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ORIGINAL RESEARCH

Adult Medicine

1. Tolvaptan for euvolemic and hypervolemic hyponatremia in the acute care setting. *Jacqueline L. Olin, M.S., Pharm.D., BCPS, CDE, CPP, FASHP*[1], Gwen Mitchell, Pharm.D., BCPS[2], Henry Cremisi, M.D.[3]; (1)Wingate University School of Pharmacy, Wingate, NC; (2)Department of Pharmacy, Novant Health Matthews Medical Center, Matthews, NC; (3)Novant Health Inpatient Care Specialists, Novant Health Matthews Medical Center, Matthews, NC

PURPOSE: Hyponatremia is the most common electrolyte disorder in the hospital, with prevalence averaging 20% of admissions. It is associated with co-morbidities, including a fourfold increase in falls. Management strategies are varied and etiology-dependent. Tolvaptan, a vasopressin antagonist, is indicated for hyponatremia. It inhibits distal water reabsorption seen in high vasopressin states and elevates serum sodium. Tolvaptan use in the community hospital setting outside of clinical trials has not been well characterized. We retrospectively reviewed our clinical experience with tolvaptan to evaluate adherence to institutional recommendations and help define reasonable expectations for its role in hyponatremia management.

METHODS: All hospitalized patients who received tolvaptan in 2013, as identified by hospital billing reports, were included in this single center, IRB-approved analysis. Medical records were used to obtain patient demographic data, tolvaptan indication, efficacy, duration and patient status at the end of the hospitalization.

RESULTS: Thirty seven patient encounters were reviewed. Mean age was 71 ± 16.4 years and 20 subjects (54%) were female. Hyponatremia was a contributory cause of admission in 15 (40.5%) and offending medications were discontinued in 7 (19%). Associated causes of hyponatremia were heart failure (8.2%), cirrhosis (13.5%), and syndrome of inappropriate antidiuretic hormone (78%). Prior treatments included fluid restriction in 19 (51%) and furosemide in 5 (13.5%), with tolvaptan administration on average 3.2 days after admission. Most patients (78.4%) required ≤2 tolvaptan doses. Discharge to palliative care or death occurred in 8 (21.6%). Post-discharge review revealed 3 (8%) maintained serum sodium concentration ≥ 130 mg/dL.

CONCLUSION: Tolvaptan was primarily initiated after other interventions and with limited duration per current recommendation. This cohort had complicating underlying chronic diseases and offending medications. The results of this analysis will be used to further refine institutional recommendations with pharmacist input for risk/benefit stratification based on reasonable expectations.

2. Evaluation of hypoglycemia associated with continuation of glyburide during hospitalization. Georgia Keriazes, Pharm.D., BCPS, BCOP, Dhaval Jivanji, Student Researcher, *Sarah A. Treadway, Pharm.D., BCPS*, Samantha Bailey, Pharm.D., BCPS; Lakeland Regional Medical Center, Lakeland, FL

PURPOSE: Although hyperglycemia in the acute care setting is ideally managed with subcutaneous insulin, oral antidiabetic medications may be continued upon hospital admission. The objective of this study was to determine the incidence of hypoglycemia in diabetic patients receiving glyburide during hospitalization.

METHODS: A sample of adult patients admitted to non-ICU medical floors between January 1, 2013 and June 30, 2013 and who received at least one dose of glyburide during the index hospitalization were retrospectively evaluated. Episodes of hypoglycemia (blood glucose ≤ 70 mg/dL) were recorded. For each patient, the number of "glyburide patient days" was calculated using the date range for doses administered. Additional prescribed antidiabetic medications were also recorded. Incidence of hypoglycemic episodes was compared using the chi square test.

RESULTS: Seventy seven patients were included in the analysis. Fifty two percent of patients (n=40) were ≥ 65 years old, and 55% (n=43) had CrCl > 60 mL/minutes. Overall, there were 36 hypoglycemic episodes that occured in 311 "glyburide patient days". There were a total of 28 and 8 episodes in patients ≥65 years and <65 years old, respectively (RR 4.907, CI 2.29–10.52). There were 16 and 19 hypoglycemic episodes in patients with CrCl > 60 mL/minutes and CrCl ≤ 60 mL/minutes, respectively (RR 2.24, CI 1.18–4.25). Thirty percent (n=10) of episodes occured in patients receiveing both glyburide and long-acting insulin (n=20).

