48 hours, or an indication of acute pain relief after osteoporotic fracture.
RESULTS: Medication utilization review found misuse of calcitonin with 82% of patients treated inappropriately. The dose of calcitonin was appropriate for most patients; however, it was used for more than 48 hours in 64% of patients. 37% of patients did not have high enough calcium levels (>14 mg/dL) for justification of calcitonin use.
CONCLUSION: There is a misuse of calcitonin in the Brooklyn Hospital Center. Current evidence-based recommendations do no support use of calcitonin for treatment of hypercalcemia in patients with calcium levels <14 mg/dl and for more than 48 hours because of lack of efficacy. Overuse of calcitonin for more than 48 hours leads to higher healthcare costs. In addition, for hypercalcemia treatment calcitonin should not be used as monotherapy; rather it should only be used as an adjunctive therapy to biphosphonates in order to successfully decrease calcium levels. In patients with CrCl <30 ml/min, biphosphonates may still be used if adequate hydration with saline, reduced dose and slower infusion rate are implemented.

Ambulatory Care

439. The effect of a color coded medication system on patient adherence *Janell Penha, Pharm.D. Candidate*; Department of Pharmacy, University of Hawaii at Hilo, Hilo, HI
PURPOSE: The aim of this study is to recruit approximately 20 patients that may have non-adherent issues and are taking at least three regularly scheduled medications or more to improve patient adherence and disease related vitals and lab values.
METHODS: Patients were being recruited from Hawaiian Island Family Health Clinic over the course of 6 months. Patients were being evaluated with the Morisky 8 questionnaire at the initial visit and at 3 and 6 months respectively. Baseline, 3 month and 6 month vitals and lab values were documented during these periods.
RESULTS: Preliminary results from five patients are as followed:

Average blood Pressure Value (mm HG)	Average Morisky 8 Value	Average A1c Value (%)	Average Lipid Value
Initial visit			
136.4/67.4	6.4	7.72	TC-94.4 TG-278.8 LDL-77.8 HDL-42
3 Month visit			
141.4	9	Pending	Pending

CONCLUSION: Research is still in process and results are pending. No patients have made it to the 6 month follow up visit.

440. Implementation of a pharmacist-driven training program for medical assistants on comprehensive medication history in a cardiology clinic *Thuylinh Nguyen, Pharm.D. Candidate 2016*[1], Delia Saadeh, Pharm.D. Candidate 2016[1], Shi Yun Leong, Pharm.D. Candidate 2016[1], Nicole Murdock, Pharm.D., BCPS[2], Laura Tsu, Pharm.D., BCPS, CGP[3], Ronni Nemeth, Pharm.D.[1], Karen Liu, Pharm.D.[1]; (1) Midwestern University-College of Pharmacy, Glendale, AZ (2) Department of Pharmacy Practice, Midwestern University-College of Pharmacy, Glendale, AZ (3) Department of Pharmacy Practice, Chapman University School of Pharmacy, Orange, CA
PURPOSE: This is a retrospective cohort study assessing the impact of pharmacist-driven interventions on the change in number of discrepancies identified during an outpatient medication history intake process by medical assistants (MAs) in a cardiology ambulatory care setting.
METHODS: The intervention was comprised of two pharmacist-led educational sessions; the first being on general information about cardiac medications and the second on how to conduct an efficient medication history. A quality improvement analysis on the clinic's medication intake and documentation process was also completed. The primary variables assessed were the number and type of discrepancies identified by the MAs, which were subsequently compared between pre- and post-intervention groups.
RESULTS: The pre-intervention group included 279 patients, which met the minimum requirement for 80% power. Patient demographics for the pre-intervention group were primarily men (52%), Caucasian (94%), within the age range of 65–79 (43%), BMI of >25 (75%), and high rates of various cardiovascular comorbidities such as coronary artery disease (54%), heart failure (27%), hypertension (73%), and hyperlipidemia (62%). It was also noted that 52% of the patients studied had >10 medications. Pre-intervention results found that the average number of discrepancies per patient was 1.75, with a higher rate in the subpopulation of those recently discharged from the hospital at 2.6. Omission and commission of medications were the most common types of discrepancies at 39% and 29%, respectively. Over 50% of discrepancies occurred within medications taken chronically (e.g. antihypertensives, cholesterol lowering agents, and other long-term medications).
CONCLUSION: We predict an increase in medication discrepancies identified by the MAs after the pharmacist-led educational session and workflow analysis. This study may demonstrate that pharmacist involvement in the medication intake process evaluation and training can help MAs reconcile more accurate medication histories, ultimately leading to higher quality patient care.

441. Review of hypertension management in an anticoagulation clinic *Stephanie Shore, B.S., Pharm.D. Candidate*[1], Katherine Vogel Anderson, Pharm.D., BCACP[2], Kristin Rieser, Pharm.D.[3]; (1) College of Pharmacy, University of Florida, Gainesville, FL (2) Department of Pharmacotherapy and Translational Research, Division of General Internal Medicine, University of Florida Colleges of Pharmacy and Medicine, Gainesville, FL (3) Department of Pharmacotherapy and Translational Research, College of Pharmacy, University of Florida, Gainesville, FL

PURPOSE: It is unknown if hypertension is controlled in an outpatient anticoagulation setting. The primary objective of this review was to evaluate blood pressure control in the outpatient setting for patients receiving warfarin in a pharmacist-managed anticoagulation clinic. Treatment goals were assigned according to recommendations from the JNC 8 writing committee. The secondary objective was to assess anticoagulation management by calculating time in therapeutic range (TTR) using the Rosendaal method. Hypertension management and TTR were compared to explore any potential associations.

METHODS: A retrospective chart review was conducted of patients followed in UF Health Internal Medicine anticoagulation clinic between April 2014 and April 2015. Pharmacologically managed hypertension was necessary for inclusion. Data collected included: demographics, current antihypertensive regimen, complete medication history, blood pressure and INR readings over time, lifestyle factors, and frequency of Emergency Department visits and hospitalizations related to hypertension or hypotension. This study is approved by the UF Institutional Review Board.

RESULTS: Data collection is ongoing. 153 patients were prescribed warfarin at the UF Health Internal Medicine clinic; 104 patients met inclusion criteria. 7 patients had hypertension that was not being treated pharmacologically. Based on a preliminary review of 11 patient charts, 8 patients had a treatment goal of <140/90 mmHg; 3 had a goal of <150/90 mmHg. For patients with a < 140/90 mmHg goal, the average blood pressure was 123.76/74.17 mmHg. For patients with a < 150/90 mmHg goal, the average blood pressure was 129.03/74.4 mmHg. Of 91 blood pressure readings assessed, individual treatment goals were met 82.4% of the time. The TTR was 63.9% using the Rosendaal method.

CONCLUSION: Preliminary analysis suggests that hypertension is being well-managed and the UF Health Internal Medicine pharmacist-managed anticoagulation clinic meets the Food and Drug Administration requirement for skillful anticoagulation management. More data collection is needed before drawing any other conclusions.

442. Medication regimen complexity and health literacy among underserved adults with chronic health conditions *Kajua Lor, Pharm.D.*, Maria Rivas, Pharm.D., Kristen Parker, Pharm.D. Candidate 2016, Eliana Barriga, Pharm.D. Candidate 2016, Leila Inting, Pharm.D. Candidate 2016; Clinical Sciences Department, Touro University California College of Pharmacy, Vallejo, CA

PURPOSE: The purpose of this study is to evaluate the relationship between health literacy and medication regimen complexity.

METHODS: The study was a cross-sectional survey of participants recruited from the lobby area of Community Health Clinic Ole in Napa, California from November 2014 to April 2015. Subjects completed the validated Short Test of Functional Health Literacy in Adults (S-TOFHLA) questionnaire in English or Spanish. Demographic and health related variables were obtained from the survey and an electronic retrospective chart review. Medication regimen complexity was assessed using the validated medication regimen complexity index (MRCI) calculated by Microsoft Access. The data for medication regimen complexity was extracted from the electronic medical record.

RESULTS: Of the 1,066 patients approached in the lobby area of the clinic, 555 patients agreed to participate in the survey. One hundred and fifty-two patients were excluded from the analysis of the study with the majority excluded due to time constraints. Four hundred and three patients were analyzed. The mean age of participants was 45 ± 14.5 years with the majority of subjects female (69%) and spoke Spanish as the primary language (45%). Eighty-eight participants (21%) were classified with low health literacy. No significant differences were found between health literacy and medication regimen complexity ($p = 0.221$). The mean medication regimen complexity scores were 17.04 in the low health literacy group versus 19.33 in the adequate to high health literacy group.

CONCLUSION: Simplifying medication regimens for patients with low health literacy is necessary to achieve optimal outcomes. Identification of patients with low health literacy is necessary.

443. Impact of a pharmacist-only clinic versus a pharmacist-led multidisciplinary clinic on tobacco cessation rates in a homeless population *April Bills, Pharm.D. Candidate 2016*[1], Kevin Giang, Pharm.D. Candidate 2016[1], Sabrina La Spisa, Pharm.D. Candidate 2016[1], Kelsey Buckley, Pharm.D., BCACP[2], Laura Tsu, Pharm.D., BCPS[2], Nicole Early, Pharm.D.[1], Rebekah McKinley, Pharm.D.[1]; (1) Department of Pharmacy Practice, Midwestern University College of Pharmacy – Glendale, Glendale, AZ (2) Midwestern University College of Pharmacy-Glendale, Glendale, AZ

PURPOSE: Tobacco usage rates among the homeless population are higher than the national average. The primary objective of this study is to determine the effectiveness of pharmacist-only education with pharmacotherapy versus pharmacist-led multidisciplinary approach with pharmacotherapy toward the rate of follow-up with a smoking cessation program in the homeless population.

METHODS: This is a prospective, cohort study of homeless patients seen by the pharmacist-only clinic versus the pharmacist-led multidisciplinary clinic. Patients are recruited to this study on-site at the Central Arizona Shelter Services, Inc. (CASS) clinic in Phoenix, Arizona. Two recruitment methods [direct patient invitation and Health Outreach through Medicine and Education (H.O.M.E.) clinic screenings] are used to identify up to 140 patients throughout the entire project, with the number of recruited patients per night varying based on patient interest and eligibility. Patients are eligible to participate in the study if they meet the following criteria (1) resident of CASS as a homeless patron, (2) current smoker, and (3) interested in tobacco cessation. Eligible patients will receive counseling, motivational interviewing, two weeks of NRT (gum or lozenge), and will be referred to Arizona Smokers' Helpline (ASHLine). Continued follow-up will be conducted by ASHLine with reports given to evaluate effectiveness of the initial recruitment and referral.

RESULTS: Baseline information collected between clinics starting 10/21/2014 through 4/14/2015. The average number of prior quit attempts for all patients was 2.3 ears, and the average number of smoking years for all patients was 14.7. Number of clinics completed for pharmacist-only (4) vs pharmacist-led (6). Percentage of patients seen vs enrolled in ASHLine for pharmacist-only (12.7%) vs pharmacist-led (14.5%).

CONCLUSION: Completion of this study will help determine if patients are more likely to continue tobacco cessation therapy when directed by a single discipline (pharmacy) versus multiple disciplines (pharmacy, medical, and clinical psychology).

444. A pharmacist-physician collaboration to optimize benzodiazepine use and anxiety/sleep symptom control in primary care *Shannon Furbish, Pharm.D. Candidate 2016*[1], Katy E. Trinkley, Pharm.D.[1], Jennifer Nelson, M.S., MSW, RN[2], Miranda Kroehl, M.S., Ph.D.[1,2], Huong Mindy Lam, M.D.[2], Carmen Lewis, M.D., MPH[2], Danielle Loeb, M.D.[3], Zeta Chow, M.D. Candidate 2017[2]; (1) University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO (2) University of Colorado Hospital, Aurora, CO (3) University of Colorado Hospital

PURPOSE: Benzodiazepines are often prescribed inappropriately, leading to increased risk of preventable adverse events, potential for abuse and addiction and suboptimal anxiety symptom relief. The purpose of this study is to (1) increase the proportion of

patients who are appropriately prescribed a benzodiazepine; and (2) improve anxiety and sleep symptom control.
METHODS: Patients who receive care at an academic internal medicine clinic were screened for inappropriate benzodiazepine use. Patients prescribed an inappropriate benzodiazepine, determined by chart review, were referred to the clinic's clinical pharmacy team, pending provider approval. The pharmacy team was the intervention, who assessed their benzodiazepine use and symptom control and managed therapy under protocol. Outcomes include proportion of appropriate prescriptions and symptom severity measured by validated instruments. The Clopper-Pearson exact method will be used to estimate the confidence interval around the estimate of patients who were switched to an appropriate prescription. Change in symptom scores will be assessed as continuous data using the paired t-test for parametric data and Wilcoxon signed rank test for nonparametric data.
RESULTS: Of 1156 patients prescribed a benzodiazepine, 280 prescriptions were deemed potentially inappropriate and 88 referrals were approved. To date, 19 patients were seen once, and two patients were seen twice. Across 21 visits, there were 15 medication changes, including 5 (26%) benzodiazepine discontinuations, 2 (11%) benzodiazepines switched to a more preferred/safer benzodiazepine; and 8 (42%) optimizations of non-benzodiazepine therapy. Eight (42%) patients had no regimen changes because therapy was deemed appropriate or the patient was resistant. Symptom improvement is not able to be assessed yet.
CONCLUSIONS: These preliminary results support the role of pharmacists as members of the primary care team, specifically in decreasing inappropriate benzodiazepine prescribing. When recruitment ends October 2015, we will be able to assess the impact on symptom improvement.

445. Recommendations of new antihyperglycemic agents among pharmacists *Caleb Wallace, Pharm.D. Candidate*, Jennifer N. Clements, Pharm.D., BCPS, CDE, BCACP; Presbyterian College School of Pharmacy, Clinton, SC
PURPOSE: The objective of this study was to determine pharmacists' recommending behaviors regarding new classes of antihyperglycemic medications.
METHODS: An IRB-approved survey was emailed in December 2014 to pharmacists who are members of the American College of Clinical Pharmacy and who subscribe to the Ambulatory Care or Endocrine and Metabolism Practice and Research Networks. All responses were anonymously recorded utilizing SurveyMonkey®. DPP-IV inhibitors, GLP-1 agonists, and SGLT-2 inhibitors were the focus of the study. Participants were asked to indicate the frequency that they recommend each class for individual patients each week, name their preferred medication in each class, indicate their top reason for recommending each class, and indicate their top reason for not recommending each class.
RESULTS: One-hundred thirty-four pharmacists responded. The majority were female (70.1%) and practiced in academia (53.7%). 52.6% of pharmacists recommend a DPP-IV inhibitor 1–5 times weekly, and sitagliptin is the preferred agent (71.6%). Oral formulation is the top reason to recommend the class (71.6%), and cost is the top reason to avoid the class (61.2%). 49.6% of pharmacists recommend a GLP-1 agonist 1–5 times weekly, and liraglutide is the preferred agent (59.2%). Weight loss is the top reason to recommend the class (48.3%), and cost is the top reason to avoid the class (65%). 81.4% of pharmacists do not recommend a SGLT-2 inhibitor for patients, and canagliflozin is the preferred agent (63.7%). Oral formulation is the top reason to recommend the class (56.6%), and contraindications are the top reason to avoid the class (44.2%).
CONCLUSION: Of the three new antihyperglycemic classes, pharmacists are more likely to recommend a DPP-IV inhibitor or GLP-1 agonist on an equal basis and less likely to recommend a SGLT-2 inhibitor.

446. Clinical pharmacists in primary care: provider satisfaction and perceived impact on quality of patient care provided *Havan Truong, B.S., Pharm.D. Candidate*[1], Miranda Kroehl, M.S., Ph.D.[2], Carmen Lewis, M.D., MPH[3], Robin Pettigrew, R.N., MBA[4], Marialice Bennett, R.Ph.[5], Joseph Saseen, Pharm.D.[6], Katy E. Trinkley, Pharm.D.[6]; (1) University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, CO (2) University of Colorado Hospital, Aurora, CO (3) University of Colorado Hospital, CO (4) The Ohio State University, OH (5) Department of Clinical Pharmacy, University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO (6) University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO (7)
PURPOSE: The purpose of this study is to determine provider satisfaction and perceived impact of clinical pharmacy services on the quality of patient care in primary care.
METHODS: A 25-item survey was distributed electronically to all pharmacy residency program directors across the US who were requested to forward the survey to their primary care provider (PCP) colleagues to complete. The survey was piloted for validity and Cronbach's alpha will later be used to examine reliability. The survey assesses (1) PCP characteristics; (2) types of pharmacy services provided; (3) PCP satisfaction and perceived impact of pharmacists on quality of patient care; and (4) differential value of different pharmacy service types.
RESULTS: After one of four weeks, 70 PCPs responded, representing attending-level physicians (66%), PCPs from the Southwest/Pacific region (61%), and PCPs practicing in academia (56%). The most valued pharmacy services identified were comprehensive medication therapy management, disease-focused management, and medication reconciliation, with 97%, 95%, and 88% of PCPs ranking these as the most valuable, respectively. The most valued disease-focused pharmacy services identified were diabetes, hypertension, and pain, with 98%, 74%, and 58% of PCPs ranking these as the most valued services, respectively. PCPs strongly agreed pharmacy services improve the quality of healthcare (mean = 5.5 $\pm$ 0.77; scale 1 = strongly disagree to 6 = strongly agree), quality of medication decisions made (mean = 5.45 $\pm$ 0.81) and that pharmacy plays an integral part in medication management (mean = 5.45 $\pm$ 0.83). PCPs also reported satisfaction and appreciation of their pharmacists' recommendations (mean = 5.64 $\pm$ 0.67) and would recommend them to colleagues (mean = 5.68 $\pm$ 0.53).
CONCLUSION: Preliminary results demonstrate PCP satisfaction and perceived benefit of pharmacy services on patient care. PCPs have identified specific types of pharmacy services to be more valuable, including comprehensive medication therapy management and disease-focused management of diabetes, hypertension and pain. These results can be used to inform development of pharmacy services in primary care.

Cardiovascular

448. Difficulties distinguishing acute decompensated heart failure (ADHF) and community-acquired pneumonia (CAP) in the outpatient setting leads to excess medication use Laura R. Davis, B.S.[1], Harleen Singh, Pharm.D.[1], *Chanchal Agr,* Pharm.D. Candidate 2016[1], Greg C. Larsen, M.D.[2], Christopher D. Pfeiffer, M.D.[2], Jessina C. McGregor, Ph.D.[1]; (1) Oregon State University/Oregon Health & Science University College of Pharmacy, Portland, OR (2) VA Portland Health Care System, Portland, OR
PURPOSE: Similarities in presentation and imaging can make distinguishing between CAP and ADHF difficult in ambulatory and emergency care settings. Thus, patients may receive inappropriate or excessive treatment if the differential diagnosis cannot be narrowed. We aimed to describe the diagnostic work-up of heart failure (HF) outpatients presenting to the Portland VA Medical Center (PVAMC) with CAP or ADHF symptoms.

METHODS: We conducted a retrospective cross-sectional study of adult HF patients presenting to PVAMC as outpatients between 1/1/12 and 12/31/12 with symptoms consistent with CAP. Patients were excluded if differential diagnoses included neither ADHF nor CAP. Medical records were reviewed to identify imaging, laboratory tests, medications, chief complaint, primary diagnosis, and patient outcomes (including subsequent hospital admissions and outpatient visits within 30 days). The proportion of patients who received treatment for ADHF and CAP was calculated.
RESULTS: Of 2,760 potentially eligible encounters, 132 have been screened to date and 32 met inclusion criteria. Primary chief complaints were shortness of breath (69%) and chest pain (16%). Chest x-rays were performed for 91%, sputum cultures for 6%, blood cultures for 25%, NT-proBNP levels for 59%, and CBC for 78%. Overall, 21.9% of encounters received both antibiotics and HF medications either during the visit or as a discharge prescription. Only 9% ultimately had a primary diagnosis of pneumonia, with an additional 9% having a primary diagnosis of obstructive chronic bronchitis; no other infectious diseases were identified among primary diagnoses. Overall, 66% of encounters were admitted directly to PVAMC, and among the remainder, 33% were admitted in the subsequent 30 days.
CONCLUSION: In outpatient settings, inconsistent use of diagnostics and laboratory tests, along with ambiguity in interpreting results, can result in excess medication use due to treatment for both CAP and ADHF. Patients may thereby be at increased risk for adverse outcomes.

449. Chronopharmacology of valsartan and amlodipine *Sephorah Falzon, M.Pharm.*[1], Louise Grech, M.Phil.[2], Anthony Serracino-Inglott, Pharm.D.[1], Lilian M. Azzopardi, B.Pharm.(Hons), M.Phil., Ph.D., MRPharmS[2]; (1) Department of Pharmacy, University of Malta, Msida, Malta (2) Department of Pharmacy, Faculty of Medicine and Surgery, University of Malta, Msida, Malta
PURPOSE: To test the effect on 24 hour blood pressure (BP) profile of valsartan and amlodipine and to compare the effects of morning versus evening dosing on circadian BP.
METHODS: Sixty two patients aged 40–75 years had their 24 hour BP measured using an ambulatory BP monitor (ABPM). Patients suffering from essential hypertension who were prescribed valsartan (n = 21) or amlodipine (n = 8) as monotherapy were monitored twice, 7 days apart and were asked to change the time of dosing of their medication for a week for the second measurement. Patients suffering from hypertension but taking no medication (n = 14) and normotensive patients (n = 19) were recruited as controls.
RESULTS: Whole day systolic BP (SBP) and diastolic BP (DBP) means following both morning and evening valsartan administration were lower than the 140/90 mmHg limit (123.91/77.94 mmHg and 121.31/76.06 mmHg respectively). Compared to morning administration, evening valsartan dosing resulted in a non-significantly lower BP during the early morning and day time periods and significantly lower BP during the night ($p = 0.146$, 0.905 and 0.012 respectively for SBP and $p = 0.079$, 0.880 and 0.003 respectively for DBP; Mann–Whitney). Whole day BP means following both morning and evening amlodipine dosing were lower than the 140/90 mmHg limit (126.23/77.35 mmHg and 127.75/78.71 mmHg respectively). Compared to evening dosing, morning amlodipine administration resulted in a non- significantly higher BP during the early morning period and non-significantly lower BP during the day and night time periods ($p = 0.330$, 0.483 and 0.091 respectively for SBP and $p = 0.480$, 0.961 and 0.065 respectively for DBP; Mann–Whitney).
CONCLUSION: Valsartan and amlodipine were effective for 24 hour BP control irrespective of their dosing time. Evening dosing of valsartan was preferred to morning administration as it was more effective at lowering early morning and night time BP.

450. Revisiting niacin at the VA Portland Health Care System (VAPORHCS): are we in compliance with the guidelines? *Matt J. Glaus, B.S.*[1], Laura R. Davis, B.S.[1], Lynnette R. Klaus, Pharm.D.[1], Jessina C. McGregor, Ph.D.[2], Harleen Singh, Pharm.D.[2]; (1) VA Portland Health Care System, Portland, OR (2) Oregon State University/Oregon Health & Science University College of Pharmacy, Portland, OR
PURPOSE: Current cholesterol guidelines recommend optimizing statin therapy for atherosclerotic cardiovascular disease (ASCVD) rather than adding niacin, which has not been proven in trials to reduce cardiovascular events. The purpose of this project is to evaluate niacin prescribing at the VAPORHCS in high cardiovascular risk veterans.
METHODS: VAPORHCS patients with active niacin orders as of 03/13/2015 were electronically identified. Chart review was conducted to collect patient demographics, lipid-lowering regimens, and comorbidities. Patients with discontinued/expired niacin orders, who were deceased, or no longer with VAPORHCS were excluded. The frequency of niacin patients at high cardiovascular risk, on optimized statin therapy, and indications for niacin were calculated. The VAPORHCS Institutional Review Board approved this as a quality improvement project.
RESULTS: Of 480 patients identified with active niacin orders, 196 charts were reviewed to date; 144 (73.5%) met inclusion criteria. Of the 52 excluded, 48 (92.3%) were for niacin expiration or discontinuation, 3 (5.7%) were deceased and 1 (1.9%) was no longer a VAPORHCS patient. Of included veterans, the average age was 67.1 years, 98.6% were male, 115 (79.9%) had hypertension and 79 (54.9%) had diabetes. Documented niacin indication was present in 114 (79.2%) and was most commonly for hyperlipidemia (57.9%) and hypertriglyceridemia (36.8%). Among patients initiated due to hypertriglyceridemia, 22/42 (52.4%) were initiated for triglycerides <500 mg/dL (average = 333.9 mg/dL). Among 134 niacin-receiving veterans with ASCVD or risk ≥7.5%, 78 (58.2%) were on a moderate- or high-intensity statin, while 56 (41.8%) were on no statin or a low-intensity statin and of those patients 23/56 (41.1%) had no documented statin intolerance.
CONCLUSION: Niacin use persists among VAPORHCS patients despite a lack of optimization of statin therapy, particularly in the highest cardiovascular risk group. These results highlight the need to optimize statin regimens before initiating non-statin therapies.

451. Alemtuzumab induction versus conventional immunosuppression in heart transplant recipients *Areerut Leelathanalerk, Pharm.D. Candidate*[1], Thammasin Ingviya, M.D.[2], Vijay Ivaturi, Ph.D.[1], Brent N. Reed, Pharm.D., BCPS-AQ Cardiology[1]; (1) Department of Pharmacy Practice and Science, University of Maryland School of Pharmacy, Baltimore, MD (2) Bloomberg School of Public Health, The Johns Hopkins University
PURPOSE: Induction therapy in the setting of heart transplantation remains an area of controversy. The purpose of this retrospective analysis was to compare alemtuzumab induction and conventional immunosuppression in heart transplant recipients.
METHODS: We included patients aged 18–89 years who underwent heart transplantation at our institution, received alemtuzumab induction, and had at least 6 months of follow-up (n = 10); this cohort was compared to an equal number of patients who received conventional immunosuppression (n = 10). The primary endpoint was time to ≥ Grade 2R rejection at 6 months; other endpoints included time to any rejection as well as differences in laboratory parameters and immunosuppression use. Baseline characteristics were compared using t-test, chi-squared, or Fisher's exact test as appropriate. Follow-up data were compared using Kaplan–Meier, Wilcoxon, or Fisher's exact as appropriate.
RESULTS: Baseline characteristics were similar between the two groups except higher mean serum creatinine concentration in the alemtuzumab group (1.65 mg/dL vs. 0.94 mg/dL in the conventional therapy group, $p < 0.001$). At 6 months, there was no

difference in freedom from ≥Grade 2R rejection between the two groups (log rank $p = 0.073$); however, freedom from any rejection was significantly higher for the alemtuzumab group (log rank $p < 0.001$; crude hazard ratio [HR] = 0.10; 95% CI: 0.02-0.50; $p = 0.004$; adjusted HR = 0.036; 95% CI: 0.001–0.800; $p = 0.036$). Mycophenolate doses and tacrolimus goal ranges were lower in the alemtuzumab group compared to the conventional immunosuppression group ($p < 0.002$ and $p < 0.04$, respectively). Differences in renal function observed at baseline were no longer present when the two groups were compared at 6 months (1.58 mg/dL and 1.76 mg/dL in the alemtuzumab and conventional therapy groups, respectively, $p = 0.968$).
CONCLUSION: Induction therapy with alemtuzumab appeared to reduce the incidence of any-grade but not ≥ Grade 2R rejection in heart transplant recipients. Renal function appeared to worsen in the conventional immunosuppression but not alemtuzumab group.

452. Metolazone versus chlorothiazide in patients with acute decompensated heart failure and loop diuretic resistance *Anthony Jiang, Pharm.D. Candidate*, Christine Puschak, Pharm.D., Sandeep Devabhakthuni, Pharm.D., BCPS-AQ Cardiology, Vijay Ivaturi, Ph.D., Tao Liu, Ph.D. Candidate, Brent N. Reed, Pharm.D., BCPS-AQ Cardiology; Department of Pharmacy Practice and Science, University of Maryland School of Pharmacy, Baltimore, MD
PURPOSE: Thiazide-type diuretics are often added for refractory congestive symptoms in patients with acute decompensated heart failure (ADHF) and loop diuretic resistance, but the optimal agent in this setting remains unknown. The purpose of this study is to compare the addition of oral metolazone versus intravenous chlorothiazide in patients with ADHF and loop diuretic resistance.
METHODS: In this single-center retrospective analysis, we included patients admitted with ADHF who received ≥ 160 mg/day of intravenous furosemide (or equivalent) who had either metolazone or chlorothiazide added to optimize diuresis. Patients were excluded if the loop diuretic dose was changed by ≥25% in the 24 hours following thiazide-type diuretic administration. The primary efficacy endpoint was increase in 24-hour urine output (UOP) after thiazide-type diuretic administration. Based on interim analysis, 178 patients would provide 90% power to demonstrate non-inferiority of metolazone using a UOP margin of 500 mL (alpha of 0.05). Safety endpoints included incidence of acute kidney injury (AKI, defined as serum creatinine increase >0.3 mg/dL or 1.5-times baseline) hypokalemia (potassium < 4.0 mEq/L), and hypomagnesemia (magnesium < 2.0 mEq/L).
RESULTS: A total of 119 patients have been enrolled to date. On average, 24-hour UOP increased by a mean 1323 mL following administration of a thiazide-type diuretic (95% CI 1063–1582). Metolazone and chlorothiazide increased 24-hour UOP by 1138 mL and 1510 mL, respectively, a difference that was not statistically significant (p = 0.16). Incidence of AKI was higher with metolazone (35% versus 17% with chlorothiazide, p = 0.04) but changes in serum potassium and magnesium were not different between the two groups.
CONCLUSION: Preliminary results suggest increases in 24-hour UOP were similar between metolazone and chlorothiazide when added in patients with ADHF and loop diuretic resistance. Metolazone was associated with a higher rate of AKI but no differences in electrolyte abnormalities were observed.

Community Pharmacy Practice

454. Investigation of weight loss supplements for banned and discouraged use ingredients *Michelle Maguire, Pharm.D. Candidate*, Sara Eichner, Pharm.D. Candidate, Leticia Shea, Pharm.D., Matthew Fete, Ph.D.; School of Pharmacy, Regis University, Denver, CO
PURPOSE: The large influx of dietary supplements into the U.S. market raises health concerns due to their unregulated nature and inadequate documentation of safety analysis. The FDA is unable to seize all dietary supplements containing undeclared pharmaceuticals and dangerous ingredients. This study investigated product labels of readily available weight loss supplements for banned and discouraged use ingredients in order to educate pharmacists on the dangers of these mainstream products.
METHODS: Investigators visited several retail outlet stores within a 15-mile radius to evaluate various weight loss supplements. Ingredients of each supplement were studied for their safety, efficacy, and FDA status in regards to weight loss.
RESULTS: Investigators discovered 17 different supplements containing FDA banned ingredients including ephedra, 1,3-dimethylamylamine (DMAA), and β-methylphenylethylamine (BMPEA). Additionally, most of the supplements included discouraged use ingredients that have a high risk of harmful events, especially when administered with other stimulants.
CONCLUSION: Knowledge of the health risks associated with unregulated ingredients found in weight loss supplements remains poorly understood by the general public. Although many ingredients have been banned by the FDA, it is important to recognize these products are still readily available in the retail setting. It is crucial that pharmacists are aware of the dangerous ingredients found in these mainstream products to ensure they are able to appropriately counsel patients in order to alert them of the possible consequences.

Critical Care

456. The impact of intravenous dopamine on respiratory function in patients with septic shock *Angela Yuen, Pharm.D. Candidate*; College of Pharmacy, Roseman University of Health Science, Henderson, NV
PURPOSE: Dopamine has both beneficial and undesirable effects on respiratory function in hypercapnic respiratory failure. Less is known about dopamine's impact on patients with primary hypoxemic respiratory failure. The objective of this study is to identify what is the impact of dopamine added to vasopressor support in patients with septic shock has on respiratory function.
METHODS: A retrospective cohort study was conducted between 7/1/2102–4/1/2014 at two hospitals in Las Vegas, NV. The study population included mechanically ventilated (MV) patients with sepsis that were receiving vasopressor support. The study population was divided into two groups: those receiving vasopressor support with the inclusion of IV dopamine and vasopressor support without the inclusion of IV dopamine. Patients were assessed for the following clinical endpoints and respiratory parameters: MV duration, LOS, in – hospital mortality, FiO2, PCO_2, PaO2, RR, PEEP, TV, and SPO_2. Patients 18 years old diagnosed with sepsis requiring MV and vasopressor support were eligible for inclusion. Wilcoxon rank sum test was used to test differences in continuous, non-parametric data. Fisher's exact test was used to compare in-hospital mortality between groups.
RESULTS: MV duration showed an absolute reduction of 1.18 days (3.18 versus 4.33, p = 0.0469) in the dopamine group. Other significant differences observed included both hospital length of stay (p = 0.0405) and PaO2 (p = 0.0094) which were also lower in the intervention group. Results from the study that did not show a significant difference between groups included: FiO2 (p = 0.8102), SPO2 (p = 0.4097), PCO2 (p = 0.4258), total RR (p = 0.6118), spontaneous breaths (p = 0.1506), and TV (p = 0.4684).
CONCLUSION: Our study showed the variable effects of dopamine on the respiratory function in patients with primary hypoxemic respiratory failure. Our study provides additional evidence that dopamine has a clinical effect on the respiratory system and supports the idea that further research is needed.