CONCLUSION: In an effort to prevent hypoglycemia during hospitalization, discontinuation of glyburide and use of alternative antidiabetic medications upon admission is prudent, especially in patients ≥65 years old, with CrCl ≤ 60 mL/minutes, or concomitantly receiving long-acting insulin. These results further validate existing evidence that suggests sulfonylureas are associated with increased risk for hypoglycemia in selected hospitalized patient populations and support recommendations that oral antidiabetic medications should be discontinued upon hospital admission.

3E. Impact of lorcaserin in obese and overweight patients with prediabetes on weight loss (WL) and reducing progression to diabetes. *Richard Nesto, M.D.*[1], Randi Fain, M.D.[2], Yuhan Li, Ph.D.[2], William Shanahan, M.D.[3], William Soliman, Ph.D.[2]; (1) Lahey Hospital and Medical Center; (2)Eisai Inc.; (3)Arena Pharmaceuticals

Presented at the 74th Scientific Sessions of the American Diabetes Association, San Francisco, CA, June 13–17, 2014.

4E. Lorcaserin free plasma levels at recommended dose are sufficient to activate 5-HT_{2C} but not $_{2A}$ or $_{2B}$ receptors. *Eric Ravussin, Ph.D.*[1], Yuhan Li, Ph.D.[2], David Unett, Ph.D.[3], Michael Morgan, Ph.D.[3], William Shanahan, M.D.[3], William Soliman, Ph.D.[2]; (1)Pennington Biomedical Research Center; (2) Eisai Inc.; (3)Arena Pharmaceuticals

Presented at 74th Scientific Sessions of the American Diabetes Association; June 13–17, 2014; San Francisco, CA.

5. Rivaroxaban compared to warfarin for the prevention of venous thromboembolism after major orthopedic surgery in a community hospital. *Nicole Cieri, Pharm.D., BCPS*[1], Kristen Kusmierski, Pharm.D., BCPS, CACP[2], Cynthia Lackie, Pharm.D.[2], Michael Botros, Pharm.D. Candidate[1], Candace Villenuve, Pharm.D. Candidate[1]; (1)D'Youville College School of Pharmacy, Buffalo, NY; (2)Pharmacy, Millard Fillmore Suburban Hospital, Williamsville, NY

PURPOSE: This study retrospectively compared bleeding and venous thromboembolic (VTE) events during the hospital course following major orthopedic surgery in patients administered rivaroxaban or warfarin.

METHODS: Data was collected via retrospective chart review for all orthopedic surgery patients that received either rivaroxaban or warfarin for VTE prophylaxis from October 1, 2011 to March 31, 2014. Patients were excluded if they were ≤ 18 years of age. Data collected and analyzed included patient demographics, indication for use (elective orthopedic surgery vs non-elective surgical repair of fracture), type of analgesia given, bleeding events, and VTE events. Statistical analysis for dichotomous data was done using a two-tailed Fisher's exact test.

RESULTS: A total of 2432 patients received VTE prophylaxis following orthopedic surgery with rivaroxaban (n=610) or warfarin (n=1822). The incidence of overall bleeding was not significantly different between patients who received rivaroxaban compared to warfarin (1% vs 0.3%; p=0.09). Wound

complications (a composite of excessive wound hematoma and reported surgical-site bleeding resulting in a therapy change or intervention) were higher in those who received rivaroxaban compared to warfarin (0.5% vs 0%; p=0.02). The incidence of VTE was not significantly different in those who received rivaroxaban compared to warfarin (0.7% vs 0.4%; p=0.51). Twenty-six patients (4.3%) received rivaroxaban following non-elective surgery, none of which experienced an adverse event during hospitalization. Out of the 49 rivaroxaban patients who received epidural analgesia, none experienced an adverse event during hospitalization.