457. A retrospective assessment of rFVIIa to facilitate procedures in critically ill patients with end stage liver disease *Jennifer Kwon, Pharm.D. Candidate 2016*[1,2], Robert Maclaren, Pharm.D.[1,2]; (1) University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO (2) University of Colorado Hospital, Aurora, CO

PURPOSE: The objective of this study is to comparatively evaluate the success rates and adverse events of coagulopathy reversal with rFVIIa or conventional procoagulant products (FFP, platelets, cryoprecipitate, vitamin K, etc) in patients with end-stage liver disease.
METHODS: A retrospective chart review of critically ill patients with end stage liver disease and use of rFVIIa to reverse INR for a procedure in a large academic medical center between September 2011 to present.
RESULTS: To date, five patients received rFVIIa. Patients were 48.6 ± 1.8 years of age with a MELD 24.6 ± 5.9; four with Child score of C. rFVIIa dose was 42 ± 17 mcg/kg for bronchoscopy, central line placement, paracentesis, IR transcatheter, and PICC IR. The INR within 4 hours before and after the procedure was 3.1 ± 1 and 1.4 ± 0.3 ($p = 0.013$) respectively. Achievement of INR ≤ 1.5 within 6 hours of rFVIIa was observed in 4 subjects. Procedures were performed 1.4 ± 0.9 hours after administering rFVIIa. No adverse events were observed.
CONCLUSION: The preliminary results show that rFVIIa lowers the INR, facilitating invasive procedures, in patients with coagulopathy due to liver disease. Data collection will continue and the rFVIIa group will be compared to conventional procoagulant products in terms of effectiveness and adverse events. Final analysis of results will be presented at the 2015 ACCP Global Conference on Clinical Pharmacy.

Education/Training

458. A comparison of student perceptions of Interprofessional Education (IPE) during an accelerated pharmacy curriculum *Blaine A. Johnson, Pharm.D. Candidate*[1], Jessica L. Miller, Pharm.D. Candidate[2], Cheryl L. Hayes, Pharm.D., MBA, MJ, BCPS[1]; (1) Roosevelt University College of Pharmacy, Schaumburg, IL (2) St. Louis College of Pharmacy, St. Louis, MO
PURPOSE: To compare the attitudes and perceptions of students in an accelerated Doctor of Pharmacy program toward Interprofessional Education (IPE) prior to and subsequent to IPE experiential activities before and after significant curriculum improvements between the Classes of 2016 and 2017.
METHODS: Students participating in Interprofessional Practice Experience I and II were asked to complete an attitudinal survey during the first and last day of the 20-week, interprofessional experience sequence. The survey included the 10-item, validated, Student Perceptions of Physician-Pharmacist Interprofessional Clinical Education (SPICE) instrument assessing attitudes and perceptions toward interprofessional collaboration before an introductory IPE experience. Preliminary resultant comparative data was used to assess the effectiveness of IPE, noting trends within and between classes for IPE readiness/awareness outcomes.
RESULTS: The survey was completed by 69 students in the Class of 2016 and 63 students in the Class of 2017. Preliminary data from both classes ($n = 132$) revealed that prior to new curricular changes, students agreed/strongly agreed that health outcomes are improved when patients are treated by a team of professionals from different disciplines (96%) and that physicians and pharmacists should collaborate in teams (98%). However, both classes responded that their role within the interdisciplinary team was not clearly defined (10%). Seven items of the survey showed numerical increases in mean scores from pre- to post-IPE experiences for the Class of 2016.
CONCLUSION: Preliminary results demonstrate that students have an appreciation for the value of IPE, however, display less familiarity regarding the role of a pharmacist and other professionals in an interdisciplinary team. New IPE curricular changes aim to address these concerns.The Class of 2016's IPE experiences led to improved attitudes of pharmacy students towards providing pharmaceutical care to patients. A post-IPE survey is planned for the Class of 2017 after students complete their IPE sequence.

459. Development and implementation of an International Pharmacy Research Project *Shiny Parsai, M.S., Pharm.D. Candidate*[1], Hazel Seaba, RPh, Pharm.M.S.[2]; (1) University of Iowa College of Pharmacy, Iowa City, IA (2) Department of Pharmacy Practice and Science, University of Iowa College of Pharmacy, Iowa City, IA
PURPOSE: To develop a successful process to create a fundable international research project proposal focusing on improving the understanding of international pharmacy practice, international professional pharmacy organizations, and pharmacist careers internationally.
METHODS: International relationships were developed with assistance from an internationally focused pharmacy faculty at The University of Iowa. Several pharmacy school faculty abroad were contacted about the potential for a research project with a detailed description of student experience and research interests. Funding sources for the project were identified through The University of Iowa International Programs office and a successful project proposal was written for the Stanley Graduate Award for International Research. Following interests from several organizations, two were selected which included the International Pharmaceutical Federation in The Hague, Netherlands and the Royal Pharmaceutical Society in London, England. A research project focused on interviewing pharmacists about their career was selected based on feasibility and application to international professional pharmacy organizations. A pharmacist career survey instrument was developed focusing on the areas of education, training, mentoring, languages, international experiences, leadership experiences, professional and personal network, and community service. Site visits at local pharmacies in each country were scheduled through the assistance of local contacts in each country.
RESULTS: Two pharmacists were individually interviewed at the International Pharmaceutical Federation and eight pharmacists were individually interviewed at the Royal Pharmaceutical Society. Five international pharmacy site visits were conducted which included the Regentesee community pharmacy and the Medical Center Haaglanden Westeinde hospital pharmacy in The Hague, Netherlands and the Green Light community pharmacy, The Heart Hospital pharmacy, and the Royal Free Hospital pharmacy in London, England.
CONCLUSION: Developing a successful international research project requires thorough planning at least six months prior to the project and a detailed project proposal for funding with establishing international relationships early being the key to successful research abroad.

460. The effect of peer tutoring on learning in pharmacy students *Dane Fickes, Pharm.D. Candidate Class of 2018*, Amanda Lewis, Pharm.D. Candidate Class of 2019, Evelyn Becker, Pharm.D., M.S., Peter Hurd, Ph.D.; St. Louis College of Pharmacy, St. Louis, MO
PURPOSE: To assess the effects of various peer tutoring methods on students' comprehension of material.
METHODS: An 8 item survey which inquired about the students experience with types of tutoring, including both quantitative and qualitative data, was administered to students in the 1st year of their 6 year pharmacy program at St. Louis College of Pharmacy. The survey solicited data on student experience in large group, small group, and private tutoring.
RESULTS: A total of 171 students completed the survey out of 189 enrolled (90%). One hundred and fifty-four students found tutoring to be of high value (mean = 4.5 out of 5). Also students who participated in small group tutoring reported a greater positive effect on their overall grade in the course than students who were involved in private tutoring ($p < 0.05$). Qualitative data aligned well with quantitative data. For example, student consistently commented that tutoring benefited their learning. Quantitatively, 88% of students indicated that tutoring helped them clear up difficult concepts and 77% marked that it helped them understand the big picture.
CONCLUSION: In a model derived from elements found in Team Based Learning (TBL), our peer led approach is facilitated by

students in the same program who have already taken that course. Small group also adds peer discussion to the learning process and may also establish a positive group dynamic. Students valued tutoring and reported more motivation to succeed and learn.

461. Determination of characteristics associated with postgraduate residency interviews of current pharmacy practice residents in five southwestern states *Andrew Sam, Bachelor of Science, Biology*[1], Sarah Nguyen, Bachelor of Science, Biology[1], Nicole Early, Pharm.D.[2], Laura Tsu, Pharm.D.[3]; (1) College of Pharmacy, Midwestern University, College of Pharmacy - Glendale, Glendale, AZ (2) Department of Pharmacy Practice, Midwestern University, College of Pharmacy - Glendale, Glendale, AZ (3) School of Pharmacy, Department of Pharmacy Practice, Chapman University, Orange, CA

PURPOSE: The objective of this study is to assess whether there are certain characteristics that lead to specific types of residency program interviews. Acute care residency interview statistics were directly compared to ambulatory care residency interview statistics and geographical comparisons were made.

METHODS: This was a cross-sectional survey study of postgraduate year 1 (PGY1) pharmacy residents located in five southwestern states: Arizona, California, New Mexico, Nevada, and Utah. The survey contained 37 questions that assessed the resident's demographics and application statistics, which included: grade point average (GPA), research experience, publications, presentations, leadership positions, type of work experience, awards received, and letters of recommendation.

RESULTS: The overall response rate for the survey was 30.7% ($n = 52$). There were no noteworthy differences observed in characteristics between acute care and ambulatory care programs. Both acute care respondents and ambulatory care respondents identified having received an award, held a leadership position, and had pharmacy related work experience in the 80–100% range. GPA ranged from 3.01–4.00, with the majority of responses in the 3.51–4.00 range. Likewise, there were no notable differences observed in characteristics when taking geographical considerations into account.

CONCLUSIONS: The top three characteristics identified for acute care and ambulatory care programs are: received an award, held a leadership position, and had pharmacy related work experience. Students should aim to have the top three characteristics represented on their curriculum vitae and maintain a GPA above 3.50 as it is associated with being granted interviews from PGY1 residency programs.

462. Cross-cultural comparison of pharmacy students' attitudes, knowledge, practice, and barriers regarding evidence-based medicine *Aya F. Ozaki, B.Sc.Phm, Pharm.D Candidate*, Cynthia A. Jackevicius, B.Sc.Phm, Pharm.D, M.Sc., BCPS-AQ Cardiology, FCSHP, FAHA, FCCP; Western University of Health Sciences, Pomona, CA

PURPOSE: Evidence-based medicine (EBM) is beginning to be adopted into pharmacy education. EBM instruction has had varying penetration in different regions of the world, and the impact of cultural influences on students' EBM attitudes and knowledge is poorly understood. Therefore, we explored this among pharmacy students in the United States (US) and Japan.

METHODS: A cross-sectional study was conducted using a self-administered survey. Senior students in one pharmacy school in the US and in Japan were invited to participate in a 33-question survey. Yes/no responses or 4-point Likert scales were used. Categorical data were compared between groups using Chi-square and continuous data were compared using t-tests.

RESULTS: The survey was completed by 562 students (US: 194/267 (73%); Japan: 368/685 (54%)). Students showed positive attitudes and had general knowledge of EBM in both groups. Most questions about future EBM use showed no statistical difference between groups. US students had higher usage, self-evaluation of their skills, and frequency of access to EBM resources ($p < 0.05$). Percentages of students that indicated at least some understanding of common EBM terms were: 99%/35% for "number needed to treat", 99%/58% for "confidence interval", 99%/71% for "publication bias", 97%/83% for meta-analysis, and 94%/93% for "odds ratio", in the US/Japan, respectively. The most common barriers for US students were lack of time (85%), statistical knowledge (64%), critical appraisal skills (53%), and for Japanese students were lack of training (92%), clinical knowledge (88%), and opportunity (88%). There were 13 barriers identified by >50% of Japanese students, while only 3 barriers for US students.

CONCLUSION: EBM was welcomed by students in both countries. However, training and access barriers may have resulted in lower self-evaluation of their EBM skills and usage in Japanese students. Future analysis will compare correlations in EBM barriers and practice between countries.

463. Impact of a medication simulation on pharmacy students' preconceived conceptions of medication adherence *Traiana Mangum, B.S.*, Diana Isaacs, Pharm.D., BCPS, BC-ADM, CDE, Sneha Srivastava, Pharm.D., BCACP, Heather Fields, Pharm.D., MPH, BCACP; College of Pharmacy, Chicago State University, Chicago, IL

PURPOSE: A one week medication simulation activity was piloted in a second year Doctor of Pharmacy course with the goals of increasing students' understanding of barriers to medication adherence and developing patient-specific strategies to overcome these barriers. The primary objective of this study is to compare anticipated medication adherence rates and barriers to taking medications with actual adherence rates and barriers during a medication simulation.

METHODS: In this IRB-approved study, second year professional pharmacy students were assigned to take one placebo medication for one week (metformin 850 mg three times daily, glipizide 5 mg twice daily, metoprolol tartrate 50 mg twice daily, or fish oil 1000 mg twice daily). Students completed a pre-simulation questionnaire asking estimated number of missed doses, anticipated barriers to medication adherence, and perceived difficulty following the regimen utilizing a 5-point Likert scale. After the one week simulation, students completed a one page reflection and similar post-questionnaire assessing actual missed doses, barriers to adherence and perceived difficulty in following the regimen.

RESULTS: Seventy-two students completed the full activity. In the pre-questionnaire, students anticipated an average of 2.6 barriers and 2.4 missed doses (85.5% adherence rate) with the most common barriers: forgetting (69.4%) and being too busy (52.7%). In the post-questionnaire, students missed an average of 4.4 doses (74.1% adherence rate) and stated 3.1 barriers (17.5% increase from pre-questionnaire) including forgetting (75.0%), being too busy (66.7%), and difficulty taking at specified times (54.2%). Analysis of reflections and comparisons of adherence rates between twice daily and three times daily regimens are in progress.

CONCLUSIONS: Results thus far suggest that students underestimate barriers to medication adherence and difficulty taking multi-dose regimens. A medication simulation may be a useful tool to help pharmacy students appreciate barriers in taking medications. Students can apply this information in practice to develop patient-specific strategies to overcome barriers.

464. The impact of a Student College of Clinical Pharmacy-led USP <797> review on technician knowledge of aseptic technique: a comparison study *Maria Kiraly, Pharm.D. Candidate*; Northeast Ohio Medical University, Roostown, OH

PURPOSE: The purpose of our research was to measure and compare the effects of a student-led USP <797> review session to hospital pharmacy technicians at two local hospitals

METHODS: Student members and two faculty advisors from the Northeast Ohio Medical University (NEOMED) Student College

of Clinical Pharmacy (SCCP) chapter developed a review of aseptic technique. The presentation was delivered over thirty minutes to a target audience of pharmacy technicians at two local teaching hospitals. Pre- and post-tests were administered to assess improvement in knowledge due to the review. Technicians were given ten minutes before the presentation for the pre-test and received the same assessment after the presentation. The assessment consisted of ten questions to gauge the technicians' baseline opinion of their understanding of USP <797> and specific content from the presentation. Topics reviewed included proper personal protective equipment, stability, sterility, and beyond-use-dating with an emphasis on using aseptic procedure when compounding medications. This program has been delivered to technicians at one hospital and will be repeated this July at another hospital.
RESULTS: Last year, the review was given on six separate occasions to a total of 28 technicians. Twenty-six (92.8%) of the technicians completed both tests and were included in the results. The mean of both tests was 61.5% and 91.2%, respectively ($\Delta = 29.7\%$). These results were statistically significant (p-value < 0.001). This year's results are pending. A comparison of the two hospitals' performance will take place once all data is collected.
CONCLUSION: SCCP's partnership with a teaching hospital's pharmacy last year proved successful in reiterating the importance of aseptic technique. Based on these results, more regular reviews and assessments of aseptic techniques and USP <797> would be beneficial for all pharmacy staff to further improve patient care and safety.

465. Establishment of a student college of clinical pharmacy chapter *Brandon Martinez, Pharm.D.*[1], Isis Simon, B.S.[2], Kamarena Sankar, B.S.[2], Jennifer Steinberg, Pharm.D., BCPS[2], Sandra Benavides, Pharm.D., FCCP, FPPAG[2]; (1) Banner University Medical Center - Tucson, University of Arizona College of Pharmacy, Tucson, AZ (2) Department of Pharmacy Practice, Nova Southeastern University College of Pharmacy, Davie, FL
PURPOSE : The American College of Clinical Pharmacy began recognizing student chapters at schools and colleges of pharmacy in 2013. However, schools and Colleges of Pharmacy may have limited resources to justify implementation of a new student organization. The purpose of this abstract is to describe the establishment of an innovative student chapter at our multi-site campus focused on professional development of student pharmacists.
METHODS: The Student College of Clinical Pharmacy (SCCP) chapter at Nova Southeastern University (NSU) was established in 2011. With the presence of 18 existing student organizations, unique opportunities for students were developed. These included a Research Mentoring Program (RMP), Lunch Time Case Study, Clinical Pharmacy Roundtable (CPR), and a Leadership Speaker Series. The organization also restructured the executive board to allow more opportunities for leadership roles for increased leadership development. These activities were in addition to the required community outreach for student government funding.
RESULTS: SCCP was officially recognized as a student chapter at NSU college of pharmacy in the 2011–2012 academic year with seven founding, paid members. During the 2014–2015 academic year, the chapter included more than 110 paid members. The executive board doubled from 6 to 13 positions. The chapter has experienced financial stability through membership, fundraisers and receipt of grants to support programming. Lastly, for the past two years, SCCP is consistently in the top 5 organizations for number of events as ranked by the student government association.
CONCLUSION: Through innovative programming and strong student leadership, the addition of a student chapter of ACCP can be uniquely beneficial to students despite the availability of numerous organizations.

466. Improving pharmacy student evidence based medicine (EBM) skills: designing an online library EBM resource page as an educational tool *Michael Griggs, Pharm.D. Candidate*[1], Debra Barnette, Pharm.D.[2], Natalie Kupferberg, MLS, BSN[3]; (1) The Ohio State University, Columbus, OH (2) Department of Pharmacy Practice, The Ohio State University, Columbus, OH (3) Biological Sciences/Pharmacy Library, The Ohio State University, Columbus, OH
PURPOSE: To increase awareness of Evidence Based Medicine (EBM) and its utilization by pharmacy students throughout the curriculum. Specific objectives: To develop an accessible premier EBM resource guide for students, evaluate potential benefits of our online EBM resource page, quantify perceptions of P4 student EBM related skill level, and assess faculty's application of EBM principles.
METHODS: We convened a focus group consisting of two subject librarians, a P2 student and a board certified pharmacotherapy specialist. Over 5 months we reviewed appropriate literature and resources to assemble an EBM resource page and construct surveys. A 34-item questionnaire was distributed electronically to 15 pharmacy faculty members assessing current perceptions of EBM knowledge and skills of P4 students, overall usefulness of the resource page, and faculty's integration of EBM into teaching responsibilities. Items were evaluated using a 5-point Likert scale.
RESULTS: The Internet accessible EBM resource was made available to all university students (medical and allied health) and faculty summer of 2015. Faculty respondents (9 of 11, 82%) either agreed or strongly agreed that students would benefit from more EBM training in terminology, resources, concepts and patient application. Respondents (7 of 11, 64%) disagreed or strongly disagreed that students were familiar with EBM focused resources. The resource was viewed positively for its overall description of EBM principles (91%), identification of useful resources (100%), ease of navigation (91%), potential clinical utility (100%) and educational value (100%). Faculty reported discussing literature and applying EBM in their practices (90%). However, they also agreed they would welcome additional EBM training (90%).
CONCLUSION: The development of an EBM resource page has been well received by our college faculty. Preliminary data suggests the resource will be beneficial in helping students identify alternative EBM resources and further develop EBM related skills. Future student assessments will further help identify EBM educational opportunities.

467. Women leaders and pharmacy practice Heather Jarvis, B.S., M.S.[1], *Isis Simon, B.S.*[2], Sandra Benavides, Pharm.D.[3]; (1) College of Pharmacy, Nova Southeastern University, Davie, FL (2) Department of Pharmacy Practice, Nova Southeastern University College of Pharmacy, Davie, FL (3) Nova Southeastern University, College of Pharmacy, Davie, FL
PURPOSE: The newest standards for pharmacy education require the development of leadership skills in pharmacy school. Providing leadership classes, seminars, workshops, and other leadership opportunities through pharmacy school will better prepare graduates to enter the ever-changing pharmacy workforce and become the best clinicians, managers, and leaders they can be. Leadership is a dynamic learning process that draws upon previous experiences of both successes and failures. The purpose of this study is to determine which leadership themes should be incorporated into and focused on in a future pharmacy leadership course.
METHODS: A four-part leadership lecture series featuring women in various leadership roles was conducted at Nova Southeastern University from January 2015 through April 2015. A qualitative analysis was completed to identify the key themes from the series. Once the themes were identified, a comprehensive review of the literature will be conducted on each topic in order

to establish course objectives and learning outcomes for the leadership course.
RESULTS: The four main themes that emerged from the leadership series was humility, life-balance, adopting a proactive behavior, and assertiveness. Each theme will be research and appropriate learning objectives and activities will be developed to teach and develop these topics. PubMed, EMBASE, and ERIC will be utilized to identify key publications related to the themes which emerged from the leadership series. Additional search terms will include pharmacy, education, and leadership. Course learning objectives and activities will be presented.
CONCLUSION: We expect the literature to expand on the key themes which were identified during the leadership speaker series. These themes have led to the development of objectives for a leadership class that will prepare students to further engage in leadership opportunities upon graduation. Through the development of this class, graduates will be better prepared to enter into the ever changing pharmacy workforce.

468. Use of an innovative mini-series movie to train preceptors: does it work? Craig D. Cox, Pharm.D.[1], *Zhen Zhang, Pharm.D. Candidate*[1], Jongpil Cheon, Ed.D.[2]; (1) School of Pharmacy, Texas Tech University Health Sciences Center, Lubbock, TX (2) College of Education, Texas Tech University, Lubbock, TX
PURPOSE: Determine whether the "Preceptor Mini-Series: Adventures in Interprofessional Precepting" movie program facilitates an innovative approach to train preceptors, and perform quality assurance measures to determine its effectiveness.
METHODS: Chronicled by two preceptor experts, the Mini-Series follows the challenges of two students and their preceptor through a six-week experiential rotation. Pharmacy preceptors were invited to premiere events held at movie theatres in three different cities. Participants were asked to provide basic demographic information and answer four "pre-program" and "post-program" survey questions. Data was analyzed by individual premiere events and collectively with all (3) events combined. A 3-month follow-up survey will be sent to participants in July/August 2015 to determine the long-term impact of this program on preceptor skills.
RESULTS: Fifty-eight individuals completed the survey at the premiere events. The majority had more than ten years of preceptor experience ($n = 21$, 36.2%), were female preceptors ($n = 40$, 69.0%), and practiced in an inteprofessional environment ($n = 48$, 82.8%). The participants' scores of all four confidence level questions were significantly increased after viewing the Mini-Series movie and the overall mean increased from 4.46 (pre-confidence level) to 4.77 (post-confidence level, $p < 0.001$). There was no significant differences of confidence levels in gender, location and the number of students the individual precept each year. Participants with fewer years of preceptor experience (0–10 years) had significantly higher perceived learning score than those with more preceptor experience (>10 years) (4.89 versus 4.63, $p = 0.020$). The mean score of satisfaction level to the program is high (4.90 on a 5 point scale).
CONCLUSION: After program completion, participants of this quality assurance program indicated an increase in confidence level for precepting. The Mini-Series movie program yielded positive feedback indicating this program and delivery format are well received and effective for similar future training initiatives.

469. An analysis of the international Advanced Pharmacy Practice Experiential program at the University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences *Melissa Laub, B.S., Pharm.D. Candidate*[1], Whitley Yi, B.S., Pharm.D. Candidate[1], Meghan Lynch, Pharm.D. Candidate[1], Michael Carpenter, Pharm.D. Candidate[1], Daniel Galipeau, Pharm.D. Candidate[1], Jaimee Truong, Pharm.D. Candidate[1], Kari Franson, Pharm.D., Ph.D.[2]; (1) University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO (2) Department of Clinical Pharmacy, University of Colorado Skaggs School of Pharmacy, Aurora, CO
PURPOSE: The field of pharmacy has grown globally, and students are increasingly interested in international rotations. It is important for pharmacy programs to offer opportunities to pursue international experiences. However, there are often barriers to providing such opportunities. The University of Colorado Skaggs of School Pharmacy and Pharmaceutical Sciences (CU SSPPS) has an established international rotation program. The aims of this analysis are to assess and describe the program and to identify areas for future program assessment and improvement.
METHODS: Retrospective review of international Advanced Pharmacy Practice Experiential (APPE) rotations from the past five years, using data provided by university experiential office.
RESULTS: Table 1 shows preliminary data from 2010–2015. International rotations have been completed at 36 different sites in 18 countries. Ninety-four percent of the sites had formal agreements in place. There has been a 49% decrease in students completing an international rotation since the peak in 2012.Table 1. Percentage of students completing international rotations 2010–2015

	Number of international rotations	Total number of rotations	Percentage of international rotations
2010–2011	15	119	12.61
2011–2012	26	151	17.22
2012–2013	18	121	14.88
2013–2014	20	158	12.66
2014–2015	14	159	8.81
Total (2010–2015)	93	708	13.14

CONCLUSIONS: Through the quantity and diverse locations of its APPE sites, the CU SSPPS international rotation program has established a broad global reach, enabling it to provide unique and enriching opportunities to its students. It is anticipated that this data will allow us to better facilitate future international APPE rotations by elaborating on techniques for establishing rotation sites and identify areas for future research by discovering gaps in knowledge. Future research will focus on analyzing the benefit of international rotations for students and developing a procedure that increases student access to international rotations.

470. Development and evaluation of a student chapter research mentoring program *Sheava Blackman, Pharm.D. Candidate 2016*[1], Duchess Domingo, Pharm.D.[2], Sandra Benavides, Pharm.D., FCCP, FPPAG[2]; (1) Nova Southeastern University College of Pharmacy, Fort Lauderdale (2) Department of Pharmacy Practice, Nova Southeastern University College of Pharmacy, Davie, FL
PURPOSE: Student College of Clinical Pharmacy (SCCP) at Nova Southeastern University developed a student led initiative, the Research Mentoring Program (RMP), to encourage and promote student research. The purpose of this study is to explore the impact of engaging students in active research participation during pharmacy school.
METHODS: In fall semester, faculty who volunteer present research interests to SCCP student members. Students rank and are matched with a faculty mentor. The groups complete the projects during the Winter/Summer semesters and the subsequent year if necessary. A seminar series is required for student participants and cover topics pertaining to effective research methods. The process repeats with each new academic year and feedback from the participants is used to develop future seminar topics and faculty involvement.
RESULTS: From 2011 to 2014, a total 0 f 105 students have been matched with a faculty member in groups of 2–4 students per group. A total of 37 students (35%) have participated in poster presentations at state or national levels (including 2 student

research award finalists), 3 publications, and one grant proposal funded. Of the 25 groups from this time period, 3(16) are still in the process of completing projects to be submitted as poster presentations or publications. A total of 18 faculty participated as mentors from all departments in the college of pharmacy. The department of pharmacy practice had the most participating faculty ($n - 11$), of which 8 (73%) completed a project with the student groups. Reasons for not completing projects include lack of student interest in project or lack of faculty commitment. Strategies to improve retention and completion have been implemented.
CONCLUSION: The RMP has provided students opportunities to learn and participate in research. Factors related to successful completion are evaluated and implemented subsequent years.

471. Changes in HIV knowledge and perceptions after an interprofessional elective course in pharmacy and dental students *Cullen Adre, B.S.*[1], James Clinard, B.A.[1], Ernesto Perez, B.S.[1], Navene Shata, A.A.[1], Jennifer Thomas, Pharm.D.[1], Mark Schweizer, DDS[2], Elizabeth Shepherd, Pharm.D.[1], Joshua Caballero, Pharm.D.[3]; (1) College of Pharmacy, Nova Southeastern University, Davie, FL (2) College of Dentistry, Nova Southeastern University, Davie, FL (3) Nova Southeastern University, College of Pharmacy, Davie, FL
PURPOSE: Interprofessional education (IPE) is now a more focused requirement of pharmacy education as per the Accreditation Counsel for Pharmacy Education (ACPE). While the literature is expanding in this area, there are limited data on collaboration between pharmacy and dentistry. Therefore, the purpose of this study was to compare pharmacy and dental students' changes in knowledge (e.g., treatment, dental care) and perceptions while collaboratively working with patients with HIV after completing an elective IPE course.
METHODS: An IPE elective course was designed at our institution to provide online didactic lectures, and an experiential component in which pharmacy students collaborated with dental students to provide care for patients with HIV. After Institutional Review Board approval, pre- and post-surveys were used to measure knowledge and perceptions of patients with HIV before and after the IPE. Descriptive statistics will be utilized to analyze demographic data. Depending on the data, parametric or non-parametric tests will be used to analyze baseline, endpoint, and changes in knowledge and perception between both groups.
RESULTS: A total of 50 students have completed the elective course and surveys. Demographic results among dental students include: female (56%), mean age of 29 years, and major race/ethnicity were white (49%). Of these, 74% of the dental students received prior HIV training (74%), but only 19% had any experience working with patients with HIV. Demographics results among pharmacy students include: female (50%), mean age of 25 years, and major race/ethnicity were Hispanic (37.5%). Of these, 63% of pharmacy students received prior HIV training, but only 12% had any experience working with patients with HIV. Statistical analysis regarding knowledge gained and changes in perceptions (e.g., towards patients, other profession) are pending.
CONCLUSION: Conclusions pending (N/A).

472. Ineluctable determinants of pharmacy residency match rates *Valerie Llerena, B.S.*[1], Brandon Martinez, Pharm.D.[2], Patrick Hardigan, Ph.D.[3], Sandra Benavides, Pharm.D.[4], Kevin Clauson, Pharm.D.[5], Joshua Caballero, Pharm.D.[6]; (1) College of Pharmacy, Nova Southeastern University, Fort Lauderdale, FL (2) Banner University Medical Center - Tucson, University of Arizona College of Pharmacy, Tucson, AZ (3) Health Professions Division, Nova Southeastern University, Fort Lauderdale, FL (4) Nova Southeastern University, Fl (5) College of Pharmacy, Lipscomb University, Nashville, TN (6) College of Pharmacy, Nova Southeastern University, Davie, FL
PURPOSE: Over the last several years, students have been competing for post-graduate pharmacy residency training with match rates at approximately 65%. While there are several criteria that may affect match rates (e.g., grade point average, interview skills, letters of recommendation), there may be factors which are outside the students' control. Therefore, the purpose of this study is to determine the impact of pharmacy program characteristics (i.e., length of program, type of institution, and didactic grading scheme) on residency match rates.
METHODS: De-identified ASHP match and non-match list were evaluated. Two authors independently calculated residency match rates for pharmacy programs for all students graduating in 2015 who entered the match for an ASHP accredited residency. Additionally, two authors independently classified pharmacy programs into the following categorical variables: length of program (i.e., 3 versus 4 year programs), type of institution (i.e., public versus private), and didactic grading scheme (GPA versus pass-fail). Any differences between the two authors in any of the aforementioned data collected were verified by a third author. Descriptive statistics were created for the study variables length of program, type of instruction, and didactic grading scheme. Bivariate chi-square analysis were calculated for each predictor variable for the outcome. To ascertain each study variable's effect on acceptance in a residency program, a logistic regression model was constructed. Odds ratios and predicted probabilities were used to evaluate factors associated with acceptance into an ASHP accredited residency.
RESULTS: Students from four-year programs, those attending a public institution, and students graded on an alpha-numeric system were most likely to be accepted. Results from the logistic regression model indicated a good model fit (Homer–Lemeshow (H–L) test yielded a $\chi^2(2)$ of 4.44, $p = 0.108$). Other results pending.
CONCLUSIONS: Pending.

Emergency Medicine

473. Patient compliance to filling discharge medication prescriptions from the emergency department *Brian Farris, B.S.*[1], Gabrielle Jacknin, Pharm.D.[2], Ty Kiser, Pharm.D.[1,2], Courtney Shakowski, Pharm.D.[1,2], Scott Mueller, Pharm.D.[1,2]; (1) Pharmacy, University of Colorado Hospital, Denver, CO (2) University of Colorado Hospital, Aurora, CO
PURPOSE: Adherence to prescribed medication is an assumption health care providers must make when deciding the course of care for a patient in the Emergency Department (ED). The aim of our study is to determine patient adherence to filling discharge medications from the University of Colorado ED, identify patient and prescription specific barriers to filling ED discharge medications, and analyze the association between patient characteristics failing to fill discharge medications and repeat ED visits within 30 days.
METHODS: This study was a retrospective longitudinal analysis with data from 4/18/13 to 5/27/13. The primary outcome for this study was patient adherence to filling discharge medication prescriptions from the ED. Secondary outcomes examined the relationship between ED and hospital readmission within 30 days and prescription or patient characteristics within those non-adherent to discharge medication pick-up.
RESULTS: There were 4,444 patients with discharge medication prescribed in the ED and 11.5% (510 patients) did not pick up their prescriptions. Within the non-adherent group, state sponsored insurance holders were more likely than patients with private insurance or self-payers to revisit the ED (43.3% self-pay, 63.2% state, 37.3% private). Hispanic patients were less likely than average to revisit the ED, whereas, African-Americans were more likely (41.2% Hispanics, 64.6% African–American). Lastly, female patients were more likely than males to revisit the ED (58.0% females versus 45.5% males). Prescription cost was not associated with repeat ED visits within 30 days ($p = 0.64$).
CONCLUSIONS: A significant number of patients seen at the University of Colorado Hospital Emergency Department were non-adherent to ED discharge medication pickup. These preliminary results highlight patient populations that should be targeted in future studies to enhance compliance and prevent re-presentation to the ED ultimately resulting in decreased healthcare costs. These results are preliminary and further studies are needed to assess the cost specific data.

474. Case report series and review of dabigatran etexilate reversal using 4-factor prothrombin complex concentrate *Nayma Moya Romero, Pharm.D. Candidate*, Veronica Nunez, Pharm.D. Candidate, Justin Presutto, Pharm.D. Candidate, Kathryn Samai, Pharm.D., BCPS; School of Pharmacy, LECOM Bradenton School of Pharmacy, Bradenton, FL
PURPOSE: The purpose of this study is to evaluate three case reports in which 4-factor prothrombin complex concentrate (PCC4) was used as a reversal agent for dabigatran.
METHODS: A retrospective case series was conducted at a level II trauma, community-based hospital. Archived pharmacy records were obtained to identify patients that received PCC4 indicated for dabigatran reversal.
RESULTS: Three patients received PCC4 for the reversal of dabigatran for severe bleeding. Complete blood count with differential, Prothrombin Time/International Normalized Ratio, Activated Partial Thromboplastin Time, and Fibrinogen laboratory markers were monitored prior to use of PCC4 and repeated after infusion. All three patients were admitted to the institution and survived through discharge.
CONCLUSION: PCC4 should be considered for the reversal of severe bleeding associated with dabigatran.

Endocrinology

476. Effects and safety of canagliflozin in the treatment of type 2 diabetes mellitus: a systematic review and meta-analysis Shuai Zhang, Master Candidate[1], *Guoying Cao, M.D.*[2]; (1) Department of Pharmacy Administration and Clinical Pharmacy, School of Pharmaceutical Sciences, Peking University (2) Department of Pharmacy, Beijing Hospital, Beijing, China
PURPOSE: To evaluate the effects and safety of canagliflozin in the treatment of type 2 diabetes mellitus.
METHODS: We electronically searched PubMed, Cochrane, and ClinicalTrails.gov for randomized controlled trials (RCTs) about canagliflozin in T2DM. Using a designed extraction form to select studies and extract data. Meta-analysis was conducted by RevMan 5.3.
RESULTS: Fourteen RCTs with 9,998 patients were eligible for meta-analysis. Canagliflozin were superior to placebo in reducing both HbA1c (MD = −0.68, 95% CI, −0.82 to 0.54, $p < 0.00001$; MD = −0.56, 95% CI, −0.62 to −0.49, $p < 0.00001$; MD = −0.48, 95% CI, −0.73 to −0.23, $p = 0.0002$; MD = −0.70, 95% CI, −0.76 to 0.63, $p < 0.00001$; MD = −0.68, 95% CI, −0.98 to-0.48, $p < 0.00001$) and FPG at doses of 50 mg to 300 mg. Canagliflozin was not inferior to glimepiride and Sitagliptin. Compared to placebo no significant differences were found in all adverse events (RR = 1.28, 95% CI, 0.97 to 1.68, $p = 0.08$; RR = 1.01, 95% CI. 0.97 to 1.06, $p = 0.50$; RR = 1.13, 95% CI, 0.94 to 1.36, $p = 0.18$; RR = 1.04, 95% CI, 1.00 to 1.09, $p = 0.06$; RR = 1.41, 95% CI, 0.97 to 2.03, $p = 0.07$). Compared to Sitagliptin, there is significant difference in genital tract fungal infection at dose of 100 mg/d and 300 mg/d (RR = 1.26, 95% CI, 1.04 to 1.53, $p = 0.02$; RR = 1.59, 95% CI, 1.07 to 2.36, $p = 0.02$) Compared to glimepiride, there is no significant difference in side effects at all dose levels (RR = 0.93, 95% CI, 0.87 to 2.02, $p = 0.06$; RR = 1.41, 95% CI, 0.97 to 2.03, $p = 0.86$)
CONCLUSION: Canagliflozin effectively improve biochemical parameters of T2DM. Data on side effects are needed to draw more reliable safety conclusions.

477. Prescribing patterns for canagliflozin (Invokana) in a specialty endocrinology group practice: patient characteristics and outcomes *Haley Kessinger, Pharm.D. Candidate 2016*[1], June Johnson, Pharm.D.[2], Rahul Parsa, Ph.D.[3], John Message, Pharm.D.[4]; (1) College of Pharmacy and Health Sciences, Drake University College of Pharmacy and Health Sciences, Des Moines, IA (2) Clinical Sciences, Drake University College of Pharmacy and Health Sciences, Des Moines, IA (3) Department of Actuarial Sciences and Statistics, Drake University College of Business and Public Administration, Des Moines, IA (4) Department of Pharmacy, VA Central Iowa Health Care System, Des Moines, IA
PURPOSE: To examine and describe actual canagliflozin prescribing patterns and outcomes in patients with type 2 diabetes managed in a specialty endocrinology clinic to determine the primary outcome of changes in A1c, and secondary outcomes of changes in total medication burden and duration of prescribing of canagliflozin.
METHODS: This trial is a retrospective electronic health record review of patients prescribed canagliflozin by endocrinologists or nurse practitioners at the clinic since June 2013. Patients were included in the sample if they were an adult with type 2 diabetes who received regular diabetes care by a clinic provider, received an initial prescription for canagliflozin by a clinic provider, and returned for at least one follow-up visit after being prescribed canagliflozin. Paired samples will be used to analyze the data, and descriptive statistics will be used to characterize the population and secondary outcomes.
RESULTS: Preliminary data was analyzed for 18 of over 500 patients. Mean age was 58.11 and mean duration of diabetes was 12.89 years. Mean baseline, 1st follow-up, and 2nd follow-up A1c was 8.83%, 8.09%, and 8.37*%, respectively (mean change of A1c 0.72% at first and second follow-up). Total number of diabetes medications at baseline, first and second follow-up were 3.44, 3.33, and 3.36 with a mean change of 0.11 medications. Total number of antihypertensive medications at baseline, first and second follow-up were 2.11, 2.0, and 1.82, with a mean change of 0.11 between baseline and 1st follow-up medications. Mean duration of prescribing canagliflozin was 12.4 months. The most common reason for discontinuation was renal function and post myocardial infarction.
CONCLUSIONS: Canagliflozin resulted in a reduction in A1c of 0.72. A reduction in total medication burden (diabetes/hypertension/lipids) occurred (from 6.94 to 6.67 after 1st follow-up) and patients continued to be prescribed canagliflozin for an extended period of time.

Gastroenterology

478. Assessment of biological agents in the treatment regimen of moderate to severe Crohn's disease *Ngoc-Anh Chau, Pharm.D. Candidate*[1], Deandra Romero, Pharm.D. Candidate[1], Priya Toolsie, B.S., M.S., Pharm.D. Candidate[1], Jiny Jimmy, B.S., Pharm.D. Candidate[1], Barry A. Bleidt, Ph.D., Pharm.D.[2]; (1) College of Pharmacy, Nova Southeastern University, Fort Lauderdale, FL (2) Sociobehavioral and Administrative Pharmacy Department, College of Pharmacy, Nova Southeastern University, Fort Lauderdale, FL
PURPOSE: Crohn's disease (CD) is a chronic idiosyncratic inflammatory disease of the digestive tract with no cure. Current treatment options are aimed to reduce and manage the symptoms and flare ups of the disease for longer periods of remission. The purpose of this study is to review the methodology for selecting biologic agents as a treatment regimen and to analyze their use in the induction and maintenance of the step-up versus step-down approach to therapy.
METHODS: Information was extracted from the Crohn's and Colitis Foundation of America and articles were selected from PubMed with a timeframe from 2005 to 2015. Keywords used were: Crohn's disease and biologics (brand and nonproprietary). Filters included: article availability, moderate to severe disease state and English language. Biologic agents, number of subjects, and study design type were all considered for each clinical trial article and independently reviewed by three students.
RESULTS: Biologic agents which include but are not limited to: Remicade® (infliximab) and Humira® (adalimumab) are used in the treatment of CD. Biologics maintain clinical remission for longer periods and achieved sooner when compared to conventional therapies. Results also show that although the step-down approach is expensive and could result in a more severe adverse event profile, it is still a preferred therapy regimen in moderate to severe CD.

CONCLUSIONS: Despite the significant upfront cost of the use of biological agents in the step-down treatment approach in CD, a majority of specialized practitioners prefer this approach as a first line therapy. Biologics are able to maintain clinical remissions for longer periods and at faster rates, therefore, resulting in fewer flare-ups, hospitalizations, and medical complications. In conclusion, with the evidence presented, biological agents should be considered as first line therapy in the treatment of moderate to severe Crohn's disease.

479. Vancomycin dosing considerations in patients with liver cirrhosis *William Ross, Pharm.D. Candidate 2016, B.S. in Mathematics*[1], Jennifer Brown, Pharm.D. Candidate 2016, B.S. in Chemistry[1], Katherine Guido, Pharm.D. Candidate 2016[1], Branden Nemecek, Doctor of Pharmacy[2], Anthony Guarascio, Doctor of Pharmacy[3]; (1) Mylan School of Pharmacy, Duquesne University (2) Department of Clinical, Social, and Administrative Sciences, Mylan School of Pharmacy at Duquesne University, Pittsburgh, PA (3) Mylan School of Pharmacy at Duquesne University
PURPOSE: Vancomycin is a commonly used antibiotic in the acute care setting, including for patients who have liver cirrhosis. While patients with cirrhosis have less albumin to bind vancomycin and potentially increasing free drug concentrations, little guidance on dosage adjustment is currently available. The purpose of this study is to give a better understanding of dosing strategies for patients with liver cirrhosis.
METHODS: We are conducting a retrospective cohort study evaluating the use of vancomycin in liver cirrhosis patients at an academic medical center. Adult in patients with liver cirrhosis and concomitant vancomycin therapy between 4/1/2011 and 4/1/2015 (307 total patients) are being reviewed. Vancomycin drug concentrations and mean steady-state drug concentration/dose(C/D) ratios are currently being measured and described according to severity of liver disease. Correlations of liver disease severity are being performed for total bilirubin, INR, transaminases and model for end-stage liver disease (MELD) scores while standardizing data for renal function and the presence of nephrotoxic agents.
RESULTS: Interim data analysis shows patients with MELD scores > 10 had a median vancomycin trough of 16.7 mg/dL (range: 4.7–32.1 mg/dL) compared to those with MELD of <10 with a median trough of 16.1 mg/dL (range: 14.7–29.2 mg/dL). The median C/D ratio was noted to be 0.81(mg/dL)/(mg/kg) with a range of 0.3–1.41 in those with a MELD > 10 and is 1.03 (mg/dL)/(mg/kg) with a range of 0.38–2.05 in patients with a MELD < 10. A full data collection and analysis is expected to be completed by the presentation of this poster.
CONCLUSIONS: Higher variability in vancomycin troughs and the C/D ratio is currently observed in patients with a higher MELD score compared to those with a lower MELD score. Further analysis at the conclusion of data collection will help determine if any specific factors (such as albumin) correspond to variability noted in this population and an increased patient pool will add more validity to any correlation identified.

Health Services Research

480. Comprehensive medication management: assessment of current status in southern California findings from the 2015 environmental scan *Ashley Butler, Pharmacy Student*[1], Steven Chen, Pharm.D., FASHP, FCSHP[2]; (1) College of Pharmacy, School of Public Health, Touro University California, CA (2) School of Pharmacy, University of Southern California, Los Angeles, CA
PURPOSE: Describe and report some highlights of an environmental scan on pharmacist-led comprehensive medication therapy management in Southern California with specific emphasis on program characteristics and challenges.
METHODS: Poster presents key informant interview results collected during during May 2015. The development of program challenges occured via a combination of key informant interviews and an accompanying literature review.
RESULTS: A total of six health systems that utilized integrated comprehensive medication management services were identified and interviewed over a one month period. Key characteristics of comprehensive medication management implementation included physician "buy-in," development of a collaborative practice agreement, use of pharmacy residents and students, health information infrastructure, and use of a systematic patient identification method. Funding was variable but came from two main sources: grant funding or physician group/health system funding. Two of the health systems reported integrating clinical pharmacy technicians in comprehensive medication management delivery. Challenges of comprehensive medication management implementation included a lack of the following: reimbursement mechanisms for pharmacists, robust health information exchange, adequate outcomes tracking, patient and provider awareness, and health system infrastructure and capacity.
CONCLUSION: Health systems that are able to successfully integrate pharmacist-led comprehensive medication management in Southern California report several similarities related to practice development, support, and spread.

481. Solutions models for poor medication access in the Dominican Republic *Diana Pei, Pharm.D. Candidate*[1], Kristi Higgins, Pharm.D. Candidate[1], Megha Trivedi, Pharm.D. Candidate[1], Emily Peron, Pharm.D., M.S.[1], Mark Ryan, M.D.[2]; (1) School of Pharmacy, Virginia Commonwealth University, Richmond, VA (2) School of Medicine, Virginia Commonwealth University, Richmond, VA
PURPOSE: Lack of medication access in underserved, rural communities puts the residents of Paraiso, Dominican Republic, at increased risk for uncontrolled chronic diseases and adverse health outcomes. This study aimed to determine potential solutions for improving medication access for this community based on previously established programs serving similar communities.
METHODS: A literature search was conducted using two databases, PubMed and Global Health in CabDirect. Database searches were conducted independently by two investigators with the help of a medical librarian.
RESULTS: Using previously established models, we developed four possible solution models tailored to the community of Paraiso, Dominican Republic. The models are: 1) distributing 6 month supply of medication twice a year, 2) establishing a telepharmacy with an off-site distance pharmacy using SMS messaging to monitor stock, 3) establishing an automated dispensing machine at an off-site distance pharmacy, or 4) establishing a community clinic in the local area managed by the local medical school.
CONCLUSION: We identified three necessary components found in all models: physician involvement and supervision, community support, and funding. The three components varied in individual degree of involvement depending on the model, but all were necessary for the establishment of a successful program to increase medication access in an underserved community. Additional components required specifically for the Paraíso, Dominican Republic site included identifying a method to secure and protect medications from theft and the environment and establishing a program with the potential to become self-sustaining in the future.

482. Development of an integrated and evidence-based treatment algorithm to standardize the collaborative drug therapy evaluation and management (DrugTEAM) service for chronic kidney disease patients *Heejin Na, B.S.*[1], Nayoung Han, Ph.D.[1], Sohyun Jeong, M.S.[1], Hyoyoung Park, M.S.[1], Minji Sohn, M.S.[1], Kiyon Rhew, Pharm.D.[2], Euni Lee, Ph.D.[1], Hyunah Kim, Pharm.D.[3], Jung-Mi Oh, Pharm.D.[1]; (1) College of Pharmacy, Seoul National University, Seoul, South Korea (2) College of Pharmacy, Dongduk Women's University, Seoul, South Korea (3) College of Pharmacy, Sookmyung Women's University, Seoul, South Korea
PURPOSE: The objective of this research was to develop a standard operating procedure (SOP) with evidence-based algorithms

focusing on pharmacotherapy that can be used as the standardized clinical guidelines for the collaborative drug therapy evaluation and management (DrugTEAM) service in chronic kidney disease (CKD) patients.
METHODS: To develop an SOP with evidence-based treatment algorithms, previously developed clinical guidelines for managing CKD and complications such as Kidney Disease Improving Global Outcomes (KDIGO) guideline and Kidney Disease Outcomes Quality Initiative (KDOQI) guideline were evaluated. Each guideline was reviewed by clinical pharmacists whether recommendations could be applied to actual practice in consideration of the circumstances of hospitals and insurance policy in Korea. The valid recommendations were incorporated in the algorithm which cover whole process of the pharmaceutical services for CKD patients from admission to discharge and ambulatory care of hospital.
RESULTS: We developed an SOP algorithm which includes five sub-algorithms. Medication reconciliation (MR), medication evaluation and management (MEM), discharge pharmaceutical transition (dPCT) service algorithms were developed for hospitalized patients, and medication reconciliation and evaluation (MRE), ambulatory pharmaceutical transition (aPCT) service algorithms were for ambulatory patients. Guideline-based knowledge was integrated into MEM and MRE sub-algorithms for better management of CKD progression, CKD-induced hypertension, mineral-bone disease, imbalanced electrolytes, anemia, hyperglycemia, dyslipidemia, hyperuricemia and metabolic acidosis. Each algorithm contained decision boxes and arrows to follow guideline-based knowledge according to the laboratory levels, clinical findings and prescriptions in situ but also the results of the assessing adherences of individual patients.
CONCLUSION: Applying the integrated algorithm from this study into the real-world, patients might receive appropriate and standardized pharmacotherapy and this research could be the cornerstone of strategy for improving the clinical pharmacists' services in Korea.

Hematology/Anticoagulation

483. Pharmacodynamic monitoring of mycophenolic acid in allogeneic nonmyeloablative hematopoietic cell transplantation *Deeter Neumann, B.S.*, Kinjal Sanghavi, M.Pharm, Anthony Wiseman, M.D., Pamala Jacobson, Pharm.D.; The Department of Experimental and Clinical Pharmacology, University of Minnesota College of Pharmacy, Minneapolis, MN
PURPOSE: Mycophenolate mofetil (MMF) is a commonly used immunosuppressant in allogeneic hematopoietic cell transplantation (HCT). Total exposure to MMF, as measured by pharmacokinetic monitoring of mycophenolic acid (MPA), has been associated with clinical outcomes such as acute graft-versus-host disease. However, these associations have not been replicated in all populations. Pharmacodynamic monitoring of MPA, through measuring activity of its pharmacologic target, inosine-5-monophosphate dehydrogenase (IMPDH), may provide a convenient biomarker to evaluate safety and efficacy.
METHODS: Fifty-six adult patients who were to undergo nonmyeloablative allogeneic HCT with a preparative regimen containing fludarabine, cyclophosphamide and total-body irradiation were consented and enrolled. Subjects received post-transplant immunosuppression consisting of cyclosporine and MMF. MMF was dosed at 1.5 grams twice daily (or 15 mg/kg to a maximum of one gram, if <50 kg) with cyclosporine 2.5 mg/kg every 12 hours. Blood samples were obtained to measure IMPDH activity on three occasions: at baseline and between both days +5 to +9 and +11 to +17. Trough MPA plasma samples were also obtained once between days +5 to +9 and again between days +11 to +17 following initiation of MMF. IMPDH activity was measured with liquid chromatography tandem-mass spectrometry and high-performance liquid chromatography for measuring MPA concentrations. Correlation plots were constructed to analyze the association between IMPDH activity and MPA Ctrough. Linear regression was used to evaluate the effect of clinical variables on IMPDH activity. IMPDH activity will be further evaluated for an association with clinical outcomes.
RESULTS: IMPDH activity correlated poorly with MPA Ctrough levels. Baseline patient characteristics did not significantly influence IMPDH activity. Investigation of IMPDH activity and clinical outcomes is pending.
CONCLUSION: Preliminary results indicate trough levels of MPA are not reflective of IMPDH activity. IMPDH activity is not influenced by baseline patient characteristics. Further review of clinical outcomes and IMPDH activity is underway.

Herbal/Complementary Medicine

484. Naturopathic medicine and pharmacy: a unique interprofessional clinic with emphasis on mental health *Sharanjit Kaur, Pharm.D. Candidate 2016*[1], Sarah Hansen, Pharm.D. Candidate 2016[1], Benjamin Chavez, Pharm.D.[1], Irina Gelman, Psy.D.[2]; (1) School of Pharmacy, Pacific University Oregon School of Pharmacy, Hillsboro, OR (2) School of Professional Psychology, Pacific University Oregon School of Professional Psychology, Hillsboro, OR
PURPOSE: To describe an innovative collaboration between Pacific University School of Pharmacy (SOP), School of Professional Psychology (SPP), and the National College of Naturopathic Medicine (NCNM) to deliver interprofessional primary care.
METHODS: In September 2014, Pacific University SPP Clinic began services for patients to receive interprofessional primary care and behavioral health. The clinic occurs half-day per week and encompasses a unique training environment for all disciplines. NCNM would provide naturopathic doctors and students to see patients on a set schedule and prescribe naturopathic medications and pharmaceuticals, while SOP would provide students and a pharmacy faculty member to make medication recommendations. The health record system utilized by the clinic allows for de-identified reports on the patients seen in the first 6 months of operation. ICD-9 codes were used to report diagnoses and reasons for visit.
RESULTS: Naturopathic doctorate students and pharmacy students worked together to assess and treat patients. Faculty for the respective school also collaborated in precepting students. A total of 68 new patients were seen with an average age of 41 years. A total of 32 female patients and 36 male patients were seen during this time period. There were 178 return visits made by these patients. The top three primary diagnoses were: depression/suicidal ideation, anxiety, and ADHD. The top three secondary diagnoses were: anxiety, depression/suicidal ideation, and pain. Patients were also seen for other primary care reasons.
CONCLUSION: These interprofessional services gave patients and students a unique setting to receive care and learn both natural medicine and traditional western medicine. These services will be expanding to two half-days per week, as well as adding a second location. The emphasis on behavioral health emphasizes the need for more training of primary care providers in this area.

HIV/AIDS

486. Evaluation of appropriate statin therapy in HIV-infected patients in the southeast *Katelyn Parrish, Pharm.D.*[1], Celeste Caulder, Pharm.D.[2], Melanie McDonald, Pharm.D. Candidate[3], Elizabeth Rogers, Pharm.D. Candidate[3], E. Kelly Hester, Pharm.D., BCPS, AAHIVP[1]; (1) Auburn University Harrison School of Pharmacy, Auburn, AL (2) South Carolina College of Pharmacy, University of South Carolina, Columbia, SC (3) South Carolina College of Pharmacy, Columbia, SC
PURPOSE: Cardiovascular disease (CVD) accounts for one-third of serious non-AIDS conditions and 10% of deaths. Additionally, patients with HIV infection are at a 1.5–2.0 times higher risk of CVD than the uninfected population. In light of this higher CVD

risk, the purpose of this study is to evaluate the appropriateness of statin intensity therapy in those currently treated and evaluate the proportion of HIV patients untreated but indicated for statin therapy based on the 2013 ACC/AHA guidelines.
METHODS: A retrospective chart review was conducted in two southeastern HIV clinics. Patients ≥ 40 years of age treated at the clinics between January 1, 2014 and August 31, 2014 were selected for review. Patient charts were reviewed for current statin use and intensity, other lipid-lowering therapy, blood pressure, lipid profile, AST/ALT, duration of HIV and treatment, viral load, CD4 count, previous and current antiretroviral treatment and past medical history of diabetes or cardiovascular disease. A 10-year ASCVD risk assessment was calculated related to statin intensity. Data was collated and analyzed using Microsoft Excel.
RESULTS: Of 500 patients reviewed, 62% were male, 71% were African-American, and the average age was 53. The mean duration of HIV diagnosis was 12 years. In this study, 46% of patients were on inappropriate statin intensity and 40% were untreated but indicated for statin therapy according to the ACC/AHA guidelines. Comparatively, 86% would have achieved LDL goals based on ATP III guidelines. In this study, 54% had >7.5% 10-year ASCVD risk and were classified as high risk.
CONCLUSION: A significant percentage of this HIV-infected patient population was indicated for statin therapy or greater statin intensity. Pharmacists are well positioned to assess and optimize statin therapy and further assist with risk reduction efforts including smoking cessation programs, and hypertension and diabetes treatment optimization.

487. Impact of clinical pharmacist intervention on error rates of antiretroviral and opportunistic infection medications in the inpatient setting *Mark Biagi, Pharm.D. Candidate*[1], John Littler, Pharm.D. Candidate[1], Benjamin Hammer, Pharm.D.[2], Thomas Chiampas, Pharm.D.[1], Melissa E. Badowski, Pharm.D.[1]; (1) University of Illinois at Chicago College of Pharmacy, Chicago, IL (2) University of Maryland School of Pharmacy
PURPOSE: To determine the impact of a dedicated Human Immunodeficiency Virus (HIV) clinical pharmacist on antiretroviral (ARV) and opportunistic infection (OI) medication error rates at our institution as it related to the number of errors identified and corrected prior to discharge, compared to the results of a retrospective study performed at our institution from February 2011–May 2012.
METHODS: A prospective quality improvement project was conducted between November 1, 2013 and May 1, 2014 to assess the impact of a dedicated clinical pharmacist on the ARV and OI medication error rates, compared to historical data at our institution. Clinical alerts sent through the electronic medical charting system notified investigators when an HIV patient was admitted or that an ARV was ordered. The investigators were responsible for reviewing every ARV and OI order on each inpatient within 24 hours of admission. They evaluated whether a medication error occurred and recommended interventions to correct the error, and whether the error was corrected.
RESULTS: A total of 144 patient encounters were included in our analysis. Although overall error rates remained unchanged from a previous retrospective study at our institution (38% versus 39%), the average time to error correction decreased from 70 to 26 hours. Additionally, the percentage of errors that were corrected prior to discharge increased from 24% to 68%. The average length of stay, regardless of whether an error had occurred, decreased from 7.56 to 5.02 days. The most common types of ARV and OI errors were omitted orders, incorrect dose, incorrect timing, and drug-drug interactions.
CONCLUSION: ARV and OI medication errors still occurred despite the presence of an HIV-trained clinical pharmacist, yet were corrected faster and with greater frequency prior to discharge. Dedicated HIV clinicians with adequate training and credentialing are necessary to manage this specialized disease state.

488. Provision of HIV services and medications in Illinois county jails *John Littler, Pharm.D. Candidate*[1], Mark Biagi, Pharm.D. Candidate[1], Pyrai Vaughn, M.A.[2], Mahesh Patel, M.D.[2], Jeremy Young, M.D., MPH[2], Melissa E. Badowski, Pharm.D.[1]; (1) University of Illinois at Chicago College of Pharmacy, Chicago, IL (2) College of Medicine , University of Illinois at Chicago
PURPOSE: Due to limited funding and medical staff, little information exists regarding HIV services in county jails. Although HIV care is provided in Illinois' prison system, many of those who pass through a county jail awaiting sentencing may not have access to life-saving medications. In our experience, many patients detained in the county jail setting were unable to access HIV services or continue their antiretroviral therapy (ART). Intermittent medication adherence puts those with HIV at an increased risk of medication resistance and the loss of viral suppression, which can lead to increased risk of transmission. Although one study evaluated the presence of HIV services and testing in the jail setting in the State of Illinois, it did not evaluate whether ART or HIV care was provided to the detainees. This study seeks to determine the number of county jails providing ART and/or HIV care to HIV-positive detainees.
METHODS: A validated, IRB-approved survey was administered via phone, facsimile, and email to all county jails throughout the State of Illinois to evaluate HIV treatment, testing, and services provided for detainees.
RESULTS: Of 30 surveys administered, 5 jails returned completed surveys (response rate16.67%). None of the jails perform HIV testing at intake or report linking HIV patients with care after release. Two of 5 jails do not request HIV status at intake. One site indicated that they provide ART and 2 sites continue therapy if the detainee brings in the medications.
CONCLUSION: Based on the preliminary results, it appears that HIV treatments are provided only to those with documented diagnosis. Although further data are needed to draw significant conclusions, it appears that HIV care and access to ART are inconsistent in county jails throughout the State of Illinois.

Infectious Diseases

489. Comparison of vancomycin dosing methods: troughs of 15 mg/L may not be necessary to achieve a target AUC:MIC of 400 *Erin McCreary, Pharm.D. Candidate*, Kurt Wargo, Pharm.D., BCPS-AQ ID; Auburn University Harrison School of Pharmacy, AL
PURPOSE: The 2009 consensus review of vancomycin therapeutic monitoring suggests a minimum trough concentration of at least 15 mg/L in order to achieve an area under the curve to minimum inhibitory concentration (AUC:MIC) of 400 for a pathogen with an MIC of 1 mg/L. Currently, there is no evidence available to support this recommendation. The purpose of this study was to compare vancomycin dosing methods with corresponding serum trough levels and evaluate therapeutic monitoring strategies.
METHODS: This was a retrospective analysis of patients admitted to a 941-bed regional referral hospital with diagnosis codes relating to acute bacterial skin and skin structure infections (ABSSSI) who were treated with vancomycin therapy. Vancomycin was dosed based upon traditional weight-based dosing methods. The doses patients received were compared to the calculated AUC:MIC dose, in order to assess congruence. Serum trough levels were also compared to the AUC:MIC dose in order to determine a correlation.
RESULTS: A total of 269 patients received vancomycin and 82 (30%) had trough levels drawn with an average level of 10.5 ± 6.5 mg/L. Among these patients, the average daily vancomycin dose was 2625 ± 849 mg, which was statistically similar to the average calculated AUC:MIC dose, 2509 ± 705 mg, $p = 0.343$. Moderate correlation existed between traditional and AUC:MIC doses among all patients ($r = 0.63$), and those with vancomycin trough levels drawn ($r = 0.66$). In patients where traditional dosing was concordant with AUC:MIC dosing, the average trough concentration was 11.4 ± 7.3 mg/L.
CONCLUSION: This study suggests that vancomycin trough levels of at least 15 mg/L may not be required in order to attain

an AUC:MIC of 400. These findings should be verified with larger, prospective studies.

490. Meropenem utilization before and after the implementation of a Best Practice Advisory de-escalation reminder at 72 hours of use *Kristina Stemple, Pharm.D. Candidate*, Lisa Keller, Pharm.D., BCPS; WVU Healthcare

PURPOSE: Our large academic medical center recently implemented a Best Practice Advisory (BPA) alert after 72 hours of meropenem therapy, which utilizes the electronic medical record to remind the provider to consider de-escalation. This alert also provides de-escalation recommendations. The primary objective of this study is to compare the days of meropenem therapy before and after the BPA alert implementation. Secondary objectives are to evaluate the indications for meropenem use and reasons for discontinuation of meropenem therapy before and after BPA implementation.

METHODS: Electronic medical records of patients who received meropenem for at least two doses during one month prior to and one month following BPA implementation will be retrospectively reviewed. Patients who have a diagnosis of cystic fibrosis or who are on Bone Marrow Transplant/Hematologic Malignancy and Medical Oncology services will be excluded. Patients' electronic medical records will be reviewed for age, gender, length of hospital stay, indication and duration of meropenem therapy, microbiologic data, and reason for discontinuation of meropenem.

RESULTS: The total number of patients meeting inclusion criteria in the BPA pre-implementation period was 86. The meropenem utilization rate was 37 days of therapy per 1000 patient days. The top three indications were pneumonia (34%), sepsis (31%), and meningitis (6%). The top three reasons for meropenem discontinuation included de-escalation (42%), antibiotic regimen discontinuation (35%), and patient discharge (28%). BPA post-implementation results and comparative analysis will be presented at the meeting.

CONCLUSION: To be presented at the meeting.