CONCLUSION: The use of rivaroxaban at our institution was not associated with an increased risk of overall bleeding events or VTE compared to warfarin. Rivaroxaban was associated with a small but significant increase in wound complications. Rivaroxaban use for VTE prophylaxis after non-elective surgical repair of fracture was not associated with an increased risk of adverse events.

6. Optimizing medication transitions: the role of pharmacy in structured interdisciplinary bedside rounds. *Lydia Newsom, Pharm.D.*[1], Nicole L. Metzger, Pharm.D., BCPS[2], Melissa M. Chesson, Pharm.D., BCPS[2], Samuel K. Peasah, Ph.D., MBA, RPh.[2], Jason Stein, M.D., SFHM[3]; (1)Department of Pharmaceutical Sciences, Emory University Hospital, Atlanta, GA; (2)Department of Pharmacy Practice, Mercer University College of Pharmacy, Atlanta, GA; (3)Hospital Medicine, Emory University School of Medicine, Atlanta, GA

PURPOSE: Structured interdisciplinary bedside roundsTM (SIBRTM) are conducted to facilitate patient understanding, safety, and care planning. Pharmacy personnel including students, residents, and clinical specialists are involved in SIBRTM, but their role has not been well-defined. The primary objective of this pilot study was to assess the impact of a standardized role for pharmacy personnel during SIBRTM on the resolution of interventions resulting from medication history discrepancies.

METHODS: The current pharmacy practice model of performing best possible medication histories (BPMH) and medication reconciliation after an initial medication history conducted by other providers was continued on two medicine teams. On the study team, unresolved interventions were discussed by pharmacy personnel during SIBRTM the following day. Patient demographics, number and type of discrepancies, as well as the number and time to resolution of interventions were compared between groups during two study months.

RESULTS: Pharmacy personnel conducted 195 BPMHs and identified that 95.1% of baseline medication histories had at least one discrepancy with a mean of 7.7 ± 6.7 and 8.0 ± 7.7 (mean $\pm$ SD) discrepancies on the study and control teams, respectively (p=0.78). There were no differences in the types of discrepancies between the groups. The majority of discrepancies requiring intervention were resolved prior to SIBRTM on day one (study team: 89% and control team: 84%, p=0.39). A total of 94% of interventions on the study team and 86% on the control team were resolved prior to SIBRTM on day two (p=0.17).

CONCLUSION: Pharmacy personnel identified and resolved numerous medication discrepancies in a timely manner on both the study and control teams. This standardized role for pharmacy personnel on SIBRTM did not impact the number of resolved interventions likely due to a high level of baseline pharmacy involvement with both unit-based medicine teams.

7. Association of loop diuretic dose at discharge on 30 day readmission rates in acutely decompensated heart failure patients. *Ashley Woodruff, Pharm.D., BCPS*[1], Ashley Dorward, Pharm.D., BCPS[2], Carolyn Hempel, Pharm.D., BCPS[1], William Loeffler, Pharm.D., MBA[3]; (1)State University of New York at Buffalo School of Pharmacy and Pharmaceutical Sciences, Buffalo, NY; (2)Buffalo General Medical Center, Buffalo, NY; (3)D'Youville College School of Pharmacy, Buffalo, NY

PURPOSE: To compare 30 day all-cause readmission rates in patients with a discharge diagnosis of heart failure (HF) and evidence of fluid overload that had an increase in loop diuretic dose at discharge versus those with no change or a decrease in loop diuretic dose at discharge in relation to their home diuretic dose prior to admission.

METHODS: Inclusion criteria were adults ≥18 years old admitted between January 1st 2012 and December 31st 2012 with a discharge diagnosis of heart failure with reduced ejection fraction (HFrEF), defined as left ventricular ejection fraction (LVEF) ≤40%, and evidence of fluid overload. Patients were included if they were on a loop diuretic on admission and discharge. Patients were divided into two groups based on loop diuretic dose at discharge; those who were discharged on an increased diuretic dose and those on a dose less than or equal to the dose upon admission.

RESULTS: In 2012, there were 438 patients with a discharge diagnosis of acute decompensated heart failure (ADHF). Of those patients, 131 were identified to meet inclusion criteria. There were 50 patients discharged with an increase in loop diuretic dose and 81 patients discharged with no change or a decrease loop diuretic dose. Both groups were similar in regards to baseline characteristics. The 30 day all-cause readmission rate was 20% in patients with an increase in loop diuretic dose at discharge versus 38% in those with a diuretic dose that remained the same or was decreased ($p<0.05$).

CONCLUSION: In patients admitted for ADHF, an increase in loop diuretic dose at discharge relative to home diuretic dose prior to admission was associated with a decrease in 30-day all-cause readmission.

8. Comparison of enoxaparin with unfractionated heparin (UFH) for venous thromboembolism (VTE) prophylaxis in medically ill dialysis patients. *Amanda Buckallew, Pharm.D.*[1], Katie Buehler, Pharm.D.[2], Brian Lee, Pharm.D.[1]; (1)Missouri Baptist Medical Center, St. Louis, MO; (2)St. Louis College of Pharmacy, Saint Louis, MO

PURPOSE: The safety and efficacy of enoxaparin compared to UFH for VTE prophylaxis has been established in patients with normal and reduced renal function. Limited evidence supports the use of enoxaparin for VTE prophylaxis in dialysis patients. The objective of this study is to determine if enoxaparin is as effective as UFH for VTE prophylaxis in medically ill patients requiring dialysis.

METHODS: This single-center, retrospective, cohort study included patients at least 18 years old admitted to a medical floor on hemodialysis or peritoneal dialysis and received at least 24 hours of thromboprophylaxis with enoxaparin or UFH. Two hundred patients per treatment group were consecutively enrolled, in reverse chronological order, beginning July 2012. The primary outcome was the occurrence of a thromboembolic event. Secondary outcomes included the occurrence of major bleeding (symptomatic bleeding in a critical site, a decrease in hemoglobin of at least 2 g/dL, or transfusion of at least 2 units of blood), minor bleeding (non-major bleeding associated with an increased level of care), and injection site hematoma.

RESULTS: With similar baseline characteristics between the groups, 4 patients in the enoxaparin group developed a deep vein thrombosis compared to 9 patients receiving UFH group (2% vs 4.5%, p=0.159). No patients experienced a pulmonary embolism. More patients had a drop of hemoglobin with a confirmed bleed in a non-critical organ (2.5% vs 1%, p=0.449), and more received blood transfusions for a confirmed bleed in a non-critical organ in the UFH group (3.5% vs 0.5%, p=0.068).Though there were no significant differences in major or minor bleeding between the groups, there was a higher composite bleed rate for UFH patients (20.5% vs 13%, p=0.045).

CONCLUSION: Dialysis patients receiving enoxaparin for VTE prophylaxis may be less likely to experience VTE and/or bleeding events compared to heparin. Prospective, randomized clinical trials are warranted to confirm this finding.

Ambulatory Care

9E. Improving Health For At-Risk Rural Patients (IHARP): medication use coordination. Michael Czar, Ph.D., RPh.[1], William Lee, BPharm, MPA[1], Leticia R. Moczygemba, Pharm.D., PhD[2], Andrea L. Pierce, Pharm.D.[2], Tanvi Patil, Pharm.D.[1], Nikisa Blevins, Pharm.D.[1], Karen Williams, Pharm.D.[1], Heidi Wengerd, Pharm.D.[1], Courtney Dickerson, Pharm.D.[1], Kelley Mills, Pharm.D.[1], *Gary R. Matzke, Pharm.D.*[2]; (1)Carilion New River Valley Medical Center; (2)Department of Pharmacotherapy and Outcomes Sciences, Virginia Commonwealth University School of Pharmacy, Richmond, VA

Presented at All Together Better Health VII International Conference on Interprofessional Practice and Education, Pittsburgh, PA, June 6–8, 2014.