491. Pharmacodynamics of polymyxin B and meropenem combinations against *Klebsiella pneumoniae* carbapenemase (KPC)-producing *K. pneumoniae* *Kezia T. Gravesande, Pharm.D. Candidate*[1], Michael J. Satlin, M.D.[2], Patricia N. Holden, B.S.[1], Brian T. Tsuji, Pharm.D.[1]; (1) Laboratory for Antimicrobial Pharmacodynamics, University at Buffalo School of Pharmacy and Pharmaceutical Sciences, Buffalo, NY (2) Department of Medicine, Weill Cornell Medical College, New York, NY

PURPOSE: The rising emergence of Class A *Klebsiella pneumoniae* carbapenemase (KPC)-producing bacteria poses a serious threat to public health. Currently, the impact of KPC *K. pneumoniae* on antimicrobial pharmacodynamics is not well known. Our objective was to evaluate the bactericidal activity of polymyxin B (PB) and meropenem (MERO) combinations against KPC-2- and KPC-3-producing *K. pneumoniae*.

METHODS: Combinations of PB and MERO were evaluated in nine KPC *K. pneumoniae* isolates (ST258) at a starting inoculum of 10^8 CFU/mL. All but one isolate wassusceptible to PB (MIC_{range} = 0.5 to 1.0 mg/L) and all were resistant to MERO (MIC_{range} = 16–>128 mg/L). Time-kill experiments were conducted over 48 hour at fixed concentrations of PB/MERO (4/100, 8/200, 16/400 mg/L) for select isolates. Serial samples were withdrawn for determination of bacterial counts at 0, 2, 4, 8, 24, 26, 28, 32, and 48 hours. The maximal log ratio change over 48 hour was calculated.

RESULTS: Combinations of PB 4 and MERO 100 mg/L versus KPC *K. pneumoniae* (n = 9) demonstrated rapid bactericidal activity within 4 hour. Maximal bacterial reductions were from −7.22 to −6.00 for all isolates. All combinations regrew after 4–6 hour. At concentrations of 8/200 mg/L, rapid bactericidal killing and suppression of regrowth was observed in two KPC-2 isolates and one KPC-3 isolate. All other isolates demonstrated regrowth after 4–6 h. Concentrations beyond the realm of clinical achievability of 16/400 mg/L evaluated against two selected KPC-2 isolates (KPCKP 9A, 27A) resulted in complete eradication within 4 h. The maximal log ratio change for PB/MERO 4/100, 8/200, and 16/400 mg/L displayed reductions for KPC9A: 6.92, −8.10, −8.15 and for KPC27A: −5.68, −8.32, −8.15 $\log_{10}$ CFU/mL.

CONCLUSION: The combination of polymyxin B and meropenem resulted in rapid bactericidal killing activity, followed by regrowth. These results have significant clinical implications regarding the utility of PB/MERO combinations in KPC-producing infections, and highlight the urgent need to explore alternative dosing/combination regimens.

492. The interplay of antibiotic resistance and virulence attenuation in *Acinetobacter baumannii*: profiling alterations in pathogenicity in response to antibiotic pressure over 14 days *Sarah Spitznogle, Pharm.D. Candidate*[1], Patricia N. Holden, B.S.[2], Brian T. Tsuji, Pharm.D.[2]; (1) University at Buffalo School of Pharmacy and Pharmaceutical Sciences, Buffalo, NY (2) Laboratory for Antimicrobial Pharmacodynamics, University at Buffalo School of Pharmacy and Pharmaceutical Sciences, Buffalo, NY

PURPOSE: In immunocompromised patients with severe bloodstream infections due to Acinetobacter baumannii (AB), there is a paucity of data regarding the interplay between the emergence of antibiotic resistance and virulence capacity. The objective was to analyze the relationship between resistance and virulence of AB when under selective antimicrobial pressure of the last-line-of-defense therapy polymyxin B (PB), using the non-mammalian Galleria mellonella waxworm model.

METHODS: AB isolates were taken from a strain with a demonstrated MIC baseline of 1.0 and resistant to all carbapenems, at pre-polymyxin B therapy (0 h) and during therapy (24, 48, 72, 96, 336 hour). 20 waxworms were injected with 10^5 CFU/mL of each isolate into the right pro-leg. Controls: 20 waxworms were injected with phosphate-buffered-saline; 20 waxworms were not inoculated. Waxworms were incubated at 37°C and mortality was accounted for daily over 6 days. Kaplan Meier survival analysis was conducted to examine statistical differences, with $p < 0.05$ defined as significant.

RESULTS: The greatest mortality of G. mellonella occurred in the 0, 24, and 48 hour isolates, which had mortality rates of 80% (16/20), 95%(19/20), and 100%(20/20) respectively. After 6 days, the 72 hour, 96, and 336 hour inoculates had mortality rates of 70%(14/20), 45%(9/20), and 20%(4/20). In the 24 hour group, 14 waxworms deceased after day 1 while the first waxworm in the 336 hour group died on day 3. The PB MICs revealed sequential increases in drug resistance after prolonged drug exposure. The 0 hour isolate had a susceptible MIC of 1.0 whereas the 336 hour isolate had a resistant MIC greater than 64.

CONCLUSION: The increasing MIC values and diminished mortality rates revealed that PB antibiotic exposure counter selected for resistance in AB over 336 hours, attenuating virulence capacity. Our data may have significant implications for severely ill patients treated with prolonged courses of antibiotics and highlight the significance of the interplay between antibiotic resistance and virulence.

493. An antimicrobial stewardship program's focus on levofloxacin utilization: comparing prospective audits, laboratory suppression of levofloxacin, & formulary restriction *Alison Le, Pharm.D. Student*[1], Liem Hoang, Pharm.D. Student[1], Susan Lee, Pharm.D. Student[1], Jennifer Kang, Pharm.D. Student[1], Crystal Lestari, Pharm.D. Student[1], Lee Nguyen, Pharm.D.[2]; (1) School of Pharmacy, Loma Linda University, Loma Linda, CA (2) St. Jude Medical Center

PURPOSE: This study evaluated three different methods of interventions on reducing levofloxacin utilization by the antimicrobial stewardship program at a community hospital. The stewardship program was formalized in September 2011. The program goal

was to ensure that all patients who required antibiotics would receive the correct drug, dose, and duration. The primary outcome of the study is to determine the effectiveness of the interventions to reduce levofloxacin use, based on days of therapy (DOT) and DOT/1000 patient-days (PD). The secondary outcomes were the cost avoidance associated with reduced levofloxacin utilization.
METHODS: The study was conducted at St. Jude Medical Center from 01/01/2012 to 12/31/2014. Prospective audits (PrA) of levofloxacin occurred during the entire study period. The suppression of levofloxacin susceptibility (SLS) on most gram-negative bacteria occurred during 01/01/2013 to 12/31/2014 of the study period. The formulary restriction (FR) of levofloxacin started 11/01/2013 to 12/31/2014 of the study period. DOT was determined based on doses given on the first and last day of therapy. DOT was obtained from electronic administration records from the Meditech® computer system. PrA was the control group and the addition of the SLS and FR groups in sequence were the intervention groups.
RESULTS: The DOT for January-October data evaluation is shown. The total DOT PrA:9414 versus SLS:7800 versus FR:1390, $p < 0.0001$. Mean (±SD) DOT was also significantly lower in each intervention group, PrA: 2.72 ± 2.8 versus 2.3 ± 21, $p < 0.0001$ & PrA: 2.72 ± 2.8 versus 1.8 ± 1.7, $p < 0.0001$. DOT/1000-PD was 804 (PrA), 747 (SLS), and 140 (FR). In terms of in DOT/1000-PD, SLS had a 7% reduction versus PrA, but FR had an 83% reduction versus PrA. Estimated costs avoidance was $38,000 for FR versus PrA.
CONCLUSION: Each intervention produced a reduction of levofloxacin utilization. Formulary restriction in concert with laboratory suppression of levofloxacin susceptibility produced the greatest reduction of levofloxacin use.

494. Evaluation of tigecycline and its role in mortality *Jane J. Kim, Pharm.D. Candidate*[1], Jeffrey Barletta, Pharm.D.[1], Scott Hall, Pharm.D.[2], Chad VanDenBerg, Pharm.D.[1], Vanthida Huang, Pharm.D.[1]; (1) Department of Pharmacy Practice, Midwestern University College of Pharmacy-Glendale, Glendale, AZ (2) HonorHealth John C. Lincoln Medical Center, Phoenix, AZ
PURPOSE: Tigecycline is a glycylcycline antibiotic indicated for the treatment of complicated intra-abdominal infections (IAI), community-acquired bacterial pneumonia (CABP), and complicated skin and skin structure infections (cSSSI). Tigecycline has excellent activity against both gram-positive and gram-negative organisms. In 2013, the FDA issued a black box warning due to increased risk of mortality associated with tigecycline based on a meta-analysis of 10 studies. The greatest increase was observed in patients with hospital-acquired pneumonia (HAP) and ventilator-associated pneumonia (VAP). Therefore, we sought to evaluate the risk of mortality associated with tigecycline in the treatment of both Gram-positive and Gram-negative infections.
METHODS: This is an observational case evaluation of patients who received tigecycline between December 2012 and May 2015. The inclusion criteria include patients at least 18 years of age without any documented allergy to tigecycline. Clinical and microbiological cure, adverse events, utility rationale, and 30-day all-cause mortality will be evaluated. In addition, combination therapy will be evaluated for its role in mortality.
RESULTS: An interim analysis has been completed on 21 out of a planned 100 patients. Our preliminary data show that clinical cure was achieved in 19 patients (90.4%) where microbiological cure was confirmed in 4 patients. The most common infections treated with tigecycline were pneumonia 12 (52%), followed by bacteremia 4 (17%), and urinary tract infection 3 (13%). The most common offending pathogen was *Klebsiella pneumoniae*. One death was noted out of 21 patients from complications during hospitalization while receiving tigecycline.
CONCLUSION: Tigecycline's role in therapy is mainly for the treatment of Gram-negative infections. Data collection will be completed in August 2015; however, our preliminary data demonstrate its role in secondary treatment of severe, complicated infections.

495. Invasive fungal disease in acute leukemia: single center retrospective study James England, M.D.[1], *Sahar Torabi, B.S., Pharm.D. Candidate*[2], Gowri Satyanarayana, M.D.[3]; (1) Department of Medicine, Vanderbilt University Medical Center, Nashville, TN (2) Lipscomb University College of Pharmacy, Nashville, TN (3) Division of Infectious Diseases, Vanderbilt University Medical Center, Nashville, TN
PURPOSE: Invasive fungal disease (IFD) is a leading cause of morbidity and mortality in patients undergoing treatment for acute leukemia. Prior studies report the incidence of IFD to be 12.3% in patients with acute myeloid leukemia (AML) and 6.5% in patients with acute lymphoblastic leukemia (ALL). Due to prolonged periods of neutropenia associated with chemotherapy, guidelines from the National Comprehensive Cancer Network and Infectious Diseases Society of America recommend routine prophylactic antifungal therapy in patients undergoing treatment for acute leukemia who become neutropenic. The purpose of this study was to determine the incidence of IFD in patients with AML and ALL receiving chemotherapy at Vanderbilt University Medical Center (VUMC).
METHODS: This was a retrospective study examining adult patients who were admitted to VUMC between July 1, 2012 and June 30, 2014 for chemotherapy for AML or ALL. Patients who received all chemotherapy prior to July 1, 2012 or at another facility were excluded from the study.
RESULTS: A total of 228 patients have been included in the study and 90 patients have been analyzed. Of evaluated patients, 82% received antifungal prophylaxis, 90% with fluconazole. There was a 10% incidence of IFD with 50% proven and 50% probable IFD. Ninety percent of observed IFD occurred in patients with AML. Half of the IFD cases were caused by Aspergillus with a mean duration of neutropenia of 32 days prior to diagnosis.
CONCLUSIONS: The rates of IFD at VUMC are consistent with previous reports and are similar to rates at other institutions which use fluconazole for prophylaxis or do not use anti-fungal prophylaxis. Patients with AML appear to be at higher risk for developing IFD, with Aspergillus as the most common causative organism. Further study may identify patients at higher risk who may benefit from prophylaxis with an antifungal agent active against Aspergillus.

496. Comparative pharmacodynamics of imipenem, doripenem, meropenem, and ertapenem in combination with polymyxin B against carbapenem-resistant *Acinetobacter baumannii* *Jonathan Gall, Pharm.D. Candidate*[1], Justin Lenhard, Pharm.D. Candidate[1], Patricia N. Holden, B.S.[2], Brian T. Tsuji, Pharm.D.[2]; (1) University at Buffalo School of Pharmacy and Pharmaceutical Sciences, Buffalo, NY (2) Laboratory for Antimicrobial Pharmacodynamics, University at Buffalo School of Pharmacy and Pharmaceutical Sciences, Buffalo, NY
PURPOSE: Carbapenem-resistant *Acinetobacter baumannii* (CRAB) is responsible for nosocomial infections with mortality rates as high as 68%. Using carbapenems in combination with polymyxin B (PB) is one strategy employed against CRAB, but it is unknown which carbapenem is the optimal choice. Therefore, our objective was to characterize the pharmacodynamics (PD) of carbapenems when used in in combination with PB against CRAB.
METHODS: In 48 hour time kill experiments, varying concentrations of carbapenems were evaluated with PB against a PB susceptible strain of CRAB, which had a PB MIC of 0.5 mg/L. Using an initial inoculum of 10^8, carbapenem concentration arrays were evaluated with a constant PB concentration of 1.5 mg/L. Each array consisted of the unbound C_{max} resulting from the highest clinical dose according to the respective patient package insert. The other concentrations utilized were 1/4, 1/2, 3/2, and 2 × the unbound C_{max}. The log ratio nadir (LRN, $\log_{10}[CFU_{nadir}/CFU_{0\ h}]$) was calculated for each dose and was fit to a Hill-type mathematical model.
RESULTS: Imipenem, doripenem, and meropenem had superior killing in combination with PB compared to ertapenem. For imipenem, doripenem, meropenem, and ertapenem, the LRN at

one-quarter the C_{max} was −0.438, −0.619, −0.929, and −0.0738 respectively. At one-half the C_{max}, the LRN was −1.34, −2.16, −2.03, and −0.0193 respectively. At the C_{max}, the LRN was −3.10, −2.73, −2.33, and −0.699 respectively. At three-halves the C_{max}, the LRN was −2.91, −2.75, −2.31, and −0.865 respectively. At double the C_{max}, the LRN was −3.28, −3.17, −2.21, and −0.978 respectively. LRN was excellently fit to Hill-type models (E_{max} of 2.92, 2.79, 2.28, and 0.904 for imipenem, doripenem, meropenem, and ertapenem respectively, $R^2 > 0.98$).

CONCLUSION: When evaluated with PB, ertapenem was unable to achieve the same magnitude of killing compared to other carbapenems. These results have implications for carbapenem selection in PB susceptible strains of CRAB.

497. Therapy use and guideline-concordance among a national cohort of Clostridium difficile infection patients with and without cancer *Courtney Ritchey, Pharm.D. Candidate 2016*[1], Tanner Moser, Pharm.D. Candidate 2016[1], Kelly Reveles, Pharm.D., Ph.D.[2]; (1) College of Pharmacy, The University of Texas at Austin, TX (2) College of Pharmacy, The University of Texas at Austin, San Antonio, TX

PURPOSE: Prior studies have identified cancer as a risk factor for Clostridium difficile infection (CDI) and poor clinical outcomes in CDI. Disparities in CDI therapies might impact CDI clinical outcomes, but few studies have evaluated this association. This study describes CDI therapy use and the impact of guideline-concordant therapy among a national cohort of CDI patients with and without cancer.

METHODS: This was a national, retrospective cohort study of all CDI patients (ICD-9-CM code 008.45) receiving care at any Veterans Health Administration (VHA) facility from October 1, 2010 through June 30, 2012. Data were obtained from the VA informatics and computing infrastructure. Cancer was identified using ICD-9-CM codes. Guideline-concordance was defined as receipt of appropriate antibiotics: mild to moderate CDI (metronidazole), severe CDI (vancomycin), or complicated CDI (metronidazole plus vancomycin). CDI therapies were compared between cancer and non-cancer patients using appropriate bivariable tests. The impact of guideline-concordant therapy on CDI outcomes among cancer patients was assessed using multivariable logistic regression.

RESULTS: Overall, 18,535 patients met inclusion criteria, of which 5,044 (27%) had cancer. CDI patients with and without cancer received the following therapies: metronidazole only (49% versus 48%, p = 0.1676), vancomycin only (15% versus 15%, p = 0.3170), and metronidazole plus vancomycin (22% versus 18%, p < 0.0001). Guideline-concordant CDI therapy use did not differ between patients with and without cancer (34% versus 34%, p = 0.8438). In multivariable models, guideline-concordant therapy use among cancer patients significantly reduced the risk for 30-day mortality (OR 0.84; 95% CI 0.72–0.98), but was not significantly associated with 30-day CDI recurrence (OR 0.98; 95% CI 0.83–1.15).

CONCLUSIONS: CDI patients with and without cancer receive similar CDI therapies, except for dual metronidazole plus vancomycin therapy. Among cancer patients, guideline-concordant therapy was uncommon and was associated with decreased risk for mortality, but not CDI recurrence.

498. Evaluation of appropriateness of vaccination procedures of the 13-valent pneumococcal conjugate vaccine and the 23-valent pneumococcal polysaccharide vaccine in a hospital setting *Paige Coleman, B.S. Chemistry, B.A. Biology, and Pharm.D. Candidate*[1], Matthew Sears, B.S. Molecular Biology and Pharm.D. Candidate[2], Sabina Vaichys, Pharm.D. Candidate[2], Branden Nemecek, Doctor of Pharmacy[3], Anthony Guarascio, Doctor of Pharmacy[2]; (1) School of Pharmacy, Mylan School of Pharmacy at Duquesne University, PA (2) Mylan School of Pharmacy at Duquesne University (3) Department of Clinical, Social, and Administrative Sciences, Mylan School of Pharmacy at Duquesne University, Pittsburgh, PA

PURPOSE: Immunocompromised patients have an increased risk of pneumococcal disease. The CDC Advisory Committee on Immunization Practices (ACIP) recommends use of the 13-valent pneumococcal conjugate vaccine (PCV13) for immunocompromised adult patients at the next vaccination opportunity followed by the 23-valent pneumococcal polysaccharide vaccine (PPSV23) 8 weeks later. Vaccination in the inpatient setting often requires assessment of comorbidities and vaccination history, which may be absent or incomplete. The purpose of this study is to evaluate current utilization of the PCV13 and PPSV23 vaccines and identify opportunities for optimization of patient care.

METHODS: This is a retrospective cohort study evaluating pneumococcal vaccine use within an academic medical center. Included patients are adults 18 years of age or older, admitted from April 1, 2012 to April 1, 2015 who received a pneumococcal vaccine (either PCV13 or PPSV23). Patients were evaluated to determine if vaccination practices were performed in accordance with current ACIP guidelines.

RESULTS: Inclusion criteria identified 4,349 patients who received a pneumococcal vaccine. Of these patients, 134 received PCV13 and 4,215 received PPSV23. Initial results demonstrate that 10.8% of patients received the PPSV23 without a documented indication for the vaccine according to ACIP recommendations. No patients currently assessed have received the PPSV23 within 8 weeks of receiving the PCV13. The most common indications for vaccination to date included age 65 or older (49%), current smoker (41%), and diabetes (18%), while 42 (57%) patients had multiple indications for vaccination. Completion of the full data collection and analysis are anticipated prior to the poster presentation.

CONCLUSIONS: Appropriate pneumococcal vaccination was provided according to vaccine indication approximately 90% of the time, while new recommendations for PCV13 administration at next vaccination opportunity were followed in less than 5% of vaccinations. These findings indicate need for vaccination process development as well as improved vaccination documentation practices.

499. Hospital value-based purchasing impact on the infectious disease pharmacist specialist *Kamarena Sankar, B.S.*[1], Sandra Benavides, Pharm.D.[2]; (1) Department of Pharmacy Practice, Nova Southeastern University College of Pharmacy, Davie, FL (2) Nova Southeastern University, College of Pharmacy, Davie, FL

PURPOSE: The passage and implementation of the Affordable Care Act has impacted the reimbursements for acute care settings by the Centers for Medicare & Medicaid Services (CMS). Since 2012, Hospital Value-Based Purchasing reimburses quality of health care in the inpatient setting, rather than the amount of health care provided. In the current healthcare landscape, it is critical that pharmacists are familiar with the specific measures and thresholds in order to be able to continue to provide clinical services for improved patient outcomes. Specific infectious disease (ID) measures have been established. These measures are updated and revised frequently. The objective of this project is to identify ID specific measures and review the impact pharmacists can have on specific patient outcomes.

METHODS: The Hospital Value-Based Purchasing program was reviewed from implementation to now [Fiscal Year (FY) 2013 to 2016] to characterize ID specific outcome measures. Once identified, literature reviews for each measure were conducted to determine potential pharmacist-specific impact on outcomes.

RESULTS: In FY 2013, five clinical process of care outcomes specific to ID were identified. These remained consistent until FY 2016, in which two measure were removed and one was added. In FY2014, the outcome measures included one specific to ID, 30-day mortality pneumonia, which has remained in FY 2015 and

2016. The central-line associated blood stream infection outcome was added for FY2015 and standardized infection ratios for two types of surgery were added for FY2016.
CONCLUSION: ID pharmacy specialists, clinical pharmacists, and administrations among others, should remain updated on specific CMS Hospital Value-Based Purchasing measures in order to accurately implement clinical services and documentation mechanisms.

500. Effect of statin therapy in *Staphylococcus aureus* bacteremia *Joanna Wu, Pharm.D. Candidate*[1], Emi Minejima, Pharm.D.[1], Chong Fang, Pharm.D. Candidate[1], Daniel Salas, Pharm.D.[2], Joshua Wang, Pharm.D.[1], Kristy Trinh, B.A.[1], Rosemary She, M.D.[3], Annie Wong-Beringer, Pharm.D.[1]; (1) School of Pharmacy, University of Southern California, Los Angeles, CA (2) Huntington Hospital, Pasadena, CA (3) School of Medicine, University of Southern California, Los Angeles, CA
PURPOSE: Development of persistent Staphylococcus aureus bacteremia (SAB) poses a significant therapeutic challenge. Prior studies have shown mortality benefit of adjunctive statin therapy in SAB, however, the biological mechanism remains unknown. Our objective was to evaluate the effect of statin intensity on the cytokine profile and outcomes in SAB patients.
METHODS: This was a prospective observational cohort study of hospitalized SAB patients who received ≥48 hour of anti-SA therapy during 7/12–4/15. Blood specimens were obtained at onset of SAB and 72 hour after start of effective therapy. Plasma cytokine (CYK) levels (pg/ml) of TNF, IL-6, IL-8, and IL-10 were measured by multiplex Luminex assays. Patients were grouped by: low (LOW), moderate (MOD), high (HI) intensity statin received or non-statin user (NSU) to compare CYK levels and day 4 (D4) outcomes, length of stay (LOS) and 30-d mortality.
RESULTS: Four hundred and forty-three patients were included (14 LOW, 45 MOD, 38 HI, 346 NSU). Statin patients were older than NSU (65 versus 56yo, $p < 0.0001$) and had significantly more cardiovascular comorbidities (median 3 versus 1, $p < 0.0001$). Most had intermediate SAB source risk such as soft-tissue and osteoarticular infections. (LOW 43%, MOD 44%, 51% HI, 56% NSU). Median CYK levels were initially elevated at onset of SAB which decreased after 72 hour of therapy in all groups. Initial TNF level (pg/mL) differed between NSU (20) and SU and by statin intensity (LOW 27, MOD 31, HI 39; $p = 0.0722$). LOW and MOD users had shorter LOS (10d), higher day 4 success (LOW 93%, MOD 82%), and lower 30-d mortality (LOW 0%, MOD 5%) compared to HI (LOS 15d, D4 62%, mortality 19%) and NSU (LOS 12d, D4 67%, mortality 11%).
CONCLUSION: Host CYK response to SAB was affected by intensity of statin therapy, where greatest clinical benefit was seen in the LOW and MOD groups.

501. An evaluation of therapeutic drug monitoring in patients taking voriconazole or posaconazole *Whitley Yi, B.S., Pharm.D. Candidate*[1], Kelly Schoeppler, Pharm.D.[2], Scott Mueller, Pharm.D.[3], Robert MacLaren, Pharm.D.[3], Douglas Fish, Pharm.D.[3], Tyree Kiser, Pharm.D.[3]; (1) University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO (2) Department of Pharmacy, University of Colorado Hospital, Aurora, CO (3) Department of Clinical Pharmacy, University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO
PURPOSE: Voriconazole (VOR) and Posaconazole (POS) are associated with significant pharmacokinetic inter-subject variability, which could adversely affect patient outcomes and safety. The aim of the study is to evaluate the use of therapeutic drug monitoring by determining the percentage of patients with therapeutic drug levels and by analyzing characteristics that may differ between patients with and without therapeutic drug concentrations. We hypothesize that inter-subject variability will result in a large proportion of VOR and POS plasma concentrations that are not therapeutic.
METHODS: A retrospective analysis of all VOR and POS serum levels drawn in adult patients at our center. The goal levels for VOR and POS were >1 and <5.5 mcg/mL and >0.7 mcg/mL, respectively. The primary outcome was the percentage of patients at goal. The secondary outcome compared patient characteristics between those with (therapeutic) and without (non-therapeutic) a therapeutic drug concentration.
RESULTS: Overall, 191 levels (164 VOR and 27 POS) were evaluated in 87 patients (47 years old, 52% male, 59% Caucasian). Of those, 55% of VOR and 33% of POS achieved goal plasma levels. The mean total daily dose (TDD) for therapeutic VOR versus non-therapeutic VOR concentrations was 619 mg (8.4 mg/kg/day) versus 678 mg (9.1 mg/kg/day), respectively ($p = 0.14$). The mean TDD for therapeutic versus non-therapeutic POS concentrations was 733 mg (10.8 mg/kg/day) versus 944 mg (11.7 mg/kg/day), respectively ($p = 0.15$). No differences in patient demographics between groups were observed.

	Therapeutic ($n = 99$) (%)	Non-therapeutic ($n = 92$) (%)	p-Value
Critically ill	37 (37)	36 (38)	0.88
Cystic Fibrosis	9 (9)	8 (9)	0.99
Immunocompromised	64 (65)	64 (70)	0.54

CONCLUSION: A significant proportion of VOR and POS levels were not therapeutic, indicating the benefit of therapeutic drug monitoring. Its importance was additionally reinforced by the inability to identify patient factors that might predict a greater risk of not achieving therapeutic VOR or POS levels.

502. *Brevundimonas vesicularis* pneumonia post equestrian injuries: a culture confirmed case report *Jane J. Kim, Pharm.D. Candidate*[1], Jeffrey Barletta, Pharm.D.[1], Leslie B. Robinson, M.D.[2], Alicia Mangram, M.D.[2], Joseph F. Sucher, M.D.[2], Scott Hall, Pharm.D.[2], Vanthida Huang, Pharm.D.[1]; (1) Department of Pharmacy Practice, Midwestern University College of Pharmacy-Glendale, Glendale, AZ (2) HonorHealth John C. Lincoln Medical Center, Phoenix, AZ
PURPOSE: *Brevundimonas vesicularis* is an aerobic, non-fermenting, Gram-negative bacillus which is ubiquitous in the environment but rarely isolated from clinical samples or the primary cause of invasive infection. *Brevundimonas* species was formerly classified as *Pseudomonas* prior to 1994 and cases of bacteremia and infective endocarditis have been reported worldwide. Variation of in vitro susceptibilities limits the antimicrobial therapeutic options. Thus, we describe a case of multidrug-resistant (MDR) *B. vesicularis* nosocomial pneumonia post equestrian crush injury.
METHODS: A retrospective electronic medical record review was conducted.
RESULTS: A 52-year-old Caucasian male presented to the emergency department with hemorrhagic shock after being struck by a horse. Patient had an extended hospital stay with multiple surgeries to repair the abdominal and pelvis injuries and complications. The patient's infection-related hospital course consisted of *Serratia marcescens* pneumonia followed by *Escherichia coli* bacteremia and pneumonia both of which were successfully treated. Shortly thereafter, the patient developed symptomatic pneumonia with positive cultures (via bronchoalveolar lavage) for MDR *B. vesicularis* 5 days later. Susceptibility testing revealed the isolate was only susceptible to sulfamethoxazole-trimethoprim (SMZ-TMP). Treatment was initiated on SMZ-TMP10 mg/kg intravenous every 12 hours for 10 days after which the pneumonia was resolved. The patient was eventually transferred to a rehabilitation clinic to complete the recovery.

CONCLUSION: *Brevundimonas vesicularis* pneumonia is rare; however, clinicians should include this pathogen as differential diagnosis due to its slow growing nature. Antimicrobial treatment options are limited both in vitro and in vivo; therefore, future investigation is warranted.

503. Case-control evaluation of risk factors associated with hepatitis C testing in a correctional facility *Kaitlyn Craddock, Pharm. D. Candidate Class of 2016*, Nicolette Duong, Pharm. D. Candidate Class of 2017; St. Louis College of Pharmacy, St. Louis College of Pharmacy, St. Louis, MO
PURPOSE: The estimated prevalence of hepatitis C virus (HCV) infection in the US incarcerated population is 15–40%, which is several times higher than the general population at 1.3–1.9%. Only one study related to HCV has been conducted in a jail population, while most studies have focused on prison populations. Because of the dynamic nature of jails, data pertaining to the general or prison population are not likely to be accurate for the jail population. This study aims to assess the historical practices for identifying HCV infection in the St. Louis County Jail and the risk factors associated with positive HCV results.
METHODS: Patients from Phase 2 were matched 1:1 with control patients who were seen from 09/01/2007 through 08/31/2012 at the St. Louis County Jail with at least one clinic visit and no ordered hepatitis C antibody. The matching was done based on gender, self-identified race/ethnicity and age, within 5 years. A chart review was conducted on all of the control patients and the information from Phase 2 was collected and recorded. A Pearson's correlation coefficient was calculated to assess association of each risk factor to the binary outcome of hepatitis C tested or not tested. Binary logistic regression was used to identify risk factors that are independently associated with being tested for HCV. All patient names were replaced with ID numbers with no link to the names and all provider names were re-coded after data collection was completed.
RESULTS: During Phase 2 and Phase 3, 490 patients were assessed (Phase 2 – $n = 247$, Phase 3 – $n = 243$). In Phase 2, 30 patients reported that they were HCV positive. In Phase 3, 9 patients reported that they were HCV positive.
CONCLUSIONS: N/A.

Managed Care

504. Strategies for medication management services (MMS) within value-based health plans *Brody McConnell, B.S.*[1], Marie Smith, Pharm.D.[2]; (1) School of Pharmacy, University of Connecticut, Storrs, CT (2) Department of Pharmacy Practice, University of Connecticut, Storrs, CT
PURPOSE: Understand the health plan evaluation process to determine benefit coverage for pharmacist-provided MMS and propose strategies for pharmacist-provided MMS in value-based health plans.
METHODS: Convenience sample of CT health plans; key informant interviews were conducted with commercial health plan leaders to cover topics of benefit design factors/review process, MMS coverage and value, and MMS barriers. MMS was defined as a full array of pharmacist services: medication reconciliation, medication optimization, medication coordination across multiple provider and pharmacies, and medication monitoring/follow-up.
RESULTS: Seven payer executives from three commercial health plans participated – 3 senior medical directors, 1 CEOs, 1 VP clinical services, 1 client account executive, 1 chief pharmacy officer. Each interview was 60–75 minutes in length. Findings included:

- In value-based reimbursement programs, payers recognize pharmacists' contributions to improved medication use and safety.
- Payers recognize differences in Part D MTM and MMS definitions, and variation in MMS delivery models.
- MMS payments may need to initiate with FFS to establish use/payment trends, then incorporate in provider group alternative payments
- Payers are hesitant to "double-pay" for care management services (including MMS) provided to physician practices.
- Pharmacists should consider ACOs/large practice groups as a way to integrate pharmacist-led MMS payments.