10. Medication errors prevented by the Medication Therapy Management Clinic (MTMC). *Tiffany Scott-Horton, Pharm.D., BCACP*[1], Mansi Shah, Pharm.D., BCACP, CDE[2], Jessica Tilton, Pharm.D., BCACP[2]; (1)Pharmacy Practice, University of Illinois at Chicago, Chicago, IL; (2)University of Illinois at Chicago, Chicago, IL

PURPOSE: The mission of the University of Illinois Hospital and Health Sciences System (UI Health) MTMC is to assist patients who take multiple medications with the management of their drug therapy. Prior to each patient visit, the MTMC staff completes a medication reconciliation process which includes: reviewing the electronic medical record (EMR), clinic notes, and hospitalizations to identify medication changes since the patient's last MTMC visit. The primary outcome was to determine the number of medication changes that occurred between MTMC patient visits that could have potentially led to medication errors.

METHODS: This was a prospective study between 2012 to 2013 that collected the following data on medication changes: new prescriptions, change in dose, discontinued medications, and prescription attainment process (written/printed/neither) along with demographic data.

RESULTS: A total of 102 patients were assessed and averaged 17 medications per patient. The most prevalent health conditions included: hypertension, hyperlipidemia, and pain. There were 108 medications changes that occurred between MTMC visits, 50% were new prescriptions, 25% were dose changes, 23% were drug discontinuations and 3% were brand to generic switches or trail discontinuations. Thirty-percent of the medication changes were not printed for the patient or sent to a dispensing pharmacy. When asked only 26 patients were aware of a medication change. Approximately 28% of the medication changes were made by general medicine, 28%. Lastly, 55% of the medication lists needed to be updated during the MTMC medication reconciliation process.

CONCLUSION: This study identified a communication gap between the provider, patient and pharmacy regarding medication changes. Furthermore, it highlighted the need for medication therapy management services to have access to the patient's EMR in order to help prevent medication errors.

11. Physician engagement and acceptance of collaborative treatment of hypertension in primary care. *Steven Smith, Pharm.D., MPH*[1,2], Michaela Hasan, Pharm.D.[3], Amy Huebschmann, M.D.[4], Richard Penaloza, M.D.[4], Wagner Schorr-Ratzlaff, M.D.[4], Amber Sieja, M.D.[4], Katy E. Trinkley, Pharm.D.[3]; (1)Department of Pharmacotherapy & Translational Research, University of Florida, Gainesville, FL; (2)Department of Community Health & Family Medicine, University of Florida, Gainesville, FL; (3)University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO; (4)Division of Internal Medicine, Department of Medicine, University of Colorado, Aurora, CO

PURPOSE: Pharmacist-physician collaborative care (PPCC) is effective in treating hypertension (HTN), yet the extent to which primary care providers (PCPs) are willing to refer patients for PPCC is unknown. We aimed to assess PCP engagement/acceptance of a PPCC HTN model.

METHODS: We analyzed data from a PPCC model used at two University of Colorado Internal Medicine clinics from 11/2012 through 11/2013. Enrollment requests were sent to PCPs for patients with uncontrolled HTN meeting inclusion criteria (predetermined with physician leadership input) for the PPCC clinic. PCPs then accepted or denied enrollment requests in the EMR; for denials, PCPs were asked to provide a rationale. Response data from 108 PCPs were analyzed for proportion of enrollment requests approved, disapproved, and ignored, as well as reasons for disapproval; data were further analyzed for time trends.

RESULTS: Of 2232 persons with uncontrolled HTN, PPCC enrollment requests were sent for 1,516 (67.9%): 950 (62.7%) were approved, 406 (26.8%) were disapproved, and 160 (10.6%) had no response. Approval rates differed by clinic (74% vs 63%; $p<0.0001$) and widely by provider: among PCPs with ≥10 requests, median (IQR) approval was 70% (54% to 89%) and 75% of providers approved ≥50% of requests. The most common reasons for disapproval were: PCP prefers to manage themselves (19%), BP controlled per PCP estimation (18%), patient unable to make appointments (12%), and suspected white coat HTN (9%); 35% of disapprovals were not accompanied by a reason. Approval rates were stable over time (64% in Q1 vs 68% in Q4; $p=0.14$), but non-response increased from 6% to 16% over the same time period ($p<0.0001$).

CONCLUSION: PCP engagement/acceptance of a PPCC model in HTN management was generally high and sustained, but varied widely among providers; non-response from PCPs increased over time. Reasons for disapproval varied with none exceeding 20% of all rationales.