CONCLUSION: Strategies for sustainable MMS include:

- Position MMS with payers as a medical benefit (rather than a pharmacy benefit)
- Include MMS in payer's medical loss ratio calculation Match MMS to high risk populations based on clinical guidelines, medication safety, utilization patterns, and care gaps
- Articulate MMS to payers with examples of components, business models, outreach methods, quality assurance plans
- Create MMS metrics system to evaluate the delivery, quality, and impact of the service
- Discuss integrative models for MMS funded through the care management payments to provider groups
- Develop MMS outreach education of health care professionals and the public

505. Evaluation of the oral anticoagulant prior authorization policy in the Oregon Medicaid Program *Megan Herink, Pharm.D.*[1], Kathleen Ketchum, M.P.A. H.A.[2], Amanda Tobias, 2016 Pharm.D. Candidate[1], Megan Carroll, 2016 Pharm.D. Candidate[1]; (1) College of Pharmacy, Oregon State University/Oregon Health & Science University, Portland, OR (2) College of Pharmacy, Oregon State University/Oregon Health & Science University, Corvallis, OR
PURPOSE: This study evaluated direct-acting oral anticoagulant (DOAC) utilization after implementation of the Oregon Medicaid prior authorization (PA) policy, which preferred warfarin and enoxaparin. The primary objectives were to determine if agents were prescribed for approved indications and if the policy led to the switching of agents or disruption of therapy.
METHODS: This descriptive study included patients with a claim for anticoagulants between 2012 and 2014. Patients were categorized by whether the first claim (index event) was paid or denied and by the generic drug name to describe drug switching and therapy disruption. Patient profiles were manually reviewed for indications, contraindications, precautions, and adverse events.
RESULTS: A total of 1,007 patients were included. The majority of patients (90.5%) had paid index events, with only 20 patients having a DOAC index event (all associated with appropriate indications). There were only 96 (9.5%) patients with denied index events, 86 of which were for DOACs. Only 54 of these patients had an approved PA request, while the remaining 41 had no record of a request and subsequently did not receive anticoagulation within 14 days of the denied index event. A cumulative of 6 adverse clotting events occurred post-index date in these patients. No patients were switched from DOACs to a preferred agent, but 14 contraindications or precautions to DOACs were identified among the patients with paid DOAC claims.
CONCLUSION: The PA policy was successful at limiting DOAC use to approved indications and switching from one DOAC to another agent was not observed. However, the low rate of PA requests submitted by providers after encountering a PA and the many patients who did not subsequently receive anticoagulation therapy within an appropriate time period suggest an increased risk of thrombotic events. This risk is high enough to consider discontinuing the current PA.

Medication Safety

506. Prevalence and effects of potentially inappropriate medication ordering for drugs with sedative effects in acute geriatric inpatient care using electronic health records *Collin Z. Yu, Bachelor of Science*[1], Calvin D. Newman, Doctor of Medicine[2], Linda L. Brisbane, Bachelor of Science[2], Matthew D. Zak, Doctor of Pharmacy[2], Lisa A. Nelson, Doctor of Pharmacy[2]; (1) School of Pharmacy, University of California at San Francisco, San Francisco, CA (2) Department of Pharmacy, University of Rochester Medical Center, Rochester, NY

PURPOSE: To determine the baseline prevalence and variables influencing Potentially Inappropriate Medication (PIM) ordering by utilizing pharmacoinformatics for data mining and implementation of subsequent clinical advisory interventions to improve patient outcome.

METHODS: Preventable Adverse Drug Events (ADE) of bone fractures from falls, delirium and gastrointestinal complications, caused by sedative PIMs with anticholinergic properties or in the benzodiazepine class, in elderly patients, 65 years old and greater, during acute inpatient care, can be reduced through adherence to the Beers criteria. System analytics and structured queries of Electronic Medical Records (EMR), from 01/01/2013–06/30/2013, retrieved criteria PIMs information from the formulary and prescription orders. Frequency analysis assessed PIM ordering rates. Further evaluations by practicing clinicians excluded PIMs that were therapeutic to specific indications, isolated sedative PIMs that were consistently ordered over safer alternatives and characterized the major factors that contributed to ordering PIMs.

RESULTS: Retrospective inspection of EMRs found 7,237 sedative PIM orders for the identified 9 high risk anticholinergic or benzodiazepine PIMs. Diphenhydramine had 2,361 orders (32.6% of PIM orders), of which 46.0% were administered. The mean age was 73.7 years. The mean therapy duration was 3.4 days, and the mean hospital stay was 13.5 days. 72.0% of the orders were entry orders, and 26.4% came from order sets of which 14.6% of the orders were from admission. Representative clinicians indicated that persistently outdated practices, insufficient current medical education and lack of vigilance for prescriber errors and multiple therapies led to PIM ordering, and that clinical decision support can aid prescribing behavior.

CONCLUSION: PIMs increase ADE risks and hospitalizations for elderly patients. Using pharmacy informatics, baseline PIM prevalence was reported. Implications of these findings are the development of evidence-based targeted alerts and meaningful restrictions of medications to provide relevant clinical guidance and education in changing prescriber behavior and improving patient outcome.

Nephrology

508. Prospective review of interventions resulting from student pharmacist medication reviews in hemodialysis patients *Nicholas Patricia, Pharm.D. Candidate*[1], Edward Foote, Pharm.D.[2]; (1) School of Pharmacy, Wilkes University, Wilkes-Barre, PA (2) School of Pharmacy, Department of Pharmacy Practice, Wilkes University, Wilkes-Barre, PA

PURPOSE: To determine the types of medication discrepancies and medication related problems (MRPs) in dialysis patients as identified by student pharmacists. In addition, to determine if the resulting recommendations were accepted by the provider.

METHODS: P2 and P3 students participated in medication reviews as part of their Introductory Pharmacy Practice Experience (IPPE) in 2 separate dialysis units (Wilkes-Barre and Nanticoke, PA). Patients were asked to bring medications to the unit for review. Discrepancy and MRP recommendations were communicated to the unit staff via written progress notes. A follow-up was performed 4–6 weeks later by the faculty member and student researcher to determine if the recommendations were accepted. This project was approved by our IRB.

RESULTS: Medication reviews were conducted between April of 2014 and April of 2015 in the two units. In total, there were 93 patient encounters in 82 patients (11 patients were seen twice, approximately 12 months apart). Overall, 290 discrepancies (3.1 per patient) and 53 MRPs (0.6 per patient) were identified. The most common type of discrepancy and MRP was omission and indication without drug, respectively. Of the total 343 interventions, 75% were ultimately accepted by the provider. Discrepancies were more likely to be accepted as compared to MRPs (83%, 28% respectively, $p < 0.05$). There were significantly more discrepancies per patient in the Wilkes-Barre unit as compared to Nanticoke (4.2 versus 2.3 respectively, $p < 0.05$). In addition, the Nanticoke unit was more likely to accept recommendations as compared to the Wilkes-Barre unit (86% versus 66% respectively, $p < 0.05$).

CONCLUSION: We found that discrepancies and MRPs are common in dialysis patients. Recommendations related to discrepancies were more likely to be accepted by the provider as compared to MRPs. Medication reviews by student pharmacists can have an important impact on the care of hemodialysis patients.

Neurology

509. The impact of previous use of anti platelet agents on hemorrhagic transformation in acute ischemic stroke post-thrombolytic therapy Mahboubeh Mashayekhi, Pharm.D. Candidate[1], Susan Huynh, Pharm.D. Candidate[1], Alana Whittaker, Pharm.D., BCPS[1], Mark Decerbo, Pharm.D.[2], *Joseph McCoy, Pharm.D.*[1]; (1) College of Pharmacy, Roseman University of Health Science, Henderson, NV (2) Roseman University of Health Sciences, Henderson, NV

PURPOSE: Hemorrhagic transformation (HT) is a serious complication of post-thrombolytic therapy in acute ischemic stroke (AIS). Anti-platelet therapy (APT) has shown to increase the risk of bleeding; however, currently there is no recommendation to withhold r-TPA in in this population. The purpose of this study is to evaluate the rates and severity of HT in patients with AIS who received r-TPA with recent APT.

METHODS: A retrospective cohort study was conducted in which data was culled between 7/1/2102–12/31/2014 at a hospital in Las Vegas, NV. The study population included patients with AIS that received r-TPA and was divided into four groups: patients with HT previously taking APT, patients with HT not previously taking APT, patients without HT previously taking APT, and patients without HT not previously taking APT. Patients were assessed for the following clinical endpoints: rates of HT, hospital LOS, and in-hospital mortality. The Kruskal-Wallis test, descriptive statistics and a logistic regression model were performed to test baseline characteristics and results of the study

RESULTS: Eighty-one patients were included into the study with no statistically significant difference in baseline characteristics among the study arms. 20 (24.7%) patients underwent HT and 13 (65%) HT patients were previously taking APT. 61 (75.3%) patients did not undergo HT despite 26 (42.6%) patients in this group having received APT. 10 patients overall died in-hospital: 3 patients in the HT without APT group, 3 in the HT with APT group, 3 in the no HT without APT group, and 1 in the no HT with APT group. Hospital LOS did not differ among groups ($p = 0.476$). A regression analysis using prespecified variables did not significantly predict HT or in-hospital mortality.

CONCLUSION: Our study did not show any difference in the HT rate, hospital LOS, or in-hospital mortality in AIS patients who received r-TPA previously on APT.

Nutrition

510. Attenuation of cellular injury by eicosapentaenoic acid and docosahexaenoic acid Emma M. Tillman, Pharm.D., Ph.D.[1], *Merrion Buckley, B.S.*[2], Peihong Guan, B.S.[1], Paige Klingborg, M.D.[3]; (1) University of Tennessee Health Science Center College

of Pharmacy, Memphis, TN (2) College of Pharmacy, University of Tennessee Health Science Center, Memphis, TN (3) University of Tennessee Health Science Center, Memphis, TN
PURPOSE: Omega-3 long-chain polyunsaturated fatty acids (ω3PUFA) have been shown to attenuate inflammation in multiple disease processes, such as liver disease, cardiovascular disease, arthritis, asthma, autoimmune diseases, and malignancy. In vitrostudies have shown the ω3PUFA eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) were synergistic in attenuating apoptosis in human hepatocytes; however, the mechanism is not well understood. The purpose of this study was to determine how combination EPA and DHA work synergistically in the attenuation of cellular injury through evaluating specific pathways of inflammation and apoptosis.
METHODS: Human acute monocytic leukemia cells (THP-1) were treated with various stimuli to induce inflammation (Escherichia coli (E. coli) lipopolysaccharides (LPS), Salmonella LPS, interferon gamma (INF-γ) with or without EPA, and/or DHA. Cytokines (interleukin one beta (IL-1β), and tumor necrosis factor alpha (TNF-α)) were measured using enzyme-linked immunosorbent assay (ELISA) and real-time polymerase chain reaction (RT-PCR). Inflammatory pathways will be examined using RT- PCR Profiler Assays that evaluated 84 inflammatory genes and apoptosis was evaluated by a commercially available kit.
RESULTS: Production of TNF-α and IL-1β was greatest with E. coli compared to Salmonella LPS. Optimal inflammatory response was observed when cells were primed with INF-γ for 3 hours then treated with E. coli LPS (50 ng/mL). This resulted in a 1000-fold increase in TNF-α compared to control ($p < 0.01$) measured by RT-PCR, therefore these treatment conditions will be used to test the effect of EPA and DHA on the attenuation of cellular injury.
CONCLUSION: Treatment of human monocytes with INF-γ and LPS induced an inflammatory response. Our continued work aims to show that EPA and DHA work synergistically to attenuate inflammation.

511. Dietary practices in cardiac patients *Francesca Attard Baldacchino, B.Sc. Pharmaceutical Sciences (Hons), Masters in Pharmacy*, Lilian M. Azzopardi, B.Pharm.(Hons.), M.Phil., Ph.D., MRPharm.S., Anthony Serracino-Inglott, B.Pharm., Pharm.D.(Cinc.), M.A.C.C.P., M.R.Pharm.S.; Department of Pharmacy, University of Malta, Msida, Malta
PURPOSE: To identify the dietary practices of patients suffering from cardiac disease and to evaluate the suitability of these practices for cardiac health.
METHODS: A food frequency questionnaire was developed by compiling into it a list of food items according to their relevance to cardiac disease. For each respective food item, the frequency of weekly consumption was requested. A section on food type consumption was also included. The questionnaire was validated and tested for reliability. It was distributed to 66 patients discharged from hospital after presenting with one of the following conditions: arrhythmias, post-myocardial infarction, hypertension and ischaemia.
RESULTS: From the questionnaire were analysed and the resulting food consumption scenario was compared with an ideal eating scenario
RESULTS: Table 1 below defines the frequency codes adopted for the study. The patients' choices included moderate consumption of fruit ($n = 41$: 3–5), vegetables ($n = 57$: 3–5) and fish ($n = 56$: 1–3). Poultry and ham are the most frequent meat choices (1–3: $n = 47$, $n = 63$ respectively). Low fat oils ($n = 49$) and frying ($n = 21$) are mostly used in cooking. Moderate consumption was shown for cereals ($n = 58$: 1–3) and nuts ($n = 55$: 1–2) while sweet pastries and biscuits are consumed daily ($n = 43$: 4–5). Wholemeal pasta, bread and whole grain rice are consumed minimally ($n = 6$, 13, 7 respectively) while soft drinks ($n = 27$: 1–2) are preferred alternatives to mineral water ($n = 12$: 1–3).Table 1 Codes referring to frequency of food consumptions

1	Never
2	Once weekly
3	Between 2–6 times weekly
4	Once daily
5	More than once daily

CONCLUSION: The study suggests that cardiac patients would benefit from educational strategies promoting the right dietary choices and alternatives to less healthy foods. This indicates that pharmacists' interventions to raise awareness on such a modifiable risk factor would support patients to make healthy choices so as to optimize their cardiac health.

Oncology

512. Molecular modeling studies on the tetrasaccharide linker of proteoglycans *Cathy Ng, Pharm.D. Candidate*, Padmavathy Nandha Premnath, Ph.D., Olgun Guvench, M.D., Ph.D.; Department of Pharmaceutical Sciences, College of Pharmacy, University of New England, Portland, ME
PURPOSE: Proteoglycans (PGs) are involved in important physiological functions. However, the complexity and flexibility of PGs limit their structural determination by NMR and X-ray crystallography. In this study, molecular dynamics (MD) is utilized to investigate the 3D structure and conformations of the tetrasaccharide (GlcA-Gal-Gal-Xyl) linker of PGs.
METHODS: All-atom explicit-solvent MD simulations combined with Adaptive Biasing Force (ABF) sampling were used to obtain conformational free energies as a function of glycosidic linkage dihedral angles phi, psi. Individual disaccharides of the tetrasaccharide linker were constructed using the CHARMM C36 biomolecular force field for carbohydrates in the TIP3P water model, and molecular graphics were produced with the VMD program. ABF MD simulations were performed with the NAMD program. The resulting ABF data were numerically integrated to generate free energy as a function of phi, psi.
RESULTS: Disaccharides were constructed individually as GlcA-beta(1,3)-Gal, Gal-beta(1,3)-Gal and Gal-beta(1,4)-Xyl. The global free-energy minima for GlcA-beta(1,3)-Gal, Gal-beta (1,3)-Gal and Gal-beta(1,4)-Xyl were found to be (phi, psi) = (−70, 105), (−75, 130) and (−75, −105) respectively. In addition, thermodynamically-accessible local minima were found in adjacent quadrants of phi, psi space for each of the three disaccharides. Based on these preliminary results, disaccharides will be constructed in variable conformations using these values, and ABF simulations will be performed in triplicate using a smaller bin size to generate high-resolution, high-precision free-energy values. Additionally, analogous computational experiments will be performed on the sulfated and phosphorylated analogs of the linker disaccharides.
CONCLUSION: The preferred glycosidic linkage dihedral angles for disaccharides were obtained by ABF MD simulations. These results are being applied to obtain high-resolution, high-precision disaccharide data, and as a basis for the modeling of the 3D structure of the complete tetrasaccharide.

514. Assessment of adherence to oral chemotherapy in oncology and hematology clinical trials at an Academic Medical Center *Jeff Engle, Pharm.D. Candidate*[1], Anne Traynor, M.D.[2], Toby Campbell, M.D.[2], Kari Wisinski, M.D.[2], Noelle Loconte, M.D.[2], Glenn Lui, M.D.[2], George Wilding, M.D.[2], Jill Kolesar, Pharm.D.[1]; (1) School of Pharmacy, University of Wisconsin - Madison, Madison, WI (2) Department of Medicine, University of Wisconsin - Madison, Madison, WI
PURPOSE: This study aims to quantify adherence to oral chemotherapy and determine factors that influence adherence in

the context of clinical trials. This could potentially lead to targeted interventions to improve adherence and ultimately improve patient outcomes.
METHODS: Patients enrolled in all non-industry funded clinical trials conducted at the University of Wisconsin-Madison Carbone Cancer Center by the phase I, breast, genitourinary, hematology, lymphoma, thoracic, and gastrointestinal disease groups were included. Included trials were open to accrual between January 1, 2009 and March 31, 2013 and used oral cytotoxic chemotherapy or hormone therapy as the experimental treatment. Individual patient research charts were audited to collect data on adherence and persistence with study regimen, method for adherence assessment, planned dose intensity, achieved dose intensity as well as factors previously reported to predict adherence, including age, gender, marital status, ethnicity, zip code, type of insurance, performance status, disease, disease stage, best response and regimen specific factors including study regimen and duration of regimen.
RESULTS: A total of 17 clinical trials conducted at the University of Wisconsin-Madison Carbone Cancer Center were included. The trials included were from across the clinical trial spectrum with 8 (47%) being phase I, 6 (35%) phase II, and 3 (18%) phase III trials. The 272 subjects represented in the trials were 55% female and had a mean age of 58 years. A number of cancer types were represented in this analysis with colorectal (24%), breast (15%), and prostate cancer (7%) accounting for nearly half of diagnoses.
CONCLUSION: The data will be analyzed to quantify adherence to oral chemotherapy agents and percent of the planned dose intensity achieved per cycle. This information will then be used to determine patient and clinical factors that predict adherence to therapy with the completion of data analysis occurring prior to the ACCP annual meeting.

515. A review of concomitant statin and Bacillus Calmette–Guérin (BCG) use among patients treated for bladder carcinoma in situ *Daniel Basoff, Pharm.D. Candidate*, Shivam Patel, Pharm.D. Candidate; Ernest Mario School of Pharmacy, Rutgers, The State University of New Jersey, Piscataway, NJ
PURPOSE: Bacillus Calmette-Guérin (BCG) is the current standard immunotherapy for non-muscle-invasive bladder cancer (NMIBC). HMG-CoA reductase inhibitors are a commonly prescribed class of medications in this patient population. Clinicians have raised concern that the immunosuppressive actions of statins might interfere with the immunomodulatory mechanism of BCG and compromise the cancer treatment. Our review aims to integrate the entirety of current evidence available on the impact of statin use in BCG-treated NMIBC patients into a conclusive and confident treatment recommendation.
METHODS: Studies on the effect of statins on BCG-treated NMIBC patients were identified utilizing a Medline search. The terms "BCG", "Bacille Calmette-Guerin", "Hydroxymethylglutaryl-CoA Reductase Inhibitors", and "statins" were combined and limited to those studies in English and performed in humans. Five publications were included in our analysis.
RESULTS: In 2006, Hoffman et al. was the first study to test the theoretical interaction of BCG with statins, finding statin users were more likely to develop aggressive disease requiring radical cystectomy. The most recent four publications (Kamat et al. 2007, Berglund et al. 2008, Skolarus et al. 2009, Crivelli et al. 2013) contradicted the initial finding of Hoffman et al. by reporting that statins did not significantly impact treatment outcomes of BCG-treated NMIBC patients.
CONCLUSION: Our analysis of data from the five publications concludes that statin use is not associated with an increased risk of tumor recurrence, tumor progression, increased requirement of surgical cystectomy, or mortality. Therefore, current evidence provides sufficient data that it is not necessary to discontinue statin therapy in BCG-treated NMIBC patients.

Other

516. Patient perspectives on the introduction of an electronic identification system in a rural Primary Care Health Center in Honduras *Judy Ugwuegbu, Pharm.D. Candidate, 2015*[1], Lauren J. Jonkman, Pharm.D., MPH, BCPS[1], Sharon E. Connor, Pharm.D.[1], Mark Meyer, M.D.[2], Gerald Douglas, Ph.D.[3]; (1) School of Pharmacy, University of Pittsburgh, Pittsburgh, PA (2) University of Pittsburgh Medical Center, Pittsburgh, PA (3) Center for Health Informatics for the Underserved, University of Pittsburgh, PA
PURPOSE: Shoulder to Shoulder Pittsburgh-San José has supported the provision of health care in San José del Negrito, a remote mountainous village in Honduras, for 13 years. The health center currently uses a paper-based record system for medical and dispensary information and is in the planning stages of implementing an informatics solution: RxMAGIC (Prescripion Management And General Inventory Control). The first step is to introduce an electronic identification (e-ID) and registration system for clinic patients. The purpose of this qualitative study was to describe patient perspectives on the introduction of e-IDs, assess patient willingness to use e-IDs, and determine what type of information patients would like to have associated with the e-ID.
METHODS: Spanish-speaking facilitators conducted two focus groups with participants recruited by the clinic's physician and nurse. Six open-ended questions based on the specific aims of the study were designed by a multidisciplinary team of researchers, including those with expertise in informatics. Focus groups were transcribed verbatim and coded. Themes were identified from the data. This research was approved by the University of Pittsburgh's IRB.
RESULTS: Four main themes emerged: 1) participants felt a sense of pride associated with what they saw as the modernization of their clinic; 2) participants felt that the new system would be beneficial to the clinic, although more beneficial to clinic workers than patients; 3) participants preferred small plastic ID cards to larger options; 4) participants were concerned with keeping the ID safe and the consequences of losing or forgetting IDs.
CONCLUSION: Patients are generally in support of the new system and feel that it will enhance their clinic experience. The knowledge of participants' preferences and concerns will allow the local team to develop an effective strategy to implement e-IDs at the health center.

517. Evaluating the impact of brown bag medication reviews on the understanding and adherence to medication therapy of geriatric patients in a community setting *Abdul Ghorbandi, Pharm.D./M.B.A. Candidate Class of 2016*, Lesley Mukai, Pharm.D./M.B.A. Candidate Class of 2016, Christina M. Madison, Pharm.D., BCACP, AAHIVP, Renee Holder, Pharm.D., BCPS; Roseman University of Health Sciences College of Pharmacy, Henderson, NV
PURPOSE: The purpose of this study is to evaluate participants' understanding and adherence to medication therapy before and after a brown bag medication review. Comprehensive medication reviews were conducted by members of the Student College of Clinical Pharmacy (SCCP) chapter of Roseman University of Health Sciences under pharmacist supervision.
METHODS: The study included 38 patients from 4 senior living communities within Clark County of Southern Nevada, which is home to 2.1 million residents, between November 2014 and May 2015. Patients were surveyed before and after a comprehensive medication review. The survey measured each patient's adherence to therapy, knowledge of therapy, medical conditions, number of medications, and number of visits with primary care provider per year.
RESULTS: Average age of participants was 68 years old (59–79 years old) with an average of 8 medications per participant. Before medication review, 56% and 51% reported complete knowledge of and adherence to therapy respectively. Following

review, percentages of knowledge and adherence increased to 81% and 74% respectively. Overall, 46% of participants reported annual visits with their provider while 54% reported 2 or more visits yearly.
CONCLUSION: Roseman University's SCCP organized brown bag events revealed a great opportunity to impact residents of senior communities. Elderly patients are at a higher risk of chronic disease state complications. This risk can be lessened through reducing inappropriate medication therapy, medication duplication, polypharmacy, medication adverse effects and fall risks in the elderly by conducting medication reviews. Our study theorized that medication reviews improved adherence and understanding of therapy. The next step in our interventions will be to directly communicate the pharmacy interventions to participants' primary care providers for implementation in order to optimize patient care and decrease the risk of adverse drug reactions and disease state management associated with medication therapy.

518. Quality of transitions of care in a COPD cohort prior to and following implementation of a pharmacy extender model *Sarah Hendrick, Pharm.D. Candidate*[1], Stephen Luciano, Pharm.D. Candidate[1], Nancy Nystrom, Ph.D., RPh[2], Leslie Ochs, Pharm.D., PhD, MSPH, BCPS[3], Lisa Wendler, Pharm.D., BCPS[4]; (1) College of Pharmacy, University of New England, Portland, ME (2) Medication Transitions Pharmacy, Maine Medical Center, Portland, ME (3) Department of Pharmacy Practice, College of Pharmacy, University of New England, Portland, ME (4) Adult Medicine Clinical Pharmacy, Maine Medical Center, Portland, ME
PURPOSE: The purpose of this study is to implement a model that uses third year pharmacy students as pharmacist extenders to collect patient medication histories on admission to facilitate the completion of medication reconciliation within 24 hours while also improving transitions of care at discharge. The primary study outcome is the number of medication lists completely reconciled by provider within 24 hours of admission.
METHODS: The study population consists of two patient cohorts with a diagnosis of COPD. Patients admitted to Maine Medical Center from September 1 to November 30, 2014 and prior to implementation of the pharmacy extender model are assigned to cohort one. Patients admitted to the hospital from September 1 to November 30, 2015 and following implementation of the model will be assigned to cohort two. Additional statistical tests comparing cohorts one and two on the primary outcome and other selected outcomes will be examined. Since this study is considered a clinical quality improvement initiative Institutional Review Board approval was not required.
RESULTS: Cohort one consisted of 69 patients, 42 females and 27 males with a mean age of 71 years. In cohort one, the medication lists of 40 of the 69 patients (57.97%) were completely reconciled by provider within 24 hours following admission. Preliminary results for cohort two will be shared as collected.
CONCLUSION: With the implementation of the pharmacy extender model, we anticipate an improvement in the number of medication lists reconciled within 24 hours following admission. It is our hope that this model will result in enhanced patient safety and a higher quality of patient-centered care.

519. Knowledge and perceptions of health literacy among pharmacists in Ohio *Desiree Haisley, Pharm.D. Candidate*[1], Karissa Y. Kim, Pharm.D., CACP, BCPS[2]; (1) College of Pharmacy, University of Cincinnati, Cincinnati, OH (1) University of Cincinnati James L. Winkle College of Pharmacy, Cincinnati, OH
PURPOSE: Limited health literacy (LHL) is a major public health problem that can affect patient outcomes. The purpose of this study was to 1) describe Ohio pharmacists' knowledge and perceptions of the impact of LHL on individual patients, their practice, and the health system and 2) survey self-reported communication techniques used by pharmacists to care for patients with LHL. Furthermore, this study will examine pharmacists' knowledge and perceptions of LHL over 2 years.
METHODS: Pharmacists registered with the Ohio Board of Pharmacy were randomly selected and invited to participate in an anonymous on-line survey during a 4-week period in 2013. Round 2 of the survey will be administered to 400 randomly selected pharmacists in July 2015, and the results will be compared.
RESULTS: In the first round, 497 surveys were delivered to pharmacists, and 62 completed the study. Although 82.3% had heard of the term health literacy, only 40.3% had received formal training on health literacy. Only 16.1% of pharmacists were able to identify the prevalence of LHL and 17.7% were able to identify the average reading level of Americans. Of the 10 items related to knowledge, the mean number of questions correct was 5.8±1.7 (Mean±SD). Most pharmacists were able to correctly identify risk factors for LHL such as ethnicity and educational. The majority of pharmacists concur that LHL interferes with patients' ability to understand health information, obtain appropriate health services and follow through on recommended treatments. Most pharmacists do not formally assess patients for LHL but use their "gut" feeling to identify LHL. Pharmacists use a variety of communication techniques to assist patients with LHL. Results from the second round of the survey will be compared to the first round.
CONCLUSION: The initial survey suggests that there are gaps in pharmacists' knowledge of LHL.

521. Novel spectral analysis to determine accuracy of extemporaneously compounded pharmaceuticals *Jihye Hoe, Pharm.D. Candidate*[1], Jason Evans, Pharm.D.[2], Rosanne Thurman, Pharm.D.[2], Lisa Ashworth, B.S.[3], Richard Leff, Pharm.D.[1], Claudia Meek, Ph.D.[1]; (1) Clinical Pharmacology & Experimental Therapeutics Center, Texas Tech University Health Sciences Center, Dallas, TX (2) Pharmacy, Childrens Health System of Texas, Ft. Worth, TX (3) Pharmacy, Childrens Medical Center of Dallas, Dallas, TX
PURPOSE: Raman spectroscopy is a novel technique to identify chemical entities using a unique chemical fingerprint that is created by observing vibrational, rotational, and other low frequency modes of chemicals. Use of this technology promises to provide the compounding pharmacist with the capability to provide quality control to their compounded pharmaceuticals. The specific aim of this study is to develop and validate a Raman method to accurately quantitate active pharmaceutical ingredients contained in compounded formulations.
METHODS: A handheld, Raman spectroscope was interfaced to a Dell Latitude E7250 laptop computer and calibrated for use. Seven concentrations (0.5, 1, 2, 4, 6, 8, and 10 mg/mL) of hydralazine were compounded. Each formulation was tested using Raman spectroscopy in replicate and 3 peaks were arbitrarily selected to best represent hydralazine concentration. The peak height (intensity, mW) and wavenumber for each of the respective peaks were recorded. The peak height versus concentration for each formulation was plotted and the 'best fit' line was calculated using linear regression.
RESULTS: Linearity was depicted for all three peaks with the following correlation coefficients, 0.9938, 0.9878, and 0.9984, respectfully. All three peaks could accurately predict hydralazine concentrations ranging from 1 to 10 mg/mL. Analytical variation was determined to be less than 5%.
CONCLUSION: Raman spectroscopy has been demonstrated simple to operate and able to determine accuracy of compounded hydralazine formulations. We believe that use of this method can be cost effective and easily implemented for purposes (1) to provide quality control, (2) to detect drug diversion, and/or (3) to determine formulation stability. Further study is warranted to identify Raman method limitations and develop standard operating procedures for compounding pharmacies.

522. The role of pharmacy students in the interprofessional care of immigrant, refugee, and underserved clients *Jovanna Casas, Pharm.D. Candidate 2016*[1], Sarah Lindstrom, Pharm.D. Candidate 2016[1], Kayla Grzybowski, Pharm.D. Candidate 2016[1], Chanchal Agr, Pharm.D. Candidate 2016[1], Kate Unterberger, Pharm.D. Candidate 2016[1], Sarah Louie, Pharm.D. Candidate 2016[1], Satta Jivagunchainan, Pharm.D. Candidate 2016[1], Hieu Nguyen, Pharm.D. Candidate 2016[1], Valerie Palmer, Ph.D.[2], Jessina C. McGregor, Ph.D.[1], Harleen Singh, Pharm.D. [1]; (1) Oregon State University/Oregon Health & Science University College of Pharmacy, Portland, OR (2) Oregon Health & Science University
PURPOSE: The Interprofessional Community Health and Education Exchange (iCHEE) is a novel approach to integrate interprofessional education with outreach to immigrant, refugee, and underserved clients. Our purpose was to describe the impact of iCHEE on pharmacy student learning and the client population.
METHODS: iCHEE is a semester-long elective comprising six 5-hour Saturday sessions held at community sites in Oregon. The students and faculty from multiple disciplines work collaboratively to address client needs. Pharmacy students assisted in client interviews, health screenings, medication reviews and education, as well as over-the-counter consultations. Data were collected weekly through client intake forms, post-visit satisfaction surveys, and written reflections from students.
RESULTS: During the 7-year program, 419 students from various healthcare disciplines have participated in iCHEE: pharmacy (114), nursing (102), medical (96), dental (88), public health (19), and physician assistant (12). To date, 2,200 clients have received blood pressure monitoring, basic vision exams, medication reviews, and education. Of these, 8.9% and 25.7% received specialist referrals for ophthalmology and dental, respectively. Of the 112 clients who completed satisfaction surveys, 97.4% would "always recommend" the program to others; 92.2% "always had their medications explained"; and 91.5% "always had local resources identified." Student reflections indicated that pharmacy students were invaluable to the team for providing medication management advice, counseling on side effects, and identifying resources to minimize cost associated with medications.
CONCLUSION: iCHEE provides pharmacy students with a valuable experience where they learn from interaction with diverse underserved community members, contribute to basic health assessments, assist clients with medications, and provide tailored referrals to clients.

523. Comparison of medication prescribing patterns between United States (U.S.) and dominican prescribers on medical mission trips to the Dominican Republic *Ciera L. Patzke, B.S.*, Gina M. Prescott, Pharm.D., BCPS, William A. Prescott, Jr, Pharm.D., Peter M. Brody, Jr, B.S., Pharm.D.; School of Pharmacy and Pharmaceutical Sciences, University at Buffalo, Buffalo, NY
PURPOSE: To identify differences in prescribing patterns between U.S. providers and native providers during short-term medical mission trips to the Dominican Republic.
METHODS: Faculty members, preceptors, students, and residents participating in yearly medical mission trips documented their interventions in an electronic database from January 2013–2015. The pharmacy team utilized doctors from the Dominican Republic (DR) in 2013 and U.S. doctors in 2014–2015 to provide medical care. Descriptive statistics are used to describe frequency data: patient demographics and clinical data (diagnosis, medication prescribed, dose/frequency/duration of medication prescribed, pharmacy interventions). Differences in prescribing patterns (medication selection, dose, duration) based on indication, adherence to the essential medications list, and prescribing of noncommunicable diseases will also be determined. Chi-Square or Fisher's exact test will be used for categorical data as appropriate.
RESULTS: A total of 423, 1262, and 323 patients were prescribed medications on the 2013, 2014, and 2015 trips, respectively. Average number of prescriptions per patient (n = 2.55, 2.06, and 2.4) was similar between trips. The most commonly diagnosed condition included upper respiratory infections (28% in 2013), and parasites (14% and 19% in 2014 and 2015, respectively). Rates of documented upper respiratory tract infections were much higher with DR providers (34%) compared to US providers (13%, 9%) and rates of parasite infections were much higher with US providers (15%, 19%) compared to DR providers (9%). Vitamins were the most commonly prescribed medication (30%) for all trips. DR physicians were more likely to prescribe respiratory/allergy medications (12%) compared to US providers (8%, 9%), and women's health medications (3% compared to <1% for both). The DR provider group did not diagnose any patient with allergic rhinitis, allergies, asthma, or pneumonia.
CONCLUSION: Research in progress.

Pain Management/Analgesia

524. Impact of liposomal bupivacaine in orthopedic total joint arthroplasty *Bert Matsuo, Pharm.D. Candidate*[1], LaTasha Riddick, Pharm.D.[1], Laura Ota, Pharm.D.[1], Chieko Kimata, Ph.D., M.P.H., M.B.A.[2], Joy Matsuyama, Pharm.D.[1], Kenneth Martin, P.A.[3], Cass Nakasone, M.D.[3]; (1) Inpatient Pharmacy, Straub Clinic and Hospital, Honolulu, HI (2) Hawaii Pacific Health, Honolulu, HI (3) Orthopedics, Straub Clinic and Hospital, Honolulu, HI
PURPOSE: Multimodal pain management strategies using local anesthetics and non-opioid therapy in postsurgical patients are being studied with a goal of achieving optimal post-operative pain control. There are limited clinical trials published on outcomes following the addition of liposomal bupivacaine in total joint arthroplasty. The purpose of this study is to evaluate the impact of liposomal bupivacaine on length of stay (LOS), opioid consumption, and early ambulation in patients undergoing elective total knee arthroplasty (TKA) or total hip arthroplasty (THA).
METHODS: A retrospective chart review of adult patients who underwent elective single or bilateral TKA or THA, prior to implementation of liposomal bupivacaine (July 2014 to August 2014) and after implementation (September 2014 to November 2014) was completed. Standard local anesthetic pain management prior to liposomal bupivacaine consisted of intraarticular ropivacaine. Additional multimodal adjunct pain medications pre- and post-operatively remained the same.
RESULTS: Preliminary results of 137 patients; 67 patients receiving ropivacaine and 70 patients receiving liposomal bupivacaine. Data showed a similar LOS between the two groups, with a median of 2.31 days in the ropivacaine group and a median of 2.33 days in the liposomal bupivacaine group ($p = 0.68$) and similar opioid use 24 hours post-operatively. Additional data collection and analysis will include total opioid consumption during hospitalization, time to first ambulation, and maximum distance ambulated prior to discharge.
CONCLUSION: The final results of this study are expected prior to October 2015 and will help determine if liposomal bupivacaine can decrease LOS, opioid requirements, and improve early ambulation in patients undergoing elective total joint arthroplasty.

525. Patient-controlled analgesia in post-caeserian section *Deborah Mangion, Bachelor of Science (Honours) in Pharmaceutical Science*[1], Janis Vella, B.Pharm., M.Sc. (Clinical Pharmacy)[2], Lilian M. Azzopardi, B.Pharm. (Hons), M.Phil., Ph.D., MRPharm.S.[1], Anthony Serracino-Inglott, B.Pharm., Pharm.D. (Cinc.), MACCP, MRPharm.S.[1]; (1) Department of Pharmacy, Faculty of Medicine and Surgery, University of Malta, Msida, Malta (2) Department of Pharmacy, University of Malta, Msida, Malta
PURPOSE: Pain and discomfort in patients' post caesarean-section (c-section) can be managed via self-administration of intravenous opioids using Patient Controlled Analgesia (PCA). This study assesses pain management in post c-section.

METHODS: Fifty patients were interviewed within 24 hours of having a c-section. Twenty six patients were using the electronic PCA and 24 patients were using the disposable PCA. Patient satisfaction with PCA and nurse compliance with the MEOWS (modified obstetrics early warning system) chart were assessed.
RESULTS: All patients were satisfied, with most patients giving a score between 8 and 10 (scale: 1 to 10, 10 being the highest). None of the patients experienced significant problems such as post-dural puncture headaches, urinary retention or neurological impairment following the procedure. Eleven out of 50 patients received a PCA information leaflet. Analysis of morphine consumption revealed that the majority of patients used a small dose with the average consumption being 7.4 mg (out of 50 mg) of morphine. Sixteen patients did not use morphine. The most common side-effects reported in the post-operative period include: pruritus (26) and sedation (18). Respiratory depression (5) was the least common side effect. The mean worst pain score reported by patients was 4.98 (scale: 1 to 10, 10 being the highest) which was significantly higher than that reported by the nurses (2.13) in the MEOWS chart. This reflects that patients are reporting greater pain scores than perceived and reported by the nurses.
CONCLUSION: Although patients appear satisfied with pain management received, the study reveals that misinformation about PCA may be impacting its proper use and limiting morphine consumption that may explain the mean worst pain scores reported by the patients which are higher than perceived by the nurses.

Pediatrics

526. Evaluation of ipratropium use in pediatric patients <2 years of age in a large academic medical center *Lauren Dombrowski, B.S., Pharm.D. Candidate*, Lisa Biondo, Pharm.D.; School of Pharmacy, West Virginia University, Morgantown, WV
PURPOSE: Ipratropium is an anticholinergic bronchodilator that inhibits muscarinic acetylcholine stimulation in the vagal nerve, resulting in smooth muscle dilation of the bronchial tubes. Ipratropium is not FDA-approved in children under 12 years for pulmonary conditions, and limited studies on proper use in a young patient population have been performed. Despite this, ipratroprium is used in practice for bronchiolitis, asthma, and respiratory distress in patients <2 years. The purpose of this study was to determine prescribing practices for ipratroprium at West Virginia University Children's Hospital (WVUCH) in patients ≤2 years. The primary objective was evaluation of patients receiving a scheduled order for ipratropium, focusing on dose, frequency, duration, and indication for use. Secondary objectives were description of prescribing service, use of respiratory support, and concurrent pulmonary medications.
METHODS: This study was a retrospective chart review using the electronic medical record at WVUCH. A report generated included all patients discharged from the pediatric ICU, neonatal ICU, and general pediatric medicine from June to December of 2014 with an order for ipratropium. Inclusion criteria are inpatients ≤2 years who received a scheduled dose of ipratropium. Exclusion criteria included one-time/PRN orders. Data points collected include: age, gender, weight, dose, frequency, route, total doses administered, duration of therapy, prescribing service, concurrent respiratory medications, indication, and co-morbidities.
RESULTS: Twenty patients qualified for this study, including twenty-three encounters and fifty orders for ipratropium. The most common indication of use was respiratory distress (8) and bronchopulmonary dysplasia (BPD) (5). 44/50 orders were via nebulization with the most frequently ordered dose of 0.25 mg (12) and 0.5 mg(9) every 6 hours.
CONCLUSION: At WVUCH ipratroprium use in patients ≤2 is primarily in the ventilated neonatal population for BPD. Due to inconsistencies in prescribing, an opportunity arises for a consensus in practice amongst the physicians.

527. Caregiver priorities regarding pharmacological treatment of their child's attention-deficit/hyperactivity disorder *Vy Nguyen, Pharm.D. Candidate*[1], Melissa Ross, M.A.[2], Susan dosReis, Ph.D.[2]; (1) University of Maryland School of Pharmacy, Baltimore, MD (2) Department of Pharmaceutical Health Services Research, University of Maryland School of Pharmacy, Baltimore, MD
PURPOSE: Caregivers' reluctance to use medication for their child's attention-deficit/hyperactivity disorder (ADHD), one of the most common childhood psychiatric disorders, affecting 11% of children aged 4–17 years, despite the strong evidence of efficacy in managing ADHD symptoms is a major clinical dilemma. This study examines caregivers' concerns when faced with the decision to initiate ADHD medication for their child.
METHODS: Caregivers of children aged 4–14 years old and in care for ADHD were recruited from clinics and caregiver support groups across Maryland to complete a computer-based survey, which gathered information regarding demographic characteristics, the child's current ADHD treatment, and caregiver's concerns when deciding to initiate medication for their child. To assess priorities when weighing concerns prior to initiating medication, caregivers were presented with a profile of 6 statements reflecting short- and long-term medication effects, support network, and stigmatizing social views and they chose one most and one least important concern from the profile. There were 16 profiles that were experimentally varied and each statement was analyzed as a mean score where positive values reflected more important concerns and negative values represented least important concerns.
RESULTS: Of the 184 caregivers recruited from January 2013 through March 2015, most were mothers and Caucasian (68%). Children were mostly male (71%) and using medication (81%). The most important concerns when initiating ADHD medication were the child's success as an adult and its effects on controlling the child's school behavior, while school pressure and judgment from others were least important ($p < 0.0001$). Short and long-term effects of ADHD medications were generally more likely than supportive network and societal views to be important in the caregiver's decision in initiating ADHD pharmacological treatment.
CONCLUSION: By understanding and defining caregiver priorities, health care providers can successfully work with caregivers to create an optimal, patient-centered treatment plan for the child's ADHD.

528. "One Click Stewardship" – implementing antibiotic indications as an extension of a pediatric antimicrobial stewardship program *Stacey Matsuda, Pharm.D. Candidate 2016*[1], Sarah K. Parker, M.D.[2], Amanda L. Hurst, Pharm.D.[1]; (1) Department of Pharmacy, Children's Hospital Colorado, Aurora, CO (2) Department of Pediatrics, Division of Pediatric Infectious Diseases, Children's Hospital Colorado, Aurora, CO
PURPOSE: An association of an indication with an antibiotic order is considered by the Centers for Medicare and Medicaid Services (CMS) surveyors when assessing infection prevention measures. This requirement, and the assumption that associating an indication with an antibiotic order improves prescribing, is pushing hospital systems to implement this process into the electronic medical record (EMR). The purpose of this evaluation is to describe the process of implementing required indications on 13 pilot antibiotics in the EMR, summarize preliminary use trends of the antibiotics, and identify areas of improvement.
METHODS: Antibiotic indications were assigned to 13 pilot antibiotics chosen by the antimicrobial stewardship committee based on highest use, those most commonly misprescribed, or those with different doses based on indication. These indications were created in the EMR (Epic®) as a required step upon order entry. Provider and pharmacist surveys were also collected both prior to and following implementation of indications. All pilot antibiotic orders and associated indications were collected from September 2013 to February 2014 and September 2014 to February 2015.

RESULTS: There were a total of 20,521 pilot antibiotic orders during the study period, amoxicillin and cefazolin being the most common (29% and 21%, respectively). The most commonly selected indications included otitis media (20%), prophylaxis (14%), and sepsis/bacteremia (12%). Among specific indications, amoxicillin was the most commonly prescribed antibiotic for otitis media (88%), pharyngitis (95%), and pneumonia/sinusitis (54%). Survey results suggest providers feel more influenced in choice of antibiotic and dose post-implementation and are more likely to contact a pharmacist for dose information.
CONCLUSION: Requiring antibiotic indications upon order entry enables stewards to easily track overall antimicrobial use in the hospital. This may assist in identifying either inappropriate use or potential education opportunities.

529. Pediatrics quality metrics for pharmacists in acute and ambulatory care settings *Jessica Phyu, Bachelors of Science*, Erin Scarpinato, Bachelors of Science, Sandra Benavides, Pharm.D.; Nova Southeastern University, FL
PRPOSE: The United States healthcare landscape is shifting from a fee-for-service to a reimbursement system based more on quality. In May, 2015 Centers for Medicare and Medicaid Services (CMS) released a notice of proposed rule to overhaul Medicaid and Children's Health Insurance Program (CHIP). A key requirement will be inclusion of quality measures. As such, attention to core measures for pediatric patients is increasingly important. The purpose of this project is to evaluate existing measures as areas of focus for pediatric pharmacists in the acute and ambulatory care settings.
METHODS: 2015 Core Set of Children's Health Care Quality Measures for Medicaid and CHIP were identified. Each measure was reviewed to determine the impact of a pharmacist. Once the measures were identified, a comprehensive literature evaluation was conducted to determine the availability of data on a pharmacist impact.
RESULTS: Of the 24 Core Set of Children's Health Care Quality Measures for Medicaid and CHIP, pharmacist can be involved in 7 in the outpatient setting, and one following discharge from an acute facility. In the area of preventive care ($n = 3$), the focus of the intervention included rates of immunization in children and adolescents (overall and specifically for Human Papillomavirus). In the area of behavioral care ($n = 2$), pharmacists could intervene on follow-up after the initiation of medications for attention deficit activity disorder and after admission for hospitalization due to mental illness. In children with chronic conditions ($n = 2$), the management of asthma and weight assessment are areas pharmacist have improved outcomes. Lastly, for experience of care ($n = 1$), questions in the Consumer Assessment of Healthcare Providers and Systems (CAHPS) can be an area of focus for pharmacists. The CAHPS survey includes six specific questions related to medication use in pediatric patients. Further results on specific strategies conducted by pharmacist will be presented.
CONCLUSION: Pending.

530. Evaluation of current vancomycin dosing strategies in the neonatal population: a retrospective study *Chrsitine Tafoya, Pharm.D. Candidate*[1], Christopher Zhu, Pharm.D. Candidate[1], Jean-Paul Lee, Pharm.D. Candidate[11], Eric Hoie, Pharm.D., James D. Bramble, Ph.D., MPH[1], Tatiane Cooper, M.S., RPh[2]; (1) School of Pharmacy and Health Professions, Creighton University, Omaha, NE (2) St. Joseph's Hospital and Medical Center, Phoenix, AZ
PURPOSE: In 2014, Neofax guidelines were updated to reflect goal vancomycin trough concentrations of 15–20 μg/mL for MRSA and 10–15 μg/mL for less severe infections in order to obtain an AUC/MIC ratio ≥400. This retrospective study will investigate vancomycin dosing strategies for the neonatal population at a Level-III NICU in comparison to current Neofax guidelines. Evaluation of resultant vancomycin concentrations and incidence of nephrotoxicity with regards to patient-specific factors will be assessed.
METHODS: An IRB-approved retrospective chart review was conducted for neonatal patients receiving vancomycin from May 1, 2013 to September 30, 2014. Vancomycin trough concentrations utilizing 10 mg/kg at intervals of either 8, 12, or 18 hour per Neofax guidelines and deviations in dose/interval were evaluated. Patient characteristics including: postmenstrual age (PMA), postnatal age (PNA), gestational age (GA), weight, and baseline serum creatinine (SCr) as available, will be evaluated with regards to vancomycin troughs and incidence of nephrotoxicity. Impact on renal function in patients receiving gentamicin and indomethacin will be assessed.
RESULTS: Analysis of vancomycin trough concentrations ($n = 45$) revealed the incidence of subtherapeutic troughs (<10 μg/mL) was 77.8% ($n = 35$), with troughs <5 μg/mL and 5–10 μg/mL at 27.7% ($n = 12$) and 51.1% ($n = 23$), respectively. Incidence of patients reaching therapeutic troughs of 10–15 μg/mL was 20% ($n = 9$). Supratherapeutic trough (>20 μg/mL) incidence was 2.2% ($n = 1$). Utilization of Neofax dosing guidelines was 51.1% ($n = 23$), of which 82.6% ($n = 19$) resultant troughs were subtherapeutic. Analyses of contributing patient variables with regards to trough concentrations and incidence of nephrotoxicity is ongoing.
CONCLUSION: Initial data analysis suggests a more aggressive approach in vancomycin dosing strategies for neonates will be necessary to reach desired troughs of 10–15 μg/mL for less severe infections and 15–20 μg/mL for MRSA. Further evaluation is underway and will be presented at the 2015 ACCP Global Conference on Clinical Pharmacy.

531. Oculogyric crisis with the use of prochlorperazine in a pediatric patient *Samantha Lewis, Pharm.D. Candidate*[1], Chasity Shelton, Pharm.D.[2]; (1) College of Pharmacy, The University of Tennessee Health Science Center, Memphis, TN (2) Department of Clinical Pharmacy, The University of Tennessee Health Science Center, Memphis, TN
PURPOSE: The purpose of this case study is to examine the effects of prochlorperazine-induced oculogyric crisis in a pediatric patient.
METHODS: This case report is a retrospective case study examining the drug-induced adverse event in a pediatric patient after taking prochlorperazine. The Naranjo algorithm for adverse drug reaction assessment was used to determine the likelihood that the symptoms were due to prochlorperazine and not the result of other factors.
RESULTS: The 16-year old pediatric female patient in this case study received a total of four doses of 5 mg intravenous (IV) prochlorperazine and subsequently developed oculogyric crisis. The patient experienced uncontrollable eyelid flutter, bilateral outward rolling of the eyes, tachycardia, extension of the neck, and exhaustion. Oculogyric crisis thought to be induced by prochlorperazine may have been precipitated by dehydration the patient was experiencing, as well as the fact that the patient was a pediatric female, both of which are hypothesized risk factors for developing an acute dystonic reaction. Treatment consisted of IV diphenhydramine and fluids, which alleviated the patient's symptoms. Based on the Naranjo algorithm score of 7, the probability of this being an adverse drug reaction caused by prochlorperazine is probable.
CONCLUSION: Few reports have examined oculogyric crisis induced by prochlorperazine in pediatric patients as reported in this case study. Dystonic reactions can be severe among patients taking dopamine receptor blocking antiemetic or antipsychotic agents; yet discontinuing the offending agent and adding an anticholinergic and/or antihistamine agent, such as diphenhydramine, to the patient's treatment regimen, easily reverse these adverse events. It is important to monitor a patient's physical exam, as well as note any pre-disposing factors, including current fluid status, when assessing the patient for a possible drug-induced dystonic reaction, such as the prochlorperazine-induced oculogyric crisis as was seen in this female pediatric patient.

Pharmacoeconomics/Outcomes

533. The cost of treating cancer patients with antineoplastic medications during inpatient hospital admission *Alexandra Foster, Pharm.D. Candidate*[1], David Reeves, Pharm.D., BCOP[2]; (1) College of Pharmacy and Health Sciences, Butler University (2) St. Vincent Indianapolis Hospital and College of Pharmacy and Health Sciences, Butler University

PURPOSE: Cancer treatment represents a substantial portion of health care costs and is projected to increase by twenty-seven percent from 2010 to 2020, with total costs reaching 158 billion dollars per year. Due to these projections, it is imperative for institutions to implement cost saving strategies, as well as maximize reimbursement. The objective of this study is to evaluate the cost and necessity of providing chemotherapy regimens in the inpatient setting and explore the savings associated with implementation of a policy defining the appropriate indications for the use of inpatient chemotherapy.

METHODS: A retrospective chart review of adult patients receiving inpatient chemotherapy during January, April, July, and October of 2010, 2012, and 2014 at St. Vincent Hospital in Indianapolis is in progress. Demographic data, chemotherapy regimens (cycle number, dosing, schedule, agents, and routes of administration), prior adverse effects, reasons for inpatient chemotherapy, and cost of chemotherapy regimens (average wholesale price) are being collected. Necessity of inpatient chemotherapy will be determined based on adherence to the available guidelines for inpatient chemotherapy. Institutional review board approval was received on August 27, 2013.

RESULTS: Records of 415 patients receiving chemotherapy during ten of the twelve intended months have been retrospectively reviewed. Data collection for July and October 2012 are currently in progress. Preliminary results indicate the annualized number of patients receiving chemotherapy in the inpatient setting decreased from 579 patients in 2010 to 381 patients in 2014, while the annualized number of patients admitted specifically for chemotherapy decreased from 327 patients in 2010 to 189 patients in 2014. Financial and statistical analysis will be conducted upon completion of data collection.

CONCLUSION: Preliminary data suggests the number of patients receiving inpatient chemotherapy and the number of patients admitted specifically for chemotherapy decreased after implementation of a policy in 2014 regarding appropriate inpatient chemotherapy use.

534. A cost-savings analysis of a pharmacy internship program in a hospital inpatient setting Lana Al-Omar, Pharm.D. Candidate, *Daniel Galipeau, Pharm.D. Candidate*, Kristi Smith, Pharm.D. Candidate, Michelle Sugden, Pharm.D. Candidate, Kristi Bronkan, Pharm.D., BCPS, Corrie Vasilopoulos, Pharm.D., BCPS; Denver Health Medical Center

PURPOSE: Pharmacy internship programs provide the opportunity for pharmacy students to work and learn in a pharmacy practice setting, however, there is scarce published data to demonstrate the value of a pharmacy internship program to either the pharmacy student or the institution. This study is the first in a series of studies to assess the overall benefit of pharmacy internship programs, specifically in the hospital inpatient setting. The goal of this study is to assess the financial benefit of an inpatient pharmacy internship program involving both clinical and operational roles.

METHODS: The financial value of clinical services provided by interns was calculated using intervention data from August 2013 to April 2015. The savings from interns performing clinical work as compared to pharmacists were determined using the total time spent on interventions and comparing the midpoint hourly wage for interns and pharmacists. The savings from operational services provided by interns was calculated using total hours of intern operational work and comparing the midpoint hourly wage for interns and pharmacy technicians.

RESULTS: The overall value of clinical services provided by interns was $206,230 annually. The cost difference between interns providing clinical services as compared to pharmacists was $13,960 annually. The cost savings associated with interns providing operational services was $11,440 annually. Results at this time are undergoing final analysis to compile graphical data.

CONCLUSION: There is a significant financial benefit to a hospital institution for supporting a pharmacy internship program. This financial benefit should reassure hospitals that developing, promoting and sustaining a pharmacy internship program provides value to the organization. Further research is needed to elucidate the benefits of a pharmacy internship program to pharmacy students and determine what aspects of a pharmacy internship program are most beneficial to pharmacy students.

Pharmacogenomics/Pharmacogenetics

537. Effects of CYP2D6 genetic polymorphisms on the pharmacokinetics of tramadol and its active metabolite *Hye-Jin Lim, B.S.*, Dong-Hyun Kim, B.S., Young-Hoon Kim, B.S., Se-Hyung Kim, Ph.D.Candidate, Ji-Yeong Byeon, B.S., Seok-Yong Lee, Ph.D.; School of Pharmacy, Sungkyunkwan University, Suwon, South Korea

PURPOSE: Tramadol is a synthetic μ-receptor agonist used for the relief of moderate to severe acute and chronic pain. Tramadol is mainly to O-demethyltramadol (ODT) metabolized in the liver. Also tramadol itself possesses serotonin and norepinephrine reuptake blocking activity. CYP2D6 is responsible for the metabolism of approximately 25% of clinically used drugs and especially *CYP2D6*10* allele is accounted for 50% of *CYP2D6* allele in Asian. We investigated the effects of *CYP2D6*10* allele on the pharmacokinetics of tramadol and its active metabolite.

METHODS: Thirty healthy Korean volunteers with *CYP2D6*wt/*wt* (*wt = *1* or *2*, $n = 10$), *CYP2D6*wt/*10* ($n = 10$) and *CYP2D6*10/*10* ($n = 10$) were selected for this study. Each volunteer received a single oral dose of 100 mg tramadol after overnight fasting. Blood samples were collected up to 30 hour after drug intake, and plasma concentrations of tramadol and its metabolite were determined by using LC-MS/MS analytical system.

RESULTS: AUC_{inf} of tramadol in *CYP2D6*10/*10* group was higher than those in *CYP2D6*wt/*wt* genotype group; 3237.3 ± 765.7 ng*hour/mL and 2146.4 ± 407.2 ng*hour /mL ($p < 0.001$). But C_{max} tramadol was not significantly different among three different groups. In terms of O-demethyltramadol (ODT), AUC_{inf} in *CYP2D6*10/*10* group was lower than those in *CYP2D6*wt/*wt* genotype group; 882.7 ± 274.0 ng*hour/mL and 1173.9 ± 165.9 ng*hour/mL ($p < 0.001$).

CONCLUSIONS: In conclusion, *CYP2D6*10* allele has significant effects on the pharmacokinetics of tramadol and its active metabolite.

538. Effects of CYP2C9*13 allele on the pharmacokinetics of Irbesartan Hye-Jin Lim, B.S., Dong-Hyun Kim, B.S., Ji-Yeong Byeon, B.S., Young-Hoon Kim, B.S., Se-Hyung Kim, B.S. , Ph.D. Candidate; School of Pharmacy, Sungkyunkwan University, Suwon, South Korea

PURPOSE: Irbesartan is an angiotensin II antagonist that selectively blocks the binding of angiotensin II to the AT1 receptor, and is used for the treatment of hypertension, as well as diabetic nephropathy with an elevated serum creatinine and proteinuria in patients with type 2 diabetes and hypertension. Irbesartan is metabolized by polymorphic CYP2C9 to inactive metabolite. *CYP2C9*13* allele show impaired activity towards a number of substrates both in vitro and in vivo. Unlike *CYP2C9*3*, which has been extensively studied in humans, clinical studies of *CYP2C9*13* have been limited by the difficulty in finding subjects carrying this low-frequency allele. We evaluated the effect of *CYP2C9*13* allele on the pharmacokinetics of irbesartan in healthy volunteers.

METHODS: In this study, we enrolled 1907 healthy Korean subjects and divided into four different groups according to *CYP2C9*

genotype: *CYP2C9*1/*1* (n = 1734), *CYP2C9*1/*3* (n = 148), *CYP2C9*1/*13* (n = 22), *CYP2C9*3/*3* (n = 3). After overnight fasting, twelve *CYP2C9*1/*1* subjects and six *CYP2C9*1/*13* subjects received a single oral dose of 150 mg irbesartan. Blood samples were collected up to 36 hours after drug intake, and plasma concentrations of irbesartan and its metabolite were determined by using validated HPLC-Fluorescence.
RESULTS: After oral administration of irbesartan, the maximum plasma concentration (C_{max}) of irbesartan significantly higher ($p < 0.01$), half-life longer ($p < 0.001$), oral clearance lower ($p = 0.002$) and area under the plasma concentration-time curve (AUC) higher ($p < 0.001$) than those in homozygous *CYP2C9*1* subjects. C_{max} of irbesartan in *CYP2C9*1/*1* and **1/*13* genotype groups was 1.48 ± 0.47 μg/mL and 2.21 ± 0.48 μg/mL, respectively. AUC_{inf} of irbesartan in *CYP2C9*1/*1* and **1/*13* genotype groups was 7.45 ± 1.78 μg*hour/mL and 13.35 ± 3.70 μg*hour/mL, respectively.
CONCLUSIONS: In conclusion, *CYP2C9*13* alleles seems to be associated with decreased metabolism of Irbesartan.

539. CYP2C9 genetic polymorphisms significantly affected the pharmacokinetics of flurbiprofen in healthy Korean subjects *Hye-Jin Lim, B.S.*, Dong-Hyun Kim, B.S., Ji-Yeong Byeon, B.S., Young-Hoon Kim, B.S., Se-Hyung Kim, Ph.D. Candidate; School of Pharmacy, Sungkyunkwan University, Suwon, South Korea
PURPOSE: Flurbiprofen is a member of the phenylalkanoic acid derivatives of non-steroidal anti-inflammatory drugs (NSAIDs) and is used to treat inflammation in patients with arthritis. Previous in vitro studies, flurbiprofen is known to be metabolized by CYP2C9, which is plays an important role in the flurbiprofen 4′-hydroxylation. As CYP2C9 is known for a polymorphic enzyme, therefore, the aim of this study was to investigate the influence of *CYP2C9* genetic polymorphism on the pharmacokinetic parameters of flurbiprofen and 4′-hydroxyl flurbiprofen in Koreans.
METHODS: Eighteen healthy subjects were selected and they were divided into two groups according to *CYP2C9* genotype; CYP2C9EM (*CYP2C9*1/*1*, n = 10) and CYP2C9IM (*CYP2C9*1/*3* or **1/*13*, n = 8). After overnight fasting, each subject received a 40-mg single oral dose of flurbiprofen and blood samples were collected up to 24 hour after drug intake. Plasma concentrations of flurbiprofen and 4′-hydroxyflurbiprofen were measured by using a HPLC-MS/MS analytical method.
RESULTS: Area under the plasma concentration-time curve (AUC_{inf}) of flurbiprofen in the CYP2C9IM genotype group was significantly 1.4-fold higher than that in the CYP2C9EM genotype group. Oral clearance (CL/F) of flurbiprofen in the CYP2C9IM genotype group was significantly 32% lower than that in the CYP2C9EM genotype group. The AUC ratio of flurbiprofen to 4′-hydroxyflurbiprofen was lower in CYP2C9IM individuals than in CYP2C9EM individuals.
CONCLUSIONS: *CYP2C9* genetic polymorphism significantly affects the metabolism of flurbiprofen in Koreans.

540. Metabolism of lornoxicam in relation to CYP2C9 genotype status *Dong-Hyun Kim, B.S.*, Hye-Jin Lim, B.S., Ji-Yeong Byeon, B.S., Young-Hoon Kim, B.S., Se-Hyung Kim, Ph.D. Candidate; School of Pharmacy, Sungkyunkwan University, Suwon, South Korea
PURPOSE: Lornoxicam has analgesic and antipyretic effects in part through the non-selective inhibition of cyclooxygenase (COX)-1 and COX-2. It is indicated for the treatment of osteoarthritis and rheumatoid arthritis and for the management of postoperative pain. It is reported that cytochrome P450 2C9 (CYP2C9) is the primary enzyme responsible for the biotransformation of the lornoxicam to its major metabolite, 5′-hydroxylornoxicam. We evaluated the frequencies of *CYP2C9* variant alleles in the Korean population and effects of the *CYP2C9* genetic polymorphism on the pharmacokinetics of lornoxicam.
METHODS: Thirteen healthy Korean volunteers with *CYP2C9*1/*1* (n = 5), *CYP2C9*1/*3* (n = 5) and *CYP2C9*1/*13* (n = 3) were selected for this study. A single oral dose of lornoxicam (8 mg) was administered to each subject after overnight fasting. Blood samples were collected up to 24 hour after drug intake and plasma concentrations of lornoxicam were determined by using liquid chromatography-tandem mass spectrometry system.
RESULTS: C_{max} and AUC_{inf} of lornoxicam in *CYP2C9*1/*3* and *CYP2C9*1/*13* were significantly higher than those in *CYP2C9*1/*1*. Elimination half-life ($t_{1/2}$) of lornoxicam and 5′-hydroxylornoxicam in *CYP2C9*1/*3* and *CYP2C9*1/*13* were significantly longer than that in *CYP2C9*1/*1* ($p < 0.0001$). Also the pharmacokinetic parameter CL/F in *CYP2C9*1/*3* and *CYP2C9*1/*13* were 42.5% and 40% lower than that in *CYP2C9*1/*1* ($p < 0.01$).
CONCLUSION: In conclusion, the *CYP2C9*3* and *CYP2C9*13* alleles are associated with the decreased metabolism of lornoxicam.