12E. Simvastatin prescribing practices before and after the U.S. FDA updates to the 2011 simvastatin dosing standards. *Rhianna Tuchscherer, Pharm.D.*[1], Vahram Ghushchyan, Ph.D.[2], Richard Allen, M.S.[3], Kavita V. Nair, Ph.D.[4], Joseph Saseen, Pharm.D.[4]; (1)School of Medicine, Department of Family Medicine and Community Health, University of Minnesota, Minneapolis, MN; (2)American University of Armenia, Armenia; (3)Peak Statistical Services, Evergreen, CO; (4)University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO

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13. Atypical antipsychotic use and annual screening for diabetes in a patient centered medical home. *April Hinds, Pharm.D.*, Lois Coulter, Pharm.D., Jonell Hudson, Pharm.D., Victoria Seaton, Pharm.D.; College of Pharmacy, University of Arkansas for Medical Sciences, Fayetteville, AR

PURPOSE: Atypical antipsychotic therapy is associated with an increased risk for the development of diabetes. This study assessed adherence with the American Diabetes Association Consensus Statement recommendations for diabetes screening in patients receiving atypical antipsychotics and evaluated a pharmacist's role in improving guideline adherence in a Patient Centered Medical Home (PCMH).

METHODS: For patients prescribed atypical antipsychotics, records were reviewed for A1c testing within the past 12 months. If no A1c results were found within the previous 12 months, physicians were sent an alert in the patient's electronic medical record requesting an A1c order. Patients that discontinued antipsychotic therapy or no longer received care at the clinics were not included in data collection. Patients' charts were reviewed three months after contacting physicians to analyze the number of A1cs ordered pre- and post-pharmacist intervention using descriptive statistics.

RESULTS: Prior to pharmacist intervention 17 out of 120 (14%) patients received annual A1c screening. Eighty-six alerts were sent to physicians to order A1cs with 24 out of 86 (28%) receiving an order for A1c as a result of pharmacist intervention. Eleven out of 24 (46%) A1cs were collected during study follow-up, and one pre-diabetic patient was identified.

CONCLUSION: Opportunities to improve diabetes screening rates in patients receiving atypical antipsychotics exist, and pharmacist intervention increases adherence to the recommended guidelines.

14E. Physician-pharmacist collaborative management of asthma in primary care. *Tyler Gums, Pharm.D.*[1], Barry Carter, Pharm.D.[2], Gary Malivetz, Pharm.D.[3], Lucinda Buys, Pharm.D.[4], Kurt Rosenkrans, M.D.[5], Liz Uribe, M.S.[6], Christopher Coffey, Ph.D.[7], Eric MacLaughlin, Pharm.D.[8], Rodney B. Young, M.D.[9], Adrienne Ables, Pharm.D.[10], Nima Patel-Shori, Pharm.D., BCACP[11], Angela Bosinski, Pharm.D.[12]; (1)University of Iowa, Iowa City, IA; (2) University of Iowa College of Pharmacy, Iowa City, IA; (3) Division of Pharmaceutics and Translational Therapeutics, University of Iowa, IA; (4)Siouxland Medical Education Foundation, Inc., Sioux City, IA; (5)Mercy Sioux City, IA; (6) Department of Biostatistics; (7)University of Iowa-Department of Biostatistics, Iowa City, IA; (8)Department of Pharmacy Practice, Texas Tech University Health Sciences Center, Amarillo, TX; (9) Texas Tech University Health Sciences Center School of Medicine, Amarillo, TX; (10)Edward Via College of Osteopathic Medicine; (11)Temple University School of Pharmacy, Philadelphia, PA; (12)University of Buffalo

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16E. Evaluation of a pharmacist-led bedside medication delivery service for cardiology patients at hospital discharge. *Stephanie Roberts, Pharm.D.*[1], Julianna Burton, Pharm.D.[1], Pamela Mendoza, Pharm.D.[2], Patricia Poole, Pharm.D.[3], Machelle Wilson, Ph.D.[4]; (1) Pharmacy, UC Davis Medical Center, Sacramento, CA; (2) University of California, Davis Health System, Sacramento, CA; (3)Cares Community Health, Sacramento, CA; (4)University of California, Davis Medical Center, Sacramento, CA

Presented at Western States Conference, San Diego, CA, May19–21, 2014.