541. Effect of CYP2D6*10 allele on the pharmacokinetic parameters of multiple-dose metoclopramide *Dong-Hyun Kim, B.S.*, *Hye-Jin Lim, B.S.*, Ji-Yeong Byeon, B.S., Young-Hoon Kim, B.S., Se-Hyung Kim, Ph.D. Candidate, In-Su Kim, Ph.D.; School of Pharmacy, Sungkyunkwan University, Suwon, South Korea
PURPOSE: Metoclopramide is a dopamine receptor antagonist with primary function to stimulate gastric contractions. Metoclopramide treats nausea and vomiting associated with conditions such as uremia, radiation sickness, malignancy, and emetogenic drugs. CYP2D6 has been identified as a metabolic enzyme of metoclopramide and CYP2D6 is also inhibited by metoclopramide. CYP2D6 is an important drug metabolizing enzyme responsible for metabolism of ~20% of pharmaceutical drugs. Furthermore, CYP2D6 is also a highly polymorphic enzyme. In this study, effect of *CYP2D6* genetic polymorphism on the pharmacokinetics of metoclopramide after multiple dose was determined.
METHODS: Thirty-five healthy Korean volunteers with *CYP2D6*wt/*wt* (**wt* = **1* or **2*, n = 10), *CYP2D6*wt/*10* (n = 11) and *CYP2D6*10/*10* (n = 14) were selected for this study. Each volunteer was ingested a single oral dose of 10 mg metoclopramide for five consecutive days. Blood samples were collected up to 24 hour after drug intake and plasma concentrations of metoclopramide were determined by using LC-MS/MS analytical system.
RESULTS: C_{max} and $AUC_{0\text{-}24}$ of metoclopramide in *CYP2D6*10/*10* group were 41.2 ± 11.4 ng/mL and 282.2 ± 98.0 ng*hour / mL respectively, after multiple-dose metoclopramide, that is 1.46-fold and 1.53-fold higher than those in *CYP2D6*wt/*wt* group ($p = 0.010$ and $p = 0.019$ respectively). Also CL/F (oral clearance) were different between those in *CYP2D6*wt/*wt* group and *CYP2D6*10/*10* group. CL/F in *CYP2D6*10/*10* group was 37.9 ± 20.0 L/hour that is 26.2% lower than those in *CYP2D6*wt/*wt* group ($p = 0.016$).
CONCLUSION: In conclusion, the pharmacokinetics of multiple-dose metoclopramide is significantly affected by *CYP2D6* genotypes.

542. Pharmacokinetics of atomoxetine after administration of paroxetine in relation to CYP2D6 genotype status *Dong-Hyun Kim, B.S.*, Hye-Jin Lim, B.S., Ji-Yeong Byeon, B.S., Young-Hoon Kim, B.S., Se-Hyung Kim, Ph.D.Candidate; School of Pharmacy, Sungkyunkwan University, Suwon, South Korea
PURPOSE: Atomoxetine, a norepinephrine reuptake inhibitor, is a cytochrome P450 2D6 (CYP2D6) substrate. Its effectiveness in the treatment of attention deficit hyperactivity disorder (ADHD) has been demonstrated in children, adolescents, and adults. Paroxetine is a selective serotonin reuptake inhibitor that is widely used in the treatment of mental disorders, including depression, panic disorders, and obsessive compulsive disorder. Paroxetine has been shown to be a potent inhibitor of CYP2D6. Thus, the aim of this study was to investigate the influence of paroxetine, a moderate CYP2D6 inhibitor, on the pharmacokinetics of atomoxetine in relation to different *CYP2D6* genotypes.
METHODS: Forty five healthy Korean subjects were recruited and classified into three different groups according to *CYP2D6*

genotype: *CYP2D6*wt/*wt* (**wt = *1* or **2*, *n* = 16), *CYP2D6*wt/*10* (*n* = 15) and *CYP2D6*10/*10* (*n* = 14). After overnight fasting, each subject received a single oral dose of 20 mg atomoxetine (control phase) and they were given single oral dose of 20 mg paroxetine at 8 A.M. for consecutive seven days. On the day 8, 20 mg atomoxetine was administered to every subject with 20 mg paroxetine (study phase). Blood samples were collected up to 24 hour after drug intake, and plasma concentrations of atomoxetine were determined by using LC-MS/MS analytical system.
RESULTS: In control phase, C_{max} of atomoxetine in each *CYP2D6* groups were lower than that in study phase (all, $p < 0.0001$). $t_{1/2}$ of atomoxetine in each group were 4.5-fold, 2.6-fold and 3.6-fold longer respectively in study phase than those in control phase (all, $p < 0.0001$). In study phase, CL/F of *CYP2D6*wt/*wt* group, *CYP2D6*wt/*10* and *CYP2D6*10/*10* were 91%, 79% and 70% lower than those in control phase (all, $p < 0.0001$).
CONCLUSION: In conclusion, a CYP2D6 inhibitor paroxetine, affects the pharmacokinetics of atomoxetine in relation to different *CYP2D6* genotype status.

543. Evaluation of Col6A1, Col6A3, SH2B3, and PHACTR1 gene polymorphisms in acute coronary syndrome and control groups *Katherine Lemming, Pharm.D. Candidate*, Robert Kidd, Pharm.D., Ph.D., Arthur Harralson, Pharm.D., BCPS, Marcia Brackbill, Pharm.D., BCPS, Jennifer Bryant, Ph.D.; Bernard J. Dunn School of Pharmacy, Shenandoah University, Winchester, VA
PURPOSE: Acute coronary syndrome (ACS) occurs as a result of decreased blood flow to the heart, and encompasses both unstable angina and myocardial infarction (MI). Once damage to the cardiac tissue occurs, remodeling begins and is mediated by cardiac myofibroblasts, which are responsible for depositing collagen VI forming extracellular matrix. Collagen VI, SH2B3, and PHACTR1 genes are associated with cardiac remodeling and have been linked to muscle hypotonia, coronary heart disease, and early-onset MI, respectively. The purpose of this study was to evaluate and compare the genotype and allele frequencies of two functional single nucleotide polymorphisms (SNPs) of the Collagen VI gene, one SNP of the SHR2B3 gene, and one SNP of PHACTR1 gene in ACS and non-ACS control populations.
METHODS: The genotype and allele frequencies for rs2270669 (Col6A3), rs35796750 (Col6A1), rs12526543 (PHACTR1), and rs3184504 (SH2B3) were evaluated in ACS patients and non-ACS control subjects using real-time PCR. Pearson's Chi-square and Student's t-test were used to compare genotype and allele frequencies, respectively.
RESULTS: The genotype and allele frequencies for each SNP were determined in ACS (*n* = 100) and non-ACS control (*n* = 90) groups. No statistically significant differences in genotype or allele frequencies were found. However, the Col6A1 rs35796750 minor allele frequency was 0.403 in the ACS group compared to 0.500 in the non-ACS control group ($p = 0.074$). There was also a trend of differences in genotype frequencies between the ACS and non-ACS control populations for rs35796750 ($p = 0.067$).
CONCLUSIONS: There is currently only a trend in differences with rs35796750, but recruitment is ongoing. Further investigation is also needed to determine the pathophysiological effects of this SNP in collagen VI gene and its potential clinical implications.

Pharmacokinetics/Pharmacodynamics/Drug Metabolism/Drug Delivery

544. Vancomycin: an evaluation of trough monitoring and methods of determining a starting dose *Umima Baig, M.Ed.*, Mara Poulakos, Pharm.D., Dan Brown, Pharm.D., Jamie Fairclough, MPH, Ph.D., MSPharm.; Palm Beach Atlantic University, Lloyd L. Gregory School of Pharmacy, West Palm Beach, FL
PURPOSE: The purpose of this study was to review patient records obtained from a local hospital in order to assess measured vancomycin troughs, extrapolate "true troughs", and evaluate doses initiated in comparison to published dosing charts.
METHODS: One hundred patient records were randomly selected to evaluate vancomycin usage after IRB approval. Exclusion criteria included patients with a fluctuating SCr (changes > 0.4 mg/dL during treatment), troughs measured pre-steady-state, and fluctuating doses. Data were used to calculate: CrCl, extrapolated true trough level, k, vancomycin clearance, and AUC_{24}. IBM SPSS v.22 software was used to analyze the data.
RESULTS: In 42% of the cases, there was a difference greater than 0.5 mg/L between measured and extrapolated true troughs, while 58% were within + 0.5 mg/L. Of those 42 patients, 31% had a mild-moderate infection and 69% a serious infection. Mean actual body weight for the cohort was 75.3 kg, (range 40–181 kg). The mean total daily dose (TDD) recommended by each dosing chart is as follows: hospital (1987 mg); Kullar et al. (3522 mg); Brown et al. (2003 mg). The recommended TDD corresponds with the following AUC_{24}: hospital (609 mg hour/L), Kullar et al. (966 mg hour/L), and Brown et al. (555 mg hour/L), indicating significantly higher doses for Kullar ($p < 0.05$).
CONCLUSION: Current hospital practices may be of concern regarding vancomycin usage. Trough monitoring must be done at the correct time for an accurate measurement of drug concentration in relation to the dosing regimen. Without proper timing, measured troughs may not reflect true trough levels, leading to sub-therapeutic or supra-therapeutic dosing, thereby increasing risk for toxicity. Furthermore, evaluation of different dosing charts indicated vast differences in dosage regimens, some correlating with toxic levels of vancomycin.

545. Delivery of poorly water-soluble drugs using thermosensitive PLGA-b-PEG-b-PLGA hydrogels *Matt McKenzie, Pharmacy Student*[1], David Betts, III, Pharmacy Student[1], Amy Suh, Pharmacy Student[1], Kathryn Bui, Pharmacy Student[1], Abbey Jin, Pharmacy Student[1], Rui Tang, Ph.D.[2], Samuel Achilefu, Ph.D.[2], Hyunah Cho, Ph.D., B.Sc. Pharm.[1]; (1) Pharmaceutics, School of Pharmacy, St. Louis College of Pharmacy, St. Louis, MO (2) Mallinckrodt Institute of Radiology, Department of Radiology, Washington University School of Medicine, St. Louis, MO
PURPOSE: PLGA-b-PEG-b-PLGA hydrogels incorporate multidrugs and exhibit sol-to-gel thixotropy at the body temperature. Despite such appealing physicochemical properties of PLGA-b-PEG-b-PLGA hydrogels, improving convenience in handling, storage stability, and investigating different properties is necessary.
METHODS: PLGA-b-PEG-b-PLGA (1500-b-1000-b-1500) copolymer dissolved in water was mixed with drugs (paclitaxel, rapamycin and/or LS301 (fluorescence-imaging-agent)), dissolved in tert-butanol, with/without sucrose at 60°C, and lyophilized for 24-hours. The lyophilized cake was rehydrated with water and stored/dissolved at 10°C. The physical appearance, reconstitution time, and sol-gel reversibility were determined in various hydrogels (LS301 only; paclitaxel/LS301; rapamycin/LS301; and paclitaxel/rapamycin/LS301). The integrity of various hydrogels was assessed at room temperature and 37°C using an inversion (viscosity against gravity) method. The release kinetics of each formulation was evaluated in PBS buffer (pH = 7.4) at 37°C, via dialysis.
RESULTS: Paclitaxel, rapamycin, and LS301 were incorporated into PLGA-b-PEG-b-PLGA hydrogels. PLGA-b-PEG-b-PLGA hydrogels made a sol (micellar solution, c.a. 86 nm in diameter)-to-gel (aggregation of micelles, >c.a. 280 nm) transition at the body temperature/37°C, followed by a phase separation into a layer of water on top of the gel within 2–5 hours. At room temperature, PLGA-b-PEG-b-PLGA hydrogels were gel-like, but were less viscous and without phase separation. At 37°C, paclitaxel/rapamycin/LS301 hydrogels made a sol-to-gel transition (<30 seconds) and slowly returned to solutions at 10°C in 3–4 minutes. However, those hydrogels carrying LS301 alone, congealed with the most delayed kinetics (>3–5 minutes) at 37°C and turned back to solutions at 10°C (1 minute). Release profiles of contents for PLGA-b-PEG-b-PLGA hydrogels were fit into

one-phase association and shown to be identical. Upon rehydration, without continuous stirring, hydrogels containing sucrose improved reconstitution time, from c.a. 24–48 hours (without sucrose) to c.a. 3–5 hours (with sucrose).
CONCLUSION: Thermoreversible PLGA-b-PEG-b-PLGA hydrogel platforms carrying paclitaxel, rapamycin, and LS301, were formulated using a lyophilization. Properties for hydrogels varied based on hydrophobicity of contents.

546. Development and validation of a rapid high performance liquid chromatography (HPLC) method for the quantification of a rapid-acting antidepressant, Ro 25-6981 in various biological matrices *Julie Phan, Pharm.D. Candidate Class of 2016*, Annh Vo, Pharm.D. Candidate Class of 2016, Jonathan Dorigatti, B.S., Jeffery Talbot, B.S., Ph.D., Venkata Yellepeddi, B.Pharm., Ph.D.; School of Pharmacy, Roseman University of Health Sciences, South Jordan, UT
PURPOSE: Ro 25-6981, is an N-methyl-D-aspartate (NMDA) receptor blocker, with rapid-acting antidepressant activity. The purpose of this study is to develop and validate a rapid HPLC method for the quantitative analysis of Ro 25-6981 in various biological matrices. The reported method will allow us to analyze the amount of Ro 25-6981 in various dosage forms selectively, and can be utilized for the therapeutic drug monitoring and pharmacokinetic evaluation.
METHODS: The HPLC analysis was performed using Waters® 2695 Alliance® instrument equipped with Waters® 2996 PDA detector and Empower 3 software. The column was a Waters® Atlantis™ C18 column (150 × 3.9 mm (i.d); particle size, 3 μm) with mobile phase [acetate buffer (pH 8.0): acetonitrile (55:45 v/v)] pumped at 0.8 mL/minute flow rate in isocratic mode and at 210 nm detection wavelength. The developed method was validated for specificity, accuracy and precision, linearity, robustness etc. For quantification in various plasmas, Ro 25-6981 was extracted using acetonitrile and Ifenprodil was used as an internal standard.
RESULTS: The method resulted in single, sharp peak without any interfering substances at ~ 6.4 minutes. The calibration curve developed by linear regression for concentrations between 1–100 μg/mL was linear with a correlation coefficient (R^2), 0.9987. For all validation parameters tested, the % coefficient of variation (CV) did not exceed 15% and the mean value was within 15% of the nominal value. For plasma studies, the method was able to resolve Ro 25-6981 and internal standard without any interfering substances.
CONCLUSION: A rapid and highly selective reversed-phase HPLC method was developed and validated for a new rapid-acting antidepressant Ro 25-6981. Furthermore, the method was applied for the analysis of Ro 25-6981 in human, rat and mouse plasma. This method can be utilized for routine pharmaceutical and pharmacokinetic analysis of Ro 25-6981.

547. Gastrointestinal stability and oral permeability of a novel rapid-acting antidepressant, Ro25-6981 *Annh Vo, Pharm.D. Candidate Class of 2016*, Julie Phan, Pharm.D. Candidate Class of 2016, Jonathan Dorigatti, B.S., Jeffery Talbot, B.S., Ph.D., Venkata Yellepeddi, B.Pharm., Ph.D.; College of Pharmacy, Roseman University of Health Sciences, South Jordan, UT
PURPOSE: In the United States, approximately 80% of drugs are formulated as oral formulations. Recent trends in drug discovery and development show that the majority of new chemical entities (NCE's) that are good candidates for oral administration were clinically successful. Ro25-6981 is a novel N-methyl-D-aspartate (NMDA) receptor blocker, with rapid-acting antidepressant activity. In the present study, the gastrointestinal stability and oral permeability of Ro25-6981 was investigated to ascertain the deliverability of this NCE by oral route.
METHODS: The gastrointestinal stability of Ro25-6981 was studied in five different simulated gastrointestinal fluids, fasted-state simulated gastric fluid (FaSSGF), fasted-state simulated intestinal fluid (FaSSIF), fed-state simulated intestinal fluid (FeSSIF), United States pharmacopeia simulated gastric fluid (USPGF), and United States pharmacopeia simulated intestinal fluid (USPIF) using high performance liquid chromatography (HPLC). The oral permeability studies were performed using caco-2 cell monolayer permeability assay. The apparent permeability (P_{app}) values were calculated at 0.05 mM AND 0.5 mM concentrations of Ro 25-6981.
RESULTS: The concentration of Ro25-6981 after 3 hours of incubation in FaSSGF and USPGF was within 98–100% and after 6 hours of incubation in FaSSIF, FeSSIF and USPIF was within 91–99%. The P_{app} value for 0.05 mM solution and 0.5 mM of Ro 25-6981 across caco-2 monolayers after one hour of incubation was 1.414×10^{-5} and 3.32×10^{-5} cm/s respectively. There was no reduction in the transepithelial electric resistance (TEER) across caco-2 monolayers after incubating the drug for one hour indicating the membrane integrity.
CONCLUSION: Due to its gastrointestinal stability and concentration dependent oral permeability, Ro25-6981 can be a good candidate for oral administration. Future studies include in vivo oral absorption of in rats and the development of appropriate oral formulation of Ro25-6981. An oral formulation of Ro 25-6981 can be an effectively used as rapid-acting therapeutic drug for the treatment of depression.

548. Uric acid lowering effect of allopurinol in Minnesota Hmong adults with hyperuricemia or gout *Youssef Roman, Pharm.D.*[1], Kathleen Culhane-Pera, M.D., M.A.[2], Shoua Yang, B.A.[2], John Yang, B.S.[2], Muaj Lo, M.D.[2], Robert Straka, Pharm.D., FCCP[1]; (1) Experimental and Clinical Pharmacolgoy Department, College of Pharmacy, University of Minnesota, MN (2) West Side Community Health Services, MN
PURPOSE: Minnesota Hmong exhibit a 2–5 fold higher prevalence of gout and gout-related comorbidities compared to non-Hmong. This unique Asian population perceives allopurinol to be ineffective, which may relate to the documented poor medication adherence amongst Hmong patients with gout. To examine which, if either of these issues are relevant in the Hmong, we compared measurements of serum uric acid (SUA) and urinary uric acid (UA) disposition both pre and post-14 days of allopurinol.
METHODS: From a prospective open-label clinical trial (NCT02371421) and following a 7 day washout of UA lowering drugs, Hmong participants ≥18 years old with CrCl > 30 mL/minute, SUA ≥ 6 mg/dL or documented use of allopurinol or febuxostat received 7 days of 100 mg twice daily followed by 7 days of 150 mg twice daily of allopurinol. Tablet counts were used to quantify adherence while changes in SUA, UA renal clearance ($CL_{(RUA)}$) and % UA fractional excretion (%FEUA) at 0, 2, 4 and 6 hours, were used to estimate allopurinol's response. Pre and post allopurinol measures were compared using a paired t-test with $p < 0.05$ for significance.
RESULTS: Thirty-two Hmong participants (91% male) had a mean (±SD) age of 43.4 (±12.6) years, BMI 32.4 (±5.5), waist circumference 40.7 (±5.1) inches, BP 145/93 (±21/14) mmHg, baseline SUA 9.3 (±1.78) mg/dL, and mean adherence rate of 93 (±7)%. Relative to baseline, allopurinol reduced SUA (9.3 to 5.5 mg/dL, $p < 0.0001$), $CL_{(RUA)(6\ hr)}$ (7.58 to 6.45 mL/min, $p = 0.0478$), $\%FEUA_{(6\ hr)}$ (7.1 to 5.5, $p = 0.0004$), and decreased $Urine_{(UA)}/Urine_{(Cr)(6\ hr)}$ (0.57 to 0.29, $p < 0.0001$).
CONCLUSION: Given our high adherence rate, the Hmong participants responded well to allopurinol in terms of SUA percent reduction (41 ± 11.2%); however, displayed marked inter-subject variability (range 23–60%). Notably, the Hmong have a lower % FEUA and $CL_{(RUA)}$ pre and post allopurinol compared to other groups studied. Given this high inter-subject variability, we will next explore a genetic basis to evaluate this marked variability in response.

549. Caffeine disposition after oral inspiration (aeroshot) compared to an energy drink *Kembral Nelson, B.A.*, Zheyi Hu, Ph.D., S. Casey Laizure, Pharm.D.; Department of Clinical Pharmacy, University of Tennessee Health Science Center, Memphis, TN
PURPOSE: Aeroshot™ is a new marketed device that delivers caffeine as a fine powder inspired into the mouth. Concern has been expressed by the Food and Drug Administration that caffeine could be rapidly absorbed using this device increasing the risk of abuse especially in combination with alcohol. This study compares the pharmacokinetics after administration of 100 mg of caffeine by oral ingestion (energy drink) and by inspiration using the Aeroshot™ device.
METHODS: Subjects ($n = 14$) consumed 100 mg of caffeine administered by oral inspiration (Aeroshot™) or ingestion (energy drink) on two separate study days in a repeated-measures design. Blood samples were collected over 8 hours after caffeine administration. Separated plasma samples were analyzed for caffeine by LC/MS/MS.
RESULTS: The AUC, Cmax, and Tmax were 17,845 ± 7538 versus 16,672 ± 8384 ng/mL*hour, 1993 ± 345 versus 1761 ± 553 ng/mL, and 1.80 ± 0.51 versus 1.74 ± 0.74 hour for the energy drink versus Aeroshot™, respectively. The ratio of the AUC from 0–1 hours divided by the total AUC was 8.7 ± 3.1% versus 7.6 ± 3.7% for the energy drink versus Aeroshot™. No statistical differences were found in disposition between the two administration methods.
CONCLUSIONS: The efficiency of caffeine absorption using the Aeroshot™ device is comparable to an energy drink indicating that absorption through mucous membranes of the oral cavity is comparable to gastric absorption or that caffeine absorption occurs after the inspired powder is swallowed. The abuse potential with the Aeroshot™ device may still exceed typical energy drinks due to the fact that repeated dosing can be administered more rapidly with the Aeroshot™ device versus an energy drink.

550. Using IBW to calculate vancomycin dosing frequency may better account for inter-subject variability Duyen-Anh Pham, Pharm.D.[1], *Yuliya Byakina, B.S.*[2], Alice Chyan, B.S.[3], Riti Gupta, B.S.[3], Manny Saltiel, Pharm.D., FCCP[4], Douglas Steinke, Ph.D.[5], Tina Denetclaw, Pharm.D., BCPS[6]; (1) University of California, San Francisco, CA (2) School of Pharmacy, University of California, San Francisco, CA (3) School of Pharmacy, University of California, San Francisco, CA (4) Comprehensive Pharmacy Services (5) Manchester Pharmacy School, University of Manchester, Manchester, UK (6) Department of Clinical Pharmacy, School of Pharmacy, University of California, San Francisco, San Francisco, CA
PURPOSE: Assess the effect of various methods of calculating CrCl on vancomycin dosing frequency decisions.
METHODS: The ACCP Critical Care PRN was surveyed to determine the variety of ways CrCl is estimated for drug dosing decisions. A total of 74 responses yielded 47 different methods for estimating CrCl. The different methods were used to assign 237 simulation patients into vancomycin dosing frequency groups of CrCl <, 20–49, and ≥50 mL/minute. Simulation patients ranged in age 19–99 years, height 58–77 inches, IBW 45–91 kilograms, TBW 39.7–167 kilograms, and SCr 0.4–11.1 mg/dL. Methods for estimating CrCl showing the greatest differences in the numbers of each dosing frequency group were assessed for differences in simulation patient characteristics in each group.
RESULTS: Using IBW and rounding low SCr to 0.8 showed differences between vancomycin dosing frequency groups based on gender ($p < 0.001$), age ($p = 0.001$), height ($p = 0.013$), IBW ($p = 0.021$), SCr ($p < 0.001$) and CrCl ($p < 0.001$). Using TBW and not rounding up low SCr to calculate CrCl, and calculating renal function as an average of MDRD for non-African American and CrCL for patients ≥80 years old, showed significant differences between vancomycin dosing frequency groups based on SCr ($p < 0.001$) and CrCl ($p < 0.001$).
CONCLUSION: Using IBW and rounding low SCr to 0.8 showed significant differences between vancomycin dosing frequency groups based on gender, age, height, IBW, SCr and CrCl. Using TBW and not rounding up low SCr to calculate CrCl, and calculating renal function as an average of MDRD and CrCL for patients ≥80 years old, showed significant differences between vancomycin dosing frequency groups based on SCr and CrCl only. Published studies suggest using IBW to estimate CrCl may result in more patients reaching and maintaining vancomycin target trough concentrations.

Psychiatry

551. Innovative delivery of pharmacy services at a behavioral health clinic *Sharanjit Kaur, Pharm.D. Candidate 2016*[1], Sarah Hansen, Pharm.D. Candidate 2016[1], Petrus Oliphant, Pharm.D.[2], Benjamin Chavez, Pharm.D.[1]; (1) School of Pharmacy, Pacific University Oregon School of Pharmacy, Hillsboro, OR (2) Central City Concern Old Town Recovery Center, Portland, OR
PURPOSE: To examine the non-compliance rates in an outpatient behavioral health clinic with unique pharmacy services. The role of the pharmacist in this setting will also be described.
METHODS: Central City Concern Old Town Recovery Center, an outpatient behavioral health clinic, established a pharmacist operated medication depot to assist patients at high risk of non-compliance. This service provided patients with more one-on-one time with a pharmacist in order to develop a meaningful relationship when picking up their medication, the ability to come in at a predetermined time, and a more peaceful setting. The pharmacist performed an assessment of the patient during each visit and documented it in the electronic health record. A record of when patients picked up their medications was maintained. Data from the first six months of service were analyzed to produce monthly non-compliance rates for each patient.
RESULTS: In November and December 2014, there were a total of 131 patients being seen at the clinic and the average non-compliance percentages were 14.84% and 14.87%, respectively. From January to April 2015, the number of patients continued to increase. The percentage of days patients were non-compliant were as follows: January (17%), February (13.83%), March (13.82%) and April (16.73%). A significant limitation of this study is that non-adherence rates prior to the implementation of pharmacy services are non-existent; therefore, we are unable to draw comparisons.
CONCLUSION: The pharmacist has a key role in the delivery of health services at this behavioral health clinic, which includes monitoring compliance. The average compliance from November-April was 15.18%. The results from month-to-month were found to be non-significant (p-value = 0.221). Attempts to compare these results to previous studies were not possible due to the paucity of relevant literature available.

552. Ease of access to depression treatment: comparison of a primary care-based psychiatric pharmacist versus treatment within a behavioral health clinic *Michelle Plum, Doctor of Pharmacy Candidate 2017*[1], Richard Silvia, Pharm.D., BCPP[2], Robert Dufresne, Ph.D., Ph.D., BCPP, BCPS[3]; (1) School of Pharmacy, MCPHS University - Boston, Boston, MA (2) Department of Pharmacy Practice, MCPHS University, Boston, MA (3) University of Rhode Island
PURPOSE: This study examined potential improvements in patient access to antidepressant treatment by comparing (1) a clinical psychiatric pharmacist incorporated into a primary care clinic, with (2) standard treatment by a prescriber within a behavioral health clinic (BHC). These two groups were compared on time to be seen for initial evaluation and other factors.
METHODS: The investigators screened the medical records of patients treated at an urban community health center, age 18–65 with a primary diagnosis of depression, who were referred for antidepressant treatment to (1) the clinical psychiatric pharmacist from July 1, 2013 to present, versus (2) the BHC from July 1, 2012 to June 30, 2013. Data regarding patient access to care will

be analyzed using mixed model repeated analysis of variance (ANOVA) upon completion of data collection in August.
RESULTS: The study group included 88 patients while the control group included 23 patients. The time from referral for depression treatment to initial medication evaluation was a mean of 32.9 days (SD ±33.28) for the clinical pharmacist group and 110.7 days (SD±75.69) for the BHC group. A greater percentage of the clinical pharmacist's patients are still in treatment as compared to the BHC patients (58.6% versus 28.0%, respectively). Further results are still pending.
CONCLUSIONS: The data illustrate that incorporation of a clinical pharmacist into a primary care setting can greatly improve access to depression treatment for patients. Patients are seen in less than one-third the time it takes to be seen in a BHC, and are more likely to remain in treatment in this model. This demonstrates that utilization of a clinical pharmacist in this setting is a viable model for the treatment of depression.

Rheumatology

553. Chronopharmacology of prednisolone in rheumatoid arthritis *Christine Attard, B.Sc. Pharmaceutical Science (Hons.) (Melit.)*, Louise Grech, M.Phil, Anthony Serracino-Inglott, BPharm, Pharm.D. (Cinc.), MACCP, MRPharmS, Lilian M. Azzopardi, B.Pharm (Hons), MPhil, Ph.D, MRPharmS; Department of Pharmacy, Faculty of Medicine and Surgery, University of Malta, Msida, Malta
PURPOSE: Prednisolone is broadly used in the management of rheumatoid arthritis (RA), a condition that exhibits a circadian rhythmic variation in the levels of pain felt throughout the day. Influence of the time of administration of prednisolone was evaluated on a case-by-case basis and pain scores and incidence of side effects were noted. Prescribers' perception of chronopharmacology and prednisolone use was also assessed.
METHODS: This single-center, longitudinal study included patients taking prednisolone long-term for the management of RA. From 186 patients assessed, 11 patients made the inclusion criteria, 7 of which were omitted due to exclusion criteria. Baseline values of pain scores and side effects reported by patients ($n = 4$) were compared against scores obtained after the same patients had taken prednisolone once daily at 8AM for 1 week, and scores obtained after they had taken prednisolone once daily at 8PM for 1 week.
RESULTS: All participants were females aged between 55 and 64 years. 3 out of 4 participants reported lower pain scores in the morning when taking prednisolone at 8PM. However, when a paired-sample *t*-test was run, no statistical significance between the morning and evening administration of prednisolone was found ($p = 0.08$).No significant changes in side effects were identified.
CONCLUSION: There is room for further study on the time of administration of prednisolone in RA. All general practitioners and rheumatologists questioned ($n = 23$) were receptive to changing the time of administration of prednisolone should an evidence-based study reveal this to be more beneficial for RA patients.

Substance Abuse/Toxicology

554. Buprenorphine use compared to methadone *Maria Pace, MPharm*[1], Anthony Serracino-Inglott, Pharm.D.[1], Lilian M. Azzopardi, B.Pharm (Hons), MPhil, Ph.D, MRPharmS[2]; (1) Department of Pharmacy, University of Malta, Msida, Malta (2) Department of Pharmacy, Faculty of Medicine and Surgery, University of Malta, Msida, Malta
PURPOSE: This study established the opinions and outcomes of methadone substitution therapy (MST) and buprenorphine substitution therapy (BST); and the cost of MST treatment, which is available for free on the national health scheme.
METHODS: Participants over 18 years of age with a history of opioid dependence were enrolled in the study between September 1 and 27, 2013 from the Substance Misuse Outpatient Clinic (SMOPU), which is a central clinic whereby individuals can obtain free MST. Questionnaires were used to obtain the opinions and outcomes of participants about their treatment, while accounts and other statistical data were obtained to evaluate the cost of MST and BST.
RESULTS: Methadone was prescribed in 92% of 92 patients recruited, while 8% received buprenorphine/ naloxone. A greater proportion of buprenorphine/ naloxone patients ceased in abusing heroin, compared to methadone (100% BST versus 54% MST, $p < 0.05$). A majority of unemployment in both groups (66% MST versus 57% BST) was noticed. More methadone patients complained that their opioid substitution treatment interfered with their employment (65% MST versus 0% BST, $p < 0.05$). The cost per capita of methadone substitution therapy amounted to 658 Euro in 2013, while the gross expenditure on buprenorphine and buprenorphine/ naloxone substitution treatments was 285,238 Euro in that same year.
CONCLUSIONS: BST was shown to be superior to methadone in terms of having more heroin-free individuals and a report of less interference with work. Patient accessibility to BST should be increased by considering its inclusion on the national formulary list and thereby achieve better treatment outcomes and workforce among these individuals.

Transplant/Immunology

555. Does timing of calcineurin inhibitor initiation matter? Single center experience with en-bloc kidney transplantation Maya Campara, Pharm.D., BCPS[1], *Oksana Kucher, BA, MBA*[2], Kelly Galen, Pharm.D., BCPS[1], Sanjeev Akkina, M.D.[3], Enrico Benedetti, M.D.[4], Ignatius Tang, Pharm.D., M.D.[3]; (1) Department of Pharmacy Practice, University of Illinois Hospital and Health Sciences System, Chicago, IL (2) University of Illinois College of Pharmacy, Chicago, IL (3) Department of Medicine, Nephrology, University of Illinois Hospital and Health Sciences System, Chicago, IL (4) Department of Surgery, University of Illinois Hospital and Health Sciences System, Chicago, IL
PURPOSE: En-bloc kidney transplantation (txp) has yielded excellent outcomes. To minimize vascular complications and nephrotoxicity, CNI therapy is often delayed. The purpose of our study is to investigate impact of postoperative CNI management on 1-year graft function in our en-bloc recipients.
METHODS: This is a retrospective review of adult en-bloc kidney recipients between 2001 and 2013. Per institution protocol, timing of CNI initiation for this patient population is decided by the operating surgeon. The primary objective was to compare one year eGFR between patients that received CNI therapy early (≤48 hours) or late (>48 hours) post-txp.
RESULTS: Twenty-one en-bloc kidney txps were included in analysis. Ten patients were stratified into early CNI group. There are no differences in baseline characteristics between early and delayed CNI groups. Although lymphocyte depleting induction use was higher in the delayed CNI group (100% versus 50%, $p = 0.0124$), there was no difference in eGFR between groups at one year (84.9 ± 27.8 mL/min/m^2 and 80.5 ± 21.4 mL/min/m^2 in early and delayed CNI groups, respectively) or at any other time point. Comparable therapeutic tacrolimus trough was observed at 10 days (11.5 ± 4.9 ng/mL in early CNI group and 12.1 ± 7.5 ng/mL in delayed CNI group) and 30 days (9.3 ± 1.4 ng/mL in early CNI group and 9.9 ± 3.7 ng/mL in delayed CNI group). There was no difference in DGF or rejection incidence between the groups.
CONCLUSION: Based on graft and patient outcomes, timing of CNI did not appear to impact function in our cohort of patients.

556. Random tacrolimus levels in the emergency department *Brittany Lee, B.S.*[1], Iyoung Jung, B.S.[2], Maya Campara, Pharm.D., BCPS[3]; (1) 833 S. Wood St, University of Illinois at Chicago College of Pharmacy, Chicago, IL (2) University of Illinois College of Pharmacy, Chicago, IL (3) Department of Pharmacy Practice, University of Illinois Hospital and Health Sciences System, Chicago, IL

PURPOSE: Tacrolimus (TAC) is the most frequently used immunosuppressant in the USA today. The narrow therapeutic index requires frequent 12-hour trough monitoring and dose adjustment. TAC trough analysis can cost as much as $450 per level. Transplant patients often have random TAC levels drawn in the emergency room (ER) that can amount to significant cost to the hospital. Our primary objective is to assess the frequency of appropriately obtained TAC levels in the ER and determine if any intervention is warranted.
METHODS: We conducted a retrospective chart review of all TAC levels ordered in the ER from January 2010 to December 2014. The appropriately drawn TAC level was defined as 2 hours +/- anticipated 12-hour trough (7AM-11AM or 7PM-11PM). Data collection consisted of patient demographics including age, gender, ethnicity, and type of transplant; TAC level and timing obtained during the ER visit, indication for ER visit, time since last clinic follow up and TAC goal trough as per last clinic note.
RESULTS: There were a total of 109 TAC levels ordered in the ER during the study time period. Majority of the patients were female (60%), African American (46%), kidney transplants (85%) with mean age of 46 ± 14.7 years. Of the 109 TAC levels evaluated, 61 (56%) were drawn inappropriately, 46 (42%) were drawn within desired time range, and 2 (2%) were inconclusive. The average time since last clinic visit for the inappropriately drawn TAC group was 36 days versus 53 days for the appropriate TAC group.
CONCLUSION: Most TAC levels obtained in ER were drawn outside the defined appropriate time frame. Education of ER staff can potentially result in significant cost saving to the hospital.

Women's Health

557. Study of challenges and opportunities to adequately represent women in health and clinical research for gender differences in drug safety and efficacy *Yun-Kyoung Song, M.S.*, Hee-won Seo, M.S., Nayoung Han, Ph.D., Jung-Mi Oh, Pharm.D.; College of Pharmacy, Seoul National University, Seoul, South Korea
PURPOSE: Studies have shown that gender as a variable contributes to differences in the safety and efficacy of drugs. This study was performed to compare the infrastructure of regulations, scientific researches and policies related to women's health, and to provide the body of evidence on how to adequately represent women in health and clinical research to ultimately promote a better understanding of gender differences in drug safety and efficacy in South Korea.
METHODS: The regulatory requirements and policies for women's health were compared among the US Food and Drug Administration, the European Medicines Agency, and the Health Canada. The government-led scientific researches for gender differences were summarized, and the current status of clinical trials in women were analyzed using ClinicalTrials.gov and Medline databases. The strategic plan for the advancement of women's health and clinical research in South Korea was drawn from a focus group interview and an analytic hierarchy process.
RESULTS: There have been independent departments or agencies for women's health in the drug regulatory authorities in the developed countries. They have constructed a regulatory and political infrastructure to improve the quality of clinical researches for the evaluation of gender difference in drug safety and efficacy. Thus, it is necessary to establish regulatory infrastructures for women's health in South Korea. Moreover, basic pharmacology or genome studies for gender difference have been performed especially in cardiovascular, immunologic, or infectious diseases. However since the overall proportion of females in the early-phase clinical trials was less than males, the strategy to increase the women's participation in clinical research is required to account for gender differences in drug safety and efficacy.
CONCLUSION: Based on the findings from the developed countries regarding the women's health and clinical research, policies and health plans for strengthening drug safety and efficacy in women need to be developed in South Korea.

Late-Breakers

701. Geranylgeranylacetone induces apoptosis via mitochondrial pathway in human melanoma cells *Myo-Kyoung Kim, Pharm.D., BCPS*[1], Aj-Reum Jo, M.S. Candidate[2], Hyo-Soon Jeong, Ph.D.[2], Hey-Young Yun, Ph.D.[2], Kwang-Jin Baek, Ph.D.[2], Nyoun-Soo Kwon, Ph.D.[2], Dong-Seok Kim, Ph.D.[2]; (1) Pharmacy Practice, University of the Pacific, Stockton, CA (2) College of Medicine, Chung-Ang University, Seoul, South Korea
PURPOSE: To test anticancer effects of geranylgeranylacetone (GGA), an isoprenoid compound, on human melanoma cells.
METHODS: The human melanoma cell lines, G361, SK-MEL-2, and SK-MEL-5 were treated with GGA at various doses (1–100 μM). Cell viabilities were measured by crystal violet assays. Western blot analysis is adopted to test (1) phosphorylation of p38 MAPK and JNK (2) proteolytic processing of caspase-3, 8, −9, and PARP and (3) expression of Bax, Bcl-2, p53, and MITF. These are well-known key markers of cells undergoing apoptosis.
RESULTS: GGA significantly reduced the viability of G361, SK-MEL-2, and SK-MEL-5 human melanoma cells at concentrations above 10 μM, which suggested the death of tested cells. Western blot analysis showed the phosphorylation of p38 MAPK and JNK after GGA treatment. It also showed the activation of caspase-3, caspase-9, and PARP cleavage. GGA also induced p53 and Bax expression, but did not affect Bcl-2 and MITF. It suggests that GGA induced apoptosis through intrinsic pathway.
CONCLUSION: GGA may be considered for further development as a potential agent for melanoma.

702. Evaluation of adherence with insulin initiation recommendations at a suburban family medicine clinic Kira B. Harris, Pharm.D., BCPS, CDE, *Jacqueline L. Olin, M.S., Pharm.D., BCPS, CDE, FCCP*; Wingate University School of Pharmacy, Wingate, NC
PURPOSE: The American Diabetes Association recommends insulin initiation when A1c≥10%. The primary purpose of this study was to determine compliance with this recommendation at an outpatient family medicine clinic. Secondary objectives were to determine if initiation of insulin within 3 weeks of an A1c≥10% increased the rate or decreased the time to achieve an A1c < 7%, and to determine if pharmacist involvement increased the rate of reaching an A1c < 7%.
METHODS: The medical records of 121 patients with type 2 diabetes mellitus (T2DM) and A1c≥10% from January 1, 2014 to December 31, 2014 were reviewed in this IRB-approved analysis. Patients already receiving insulin or those without a follow-up A1c were excluded. Data included patient demographics, duration of diabetes, baseline and follow-up diabetes medications, baseline and follow-up A1c values, and pharmacy referrals.
RESULTS: Fifty-five patients with a mean age of 55 ± 11.9 years, mean diabetes duration 6.4 years, and mean baseline A1c 11.7% were included. Patients were receiving no therapy (29%), monotherapy (27%) or dual therapy (29%) at baseline. Insulin was initiated in 5 patients (9.1%, $p < 0.05$) within 3 weeks of the qualifying A1c. Another 5 patients ($p < 0.05$) received insulin at some point during the study. An A1c < 7% was achieved in 35.6% of patients not receiving insulin, 20% of patients receiving immediate insulin, and no patients who received insulin after 3 weeks. The mean time to A1c < 7% was 6 months for patients not on insulin and 3 months for those receiving immediate insulin. Thirty-three percent of patients who met with a pharmacist reached an A1c < 7% compared to 30% of patients who did not.
CONCLUSION: Adherence with insulin initiation recommendations and rate of achieving A1c < 7% in patients with A1c≥10%

and T2DM is low at this clinic and increasing pharmacy involvement may increase the rate of reaching goal A1c.

703. The impact of the LACE score and comprehensive medication management on hospital readmission *Anita Sharma, Pharm.D., BCACP*[1], Neal Patel, Pharm.D. Candidate 2016[2], Kyle Turner, Pharm.D.[2], Margaret Wallace, Pharm.D., M.S., BCACP[1]; (1) HealthEast Care System, St. Paul, MN (2) University of Minnesota College of Pharmacy, Minneapolis, MN

PURPOSE: Poor coordination and communication during discharge is associated with 50% of hospital medication errors and 20% of adverse drug events. Fewer than 50% of patients have care coordinated with their primary care providers within two weeks of discharge. The LACE index is a validated tool, and its score has been used in literature to stratify patients at high risk of 30-day readmission. However, LACE doesn't predict the risk of medication-related readmission. This is a limitation, since two-thirds of adverse events after hospital discharge are attributed to medications, leading to increased costs in healthcare. Comprehensive medication management (CMM) has been shown to improve patient outcomes and decrease avoidable readmissions. This quality improvement initiative aims to leverage CMM to reduce readmissions in high-risk discharged patients taking multiple medications.

METHODS: To facilitate care transitions, HealthEast Care System implemented a process at discharge that directs patients with LACE ≥10 to Care Management and Clinic Coordinators to facilitate appointments with providers and pharmacists in clinic 3–7 days after discharge. The scope of this project was to impact care in patients with a LACE score <10. Discharge data was evaluated from one HealthEast hospital from 7/2015 to 9/2015. This data calculated the percent of patients readmitted by number of medications and LACE score.

RESULTS: Globally, readmission rates increased as the number of medications at discharge increased. 54% of patients were discharged with ≥ 5 medications and LACE of 5–9 compared to 19% with LACE ≥10.

CONCLUSION: This preliminary data builds on using the LACE score alone to identify patients at risk of readmission. A new process will be implemented where patients discharged with a LACE score of 5–9 taking ≥ 5 medications will be referred to pharmacists in primary care for CMM. We will evaluate the impact of this expanded process on readmission.

704. Efficacy and safety of propranolol in Mexican patients with infantile hemangioma *Saul Castaneda, Ph.D.*[1], Jose Luis Sanchez Palacio,[1], Hermelinda De la Cruz Duran,[2], Esbeydy Garcia Lopez, M.D.,[3]; (1) Faculty of Chemical Sciences and Engineering, Autonomous University of Baja California, Tijuana, Mexico (2) Pharmacy Deparment, Children's Hospital of the California′s, Tijuana, Mexico [3]Dermatology Deparment, Children's Hospital of the California′s, Tijuana, Mexico

PURPOSE: Infantile hemangiomas (IH) are the most common vascular tumors of childhood, are presented by 10% in children less than one year. Propranolol one β-blocker mainly indicated for hypertension has proven effective in reducing this type of tumors. In Mexico there are no studies that evaluate the efficacy or parameters to guide treatment with propranolol in patients with IH. The purpose of this study is evaluate the efficacy and adverse effects of propranolol in Mexican pediatric patients diagnosed with infantile hemangioma, treated with an extemporaneous solution of propranolol.

METHODS: An open prospective observational study at the Children's Hospital of the California′s in Mexico was performed in patients diagnosed with infantile hemangioma, between the ages of 3–12 months. Patients were treated with an oral solution of propranolol prepared for the pharmacist in doses ranging from 0.5–2.5 mg/kg per day. The treatment efficacy was assessed using a visual scale clinical improvement and measurement of hemangioma, safety of propranolol was determined based on the adverse effects reported.

RESULTS: In a period of 24 months 42 patients were treated, 68% female and 32% male. The IH location was mainly in head and neck (59%). The effectiveness was proven in 97.5% of patients. Treatment had an average duration of 10.5 ± 3.5 months. Children who started therapy before five months of age had a significantly better response and shorter duration of treatment. The average effective dose was 1.5 mg/kg/day. On six patients (16%) cases of adverse effects occurred (insomnia, hypertension, and diarrhea). The reduction rate was determined by the measurements of the hemangioma, which was 10% of total volume each month.

CONCLUSION: Treatment with propranolol in this group of Mexican pediatric patients, proved to be safe and effective at an average dose of 1.5 mg/kg/day, reducing the size and coloration of hemangioma; with a minimum incidence of adverse effects.

705. Clinical outcomes from de novo weight-based dosing compared to conservative dosing of tacrolimus in kidney transplant recipients *Angela Maldonado, Pharm.D., BCPS, CPP*[1], Kristen Szempruch, Pharm.D., BCPS[1], April Miller Quidley, Pharm.D., BCPS, FCCM[2], Jenelle Hall, Pharm.D.[3], Carl Haisch, M.D.[4]; (1) Department of Transplant Surgery, Vidant Medical Center, Greenville, NC (2) Vidant Medical Center, Greenville, NC [3]Department of Pharmacy, New Hanover Regional Medical Center, Wilmington, NC (4) Department of Transplant and Surgical Immunology, East Carolina University, Greenville, NC

PURPOSE: Tacrolimus remains a part of standard post-transplant maintenance immunosuppression (IS) in kidney transplant recipients (KTR) with largely variable center-specific dosing regimens. A common reason for variability in dosing and use of initial low doses following transplantation is to minimize the vasoconstrictive effects of CNI in the acute post-operative phase and avoid presumed contribution to delayed graft function (DGF).

METHODS: To determine outcomes from de novo tacrolimus weight based dosing (WDG) compared to a conservative dosing regimen (CDG), we reviewed records of adult KTR. Twelve months of the CDG (1 mg PO BID) were compared with twelve months of the WDG, (0.1 mg/kg/day divided BID). Primary endpoint was incidence of DGF; secondary endpoints included time to therapeutic tacrolimus trough, therapeutic drug monitoring and associated costs; dose adjustments; renal function, length of stay; infections, donor specific HLA antibodies (DSA), and incidence of biopsy proven acute rejection (BPAR).

RESULTS: There was no difference in the primary endpoint of DGF between the two groups; 18 patients (20.7%) CDG versus 16 patients (18.4%) WDG, $p = 0.85$. Secondary endpoint were not significant with exception of mean time to therapeutic trough (8.3 days WDG versus 13.8 days CDG, $p < 0.0001$), higher mean tacrolimus costs ($37.26 versus $27.77, $p < 0.0001$), dose changes (1.2 versus 2.2, $p < 0.0001$) and length of stay, (4.7 versus 5.8 days, $p = 0.005$).

CONCLUSION: Increasing tacrolimus dosing from a standard of 1 mg orally twice daily to a weight based regimen did not adversely affect the incidence of DGF or overall renal function in the first 90 days post-kidney transplant. These findings are consistent with previous reports and may allay fears of utilizing de novo weight based dosing of tacrolimus in the immediate period post-transplantation.

706. Evaluation of patient and emergency department characteristics associated with inpatient sepsis mortality: comparative analysis between sepsis and severe sepsis *Shereef Ali, Pharm.D., BCPS*[1], Nikunj Vyas, Pharm.D.[2], Anthony Fryckberg, Pharm.D., BCPS[3], Kelly Schiers, D.O.[4]; (1) Department of Pharmacy, Kennedy Health, Cherry Hill, NJ (2) Department of Pharmacy, Kennedy Health, Stratford, NJ [3]Department of Pharmacy, Kennedy Health, Sewell, NJ (4) Department of Pulmonary/Critical Care Medicine, Kennedy Health, Sewell, NJ

PURPOSE: The purpose of the study is to evaluate the impact of patient characteristics, early goal directed therapy, and appropriateness of initial antimicrobial management on in-hospital mortality in the setting of sepsis.
METHODS: We performed IRB-approved, retrospective chart review from January-April 2015 at three university teaching hospitals. Patients presenting at the ED with severe sepsis were matched with (age, sex, and renal function) patients with non-severe sepsis. Patient characteristics and outcomes were analyzed between the two groups. The primary endpoint was to evaluate 7- and 28-day mortality between the two groups. Secondary endpoints included impact of appropriate initial antimicrobial management and early goal directed therapy on in-hospital mortality.
RESULTS: There were total of 80 patients in this study, 43 patients in the severe sepsis (SS) group and 37 patients in the non-severe sepsis (NS) group. The median times to in-hospital mortality for the severe sepsis and non-severe sepsis groups were 8.5 days and 10 days, respectively (p = 0.78). Seven day mortality in SS was 48.8% compared to 56.7% in NS group (p = 0.25). Appropriate empiric antimicrobial therapy was initiated in 60.4% and 62.1% of patients in the SS and NS groups, respectively (p = 0.88). Antibiotics were administered in less than 3 hour in 74.4% of patients in SS group and 62.1% in NS group (p = 0.04). Seven day in-hospital mortality rate was 48.8% and 56.7% for patients in the SS and NS group on vancomycin, respectively (p = 0.32). About 6.9% of patients in the SS group and 35.1% of patients in the NS group had therapeutic trough within 72 hours (p = 0.001).
CONCLUSION: There was no statistically significant difference between median time-to-mortality and 7 or 28-day mortality rates between SS and NS patients. Patients in SS group were more likely to receive antibiotics appropriately however; empiric antimicrobial selection and appropriate early goal directed management didn't affect time to mortality significantly.

707. Combination of opiates and psychoactive medications for risk of falling in a veteran affairs extended care facility *Jason Moss, Pharm.D.*[1], Brenda Jamerson, Pharm.D.[2], Richard Sloane, MPH[3], Jack Twersky, M.D.[4], Cathleen Colon-Emeric, M.D., MHS[4]; (1) Campbell University College of Pharmacy and Health Sciences/Durham VA GRECC (2) Duke Center for BioBehaviorial Health Disparities Research/Duke University Psychiatry and Behavioral Sciences/Durham VA GRECC [3]Duke University Center for the Study of Aging/Durham VA GRECC (4) Duke University Medical Center/Durham VA GRECC
PURPOSE: Opiates alone have not consistently been associated with falls risk; however, some evidence suggests that the combination of opiates and other psychoactive medications may increase falls. Our objective was to explore the association between psychoactive medications and risk of falling in a skilled nursing facility population receiving opiates.
METHODS: We conducted a retrospective frequency matched cohort study in a Veteran Affairs Community Living Center (CLC) in Durham, NC between January 1, 2007 and December 31, 2008. All 148 patients sustaining a fall during this time period were included. A comparison cohort of 148 similar patients without falls was randomly selected from the same time period and matched 1:1 by admission reason and ambulation status. Medications administered 48 hours prior to the fall event were collected for both the falls and comparison cohorts. The odds ratios (ORs) and 95% CI's of receiving an opiate alone and with other classes of psychoactive medications were calculated.
RESULTS: Sixty-eight (46.0%) in the falls cohort received at least one dose of an opiate within 48 hours of their fall event, compared to $n = 64$ (43.2%) of controls (p value = 0.64). The odds of being on an opiate and antidepressant was 79% greater in fallers compared to non-fallers (OR 1.79, CI 1.05, 3.06), but was not different from the odds of receiving an antidepressant alone (OR 1.8, CI 1.13, 2.97). The odds of receiving an opioid and anticonvulsant were 2× higher in fallers compared to non-fallers (OR 2.06, CI 1.13, 3.76), which was slightly higher than the odds of receiving an anticonvulsant alone (OR 1.66, CI 1.02, 2.68).
CONCLUSIONS: Antidepressants and anticonvulsants are associated with an increased risk of falling when taken alone and in combination with an opiate. The increased falls risk is not potentiated in patients concurrently receiving opiates.

709. Evaluating the accuracy of several different methods for estimating renal function for the purpose of dosing medications *Daniel Longyhore, Pharm.D., BCACP*[1], Leslie Johnson, Pharm.D., BCPS[2]; (1) Department of Pharmacy Practice, Wilkes University, Wilkes-Barre, PA (2) St. Luke's University Health Network, Bethlehem, PA
PURPOSE: The means by which clinicians estimate creatinine clearance for adjusting drug doses is variable and subjective. The purpose of this investigation is to evaluate the accuracy of different methods for estimating creatinine clearance compared to measured creatinine clearance.
METHODS: We identified all patient results from a 24-hour urine collection for creatinine clearance between 2011 and 2014. These were cross referenced with patient records for serum creatinine results collected within 48 hours of the urine collection date. Women who underwent 24-hour urine collection for creatinine clearance during a pregnancy were excluded. Patient records were used to calculate an estimated creatinine clearance using several means including Cockcroft-Gault (multiple variations), Modification of Diet in Renal Disease (MDRD), Jelliffe, Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI), and Salazar-Corcoran.
RESULTS: Resulst were then compared to the measured creatinine clearance using an intraclass correlation coefficient (two-way mixed model for absolute agreement). A coefficient of greater than 0.7 was considered acceptable agreement. Results: The analysis included 408 records (51% male, mean age 58.8 years) over a 4-year period starting in 2011. For each of the estimation calculations, the correlation to the measured clearance was poor and none provided results of at least acceptable agreement. Intraclass correlation coefficients included Cockcroft-Gault (ideal body weight) 0.211, Cockcroft-Gault (actual body weight) 0.289, MDRD 0.388, Jelliffe 0.194, CKD-EPI 0.231, and Salazar-Corcoran (for patients with BMI >30) 0.346. Estimation equation adjustments such as using a serum creatinine of at least 1 mg/dl for persons >65 years or adjusting IBW by 20 to 40% for obese patients did not yield any better correlations.
CONCLUSION: The available methods for estimating creatinine clearance are poorly correlated with measured creatinine clearance results. Preference for one estimation method over another for universal application is not justified by accuracy.

710. Cost-effectiveness analysis of posaconazole prophylaxis in Singapore *Caroline Tee, Pharm.D., BCPS*[1], Ai Leng Khoo, Ph.D.[2], Louis Chai, M.D., Ph.D.[3]; (1) Pharmacy, National University Hospital, Singapore, Singapore (2) Pharmacy & Therapeutics Office, Group Corporate Development, National Healthcare Group, Singapore, Singapore [3]Division of Infectious Diseases, University Medicine Cluster, National University Health System, Singapore
PURPOSE: Immunocompromised hosts such as those with haematological malignancies are at high risk of developing invasive fungal infection (IFI). Prophylaxis with posaconazole has proven effective in reducing IFI and mortality but raise the question of affordability. We evaluated the cost-effectiveness of posaconazole versus fluconazole in preventing IFI in acute myeloid leukaemia (AML) patients.
METHODS: A two-part decision analytic model was constructed from patient perspective over a lifetime horizon. The decision tree simulated antifungal prophylaxis and subsequent Markov model simulated the course of the primary disease (AML). Transition probabilities between health states were derived from published,

local hospital and epidemiological data. Resource use and their costs were obtained from local hospital.
RESULTS: Posaconazole prophylaxis prevented 0.06 episodes of IFI and resulted in 0.142 life year (LY) saved per patient compared with fluconazole. The incremental cost-effectiveness ratios (ICER) of SGD6035 per life-year saved and SGD14,289 per IFI avoided, were within the willingness-to-pay (WTP) threshold of SGD70,000. The probabilistic sensitivity analysis showed that at a WTP threshold of SGD35,000 and SGD70,000 per LY saved, the probability of posaconazole being cost-effective was 96% and 99% respectively.
CONCLUSION: Posaconazole was superior compared to fluconazole in reducing IFI and all-cause mortality. Posaconazole was considered a cost-effective prophylactic strategy for AML patients undergoing chemotherapy in Singapore.

711. Pneumococcal immunization rates in pediatric cystic fibrosis patients *Valerie Tran, Pharm.D. Candidate*, Jessica Le, Pharm.D. Candidate, Jeffery T. Zobell, Pharm.D., Jared A. Olson, Pharm.D., Heather Balch,M.D., Christopher W. Miller, M.D., Sara M. Lamb, M.D.; University of Utah College of Pharmacy
PURPOSE: The purpose of this retrospective chart review is to determine the pneumococcal series immunization rate in patients hospitalized at Primary Children's Hospital (PCH) with cystic fibrosis (CF). The CF hospital admissions for the past two years (children ages 2–18 years) will be compared against the Utah Statewide Immunization Information System (USIIS) to determine the rate of PCV-7, PCV-13, and PPSV-23 immunization in these patients. The hypothesis is the rate of pneumococcal immunizations amongst pediatric CF patients in Utah is less than 50%.
METHODS: Data was collected through a retrospective chart review of patients admitted to PCH between January 1, 2011 and December 31, 2013. Determination of PCV-7, PCV-13, and PPSV-23 immunizations of eligible patients was done through a query of USIIS, as accessed through the PCH USIIS access license. Patients were included in the study if they were 2–18 years old, with a primary diagnosis of CF. Patients were excluded if they were greater than 18 years old, did not have a primary diagnosis of CF, or a record in USIIS. Data were analyzed using descriptive statistics of frequency and percentage of immunizations received.
RESULTS: The retrospective chart review identified 293 eligible patients. Of these patients, 1 was excluded for not having a USIIS record. Results found 128 (43.84%) patients began the PCV-7 series, with 66 (22.6%) completing the series. For PCV-13, 60 (20.55%) patients began the series, with 22 (7.53%) completing the series. For PPSV-23, 48 (16.44%) patients received the vaccine.
CONCLUSION: The results confirm the study hypothesis that pneumococcal immunization rates are less than 50% in pediatric CF patients admitted to PCH. Rates of immunization with the completed series of PCV-7, PCV-13, and PPSV-23 were found to be 22.6%, 7.5% and 16.4% respectively. A quality initiative aiming to improve pneumococcal vaccination rates is now underway at PCH.

712. Community pharmacists' perceptions of neonatal abstinence syndrome and opioid-based medication-assisted treatment in Northeast Tennessee *Rajkumar Sevak, Ph.D., RPh*[1], Ivy Click, EdD[2], Jeri Ann Basden, M.S.[2], Nicholas Hagemeier, Pharm.D., Ph.D.[1]; (1) Department of Pharmacy Practice, Gatton College of Pharmacy, East Tennessee State University, Johnson City, TN (2) Department of Family Medicine, Quillen College of Medicine, East Tennessee State University, Mountain Home, TN
PURPOSE: The incidence of neonatal abstinence syndrome (NAS) in Tennessee has increased over ten-fold in the last 15 years and is strongly linked to increased maternal use and abuse of prescription and illicit opioids. Pharmacists are uniquely positioned to engage in dispensing and patient-care activities associated with medication-assisted treatment (MAT) of addiction during pregnancy. The aim of this study was to examine perceptions of pharmacists regarding MAT, MAT providers, and NAS as a consequence of MAT. Given increased NAS prevalence over the last two decades, we also evaluated perceptions of younger versus older pharmacists.
METHODS: One hundred pharmacists were randomly selected from a state directory of 332 licensed community pharmacists in the 8-county Northeast Tennessee region. Survey administration followed the Tailored Design Method. Survey items were responded to using a 7-point Likert scale and assessed pharmacists' perceptions regarding pregnancy substance use concerns, estimates of NAS in Tennessee due to MAT, attitudes toward MAT in pregnancy, and trustworthiness of buprenorphine prescribers. Independent samples *t*-tests were used to compare NAS estimates and composite MAT-attitude scores across pharmacists' age (<45 versus ≥45). The East Tennessee State University Institutional Review Board approved the study.
RESULTS: Substance use during pregnancy was a concern of a majority (75.8%) of pharmacist respondents. NAS estimates attributable to MAT were significantly greater for younger pharmacists (61%) as compared to older pharmacists (30%, $p = 0.012$). Attitudes of young pharmacists towards MAT were significantly less positive than those of older pharmacists (3.1 ± 0.5 versus 5.0 ± 0.4, $p = 0.01$). Overall, 3.7% of pharmacists indicated that they trust regional buprenorphine prescribers.
CONCLUSION: A large majority of pharmacists are concerned about substance use during pregnancy in their practice and report mistrust of buprenorphine prescribers. Younger pharmacists had relatively negative perceptions of MAT during pregnancy, which may be related to their more accurate estimates of MAT-associated NAS cases in Tennessee.

714. Provider acceptance rates and perceived usefulness of pharmacogenetic recommendations provided by a pharmacist and clinical decision support tool *Tyler Mamiya, Pharm.D.*[1], Eman Biltaji, BPharm, M.S.[2], Kristine Ashcraft, MBA[1], Ranjit Thirumaran, M.Pharm, Ph.D.[1], Rachel Sass, Pharm.D.[1], Diana Brixner, RPh, Ph.D.[2]; (1) Genelex Corporation, Seattle, WA (2) Department of Pharmacotherapy & Pharmacotherapy Outcomes Research Center, University of Utah College of Pharmacy, Salt Lake City, UT
PURPOSE: To determine the acceptance rate and general usefulness of recommendations encompassing clinical pharmacist interpretation of pharmacogenetic test results in conjunction with a clinical decision support tool (CDST). Pharmacogenetic testing holds significant potential and introduces an innovative practice model through clinical pharmacist interventions.
METHODS: This prospective observational study was comprised of patients ≥65 years old taking 3 + medications including at least one high risk CYP-metabolized medication and receiving pharmacogenetic testing (CYP2D6, CYP2C9, CYP2C19, CYP3A4, CYP3A5 and VKORC1). Personalized reports were sent to the provider after pharmacogenetic testing and pharmacist interpretation using a CDST (YouScript®). Provider acceptance rates of recommendations, reasons for not following recommendations and perceived usefulness were entered directly by the physician in an electronic Case Report Form.
RESULTS: Seven providers across three clinics were involved in the study including 205 patients with 381 total recommendations given. A total of 46% of recommendations (174 out of 381) were accepted by the providers, ranging from 43% to 83% depending on the strength of the recommendation severity. The most common reasons for not following recommendations were: patient currently tolerating the medication (49%) and provider already monitoring (41%). Overall, 95% of providers found the recommendations useful in clinical decision making. Main reasons cited for the recommendations being useful in clinical decision making were that the patient's drug regimen was changed as a result (15.6%) or previously unrecognized drug-gene or drug-drug interactions were identified (67.3%).

CONCLUSIONS: Pharmacogenetic testing with a CDST and pharmacist interpretation was found clinically useful by the majority of providers. Roughly half of the recommendations were accepted and in the remaining cases the patient tolerated the medication or the provider was already monitoring. This practice model may help improve patient care and outcomes by enhancing personalized care as well as alerting providers to previously unrecognized drug-gene and drug-drug interactions.

715. Outcomes in hospitalized decompensated cirrhotic patients presenting with spontaneous bacterial peritonitis (SBP) based on severity of systemic inflammatory response syndrome (SIRS)

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PURPOSE: In advanced cirrhotics with SBP, a heightened cytokine response along with systemic inflammation from endotoxemia has been shown to play a major role in the development of circulatory dysfunction, including kidney injury. The aim of our study was to determine outcomes in hospitalized cirrhotic patients with SBP based on SIRS severity grades receiving standard treatment for SBP.

METHODS: Records of patients admitted to a tertiary care University Hospital between 4/09–4/14 with an ICD-9 code 567.23 (SBP) were reviewed. Patients were divided into two groups: <2 SIRS and ≥2 SIRS criteria. Inclusion: ≥18 years of age, diagnosis of cirrhosis, SBP, and ≥5 days of systemic antibiotics. Groups were compared to evaluate development of renal failure (RF) defined as acute kidney injury (AKI)/hepatorenal syndrome (HRS), hepatic encephalopathy, and 30-day mortality/liver transplantation (LT) within 30 days of diagnosis.

RESULTS: Eighty patients included: 33 patients <2 SIRS group and 47 patients ≥2 SIRS group. RF was identified in 21% of <2 SIRS group versus 43% in ≥2 SIRS group, $p = 0.047$. The percentage of patients with RF increased based on the number of SIRS criteria present (0SIRS = 20%; 1SIRS-21%; 2SIRS-38%; ≥3SIRS-48%). Compared to patients that did not develop RF, patients with RF had a total bilirubin >3 mg/dL ($p = 0.032$), ascitic fluid protein <1.5 g/dL ($p = 0.037$), no prior rifaximin use ($p = 0.042$), and higher MELD scores ($p = 0.007$). At 30 days, the combined endpoint of mortality or LT was significantly higher in the ≥2 SIRS group 26% versus <2 SIRS group 6%, $p = 0.035$.

CONCLUSIONS: In SBP patients meeting ≥2 SIRS criteria at admission receiving standard care, there was a higher incidence of RF as well as mortality and LT at 30 days. The role of rifaximin for preventive treatment for HRS/AKI in cirrhotic patients with ≥2 SIRS at admission should be investigated in prospective studies.