Cardiovascular

17. Aspirin pharmacodynamics are improved in obesity patients following bariatric surgery. *Nicholas B. Norgard, Pharm.D.*[1], Scott Monte, Pharm.D.[1], Stanley Fernandez, M.D.[2]; (1)Department of Pharmacy Practice, School of Pharmacy and Pharmaceutical Sciences, University at Buffalo, Buffalo, NY; (2)Division of Cardiovascular Medicine, University at Buffalo, School of Medicine and Biomedical Sciences, Buffalo, NY

PURPOSE: Bariatric surgery has emerged a promising treatment option for weight loss and to counter the metabolic consequences of obesity. Obesity has been linked to a hyperaggregable state, as well as a blunted response to aspirin compared with nonobese individuals. It is unknown how bariatric surgery effects platelet aggregability and aspirin pharmacodynamics. We assessed the hypothesis that bariatric surgery would lead to an improvement in aspirin-induced platelet inhibition and a reduction in platelet aggregability

METHODS: Fifteen patients scheduled to undergo bariatric surgery were administered two 7-day courses of aspirin 81 mg: one before surgery and one 3 months following surgery. Platelet aggregation was measured before and after each aspirin course using VerifyNow-ASA and whole blood impedance aggregometry using collagen and adenosine diphosphate (ADP). The primary endpoint was the change in on treatment aspirin reactive units (ARU) pre- and post-surgery.

RESULTS: Eleven out of 15 patients completed both courses of aspirin. Seventy-three percent were female and 53% were caucasian. Roux-en-Y gastric bypass was performed in 82% and 18% underwent sleeve gastrectomy. The mean starting BMI was 47 kg/m^2. Patients lost on average 56 pounds. Post-bariatric surgery, on-treatment aspirin response was significantly reduced following surgery (469 ARU $\pm$ 60.4 vs 432 $\pm$ 63.0, p=0.03). Off-treatment ARU was also significantly reduced from pre-surgery levels (602 $\pm$ 58.8 vs 531 $\pm$ 78.4, p=0.035). There was a significant correlation between the extent of weight loss and the degree of improvement in on-treatment aspirin response ($r^2 = 0.43$, p=0.04). Off-treatment collagen and ADP platelet aggregation before and after surgery remained unchanged but on-treatment inhibition of collagen platelet aggregation was significantly increased post-surgery ($-19\% \pm 24.1$ vs $2.4\% \pm 15.8$, p=0.018). Aspirin's response to ADP was unchanged.

CONCLUSION: Bariatric surgery may improve aspirin-induced platelet inhibition and reduce platelet aggregability. The mechanisms behind this improvement require further investigation.

18. Aripazine (PER977) reverses unfractionated and low molecular weight heparins, fondaparinux and new oral anticoagulants: report of a clinical trial with edoxaban and anticoagulant reversal biomarker identification. *Bryan Laulicht, Ph.D.*[1], Sasha Bakhru, Ph.D.[2], Solomon Steiner, Ph.D.[1], Jack Ansell, M.D.[1], Karen Brown, Ph.D.[3], Hiroshi Masumoto, Ph.D.[4], Yoshiyuki Morishima, Ph.D.[5], Michael Grosso, M.D.[6], Michele Mercuri, M.D., Ph.D.[7], Robert Noveck, M.D., Ph.D.[8], James Costin, M.D.[1]; (1) Perosphere Inc, Danbury, CT; (2)Perosophere Inc, Perosphere Inc., Danbury, CT; (3)Clinical Pharmacology, Daiichi-Sankyo, Edison, NJ; (4)Global Project Management, Daiichi-Sankyo, Edison, NJ; (5)Research and Development Division, Daiichi-Sankyo, Tokyo, Japan; (6)Cardiovascular Clinical Research, Daiichi-Dankyo, Edison, NJ; (7)Clinical Development, Daiichi-Sankyo, Edison, NJ; (8)Clinical Research Unit, Duke University School of Medicine, Durham, NC

PURPOSE: This study was done to evaluate the safety and tolerability of aripazine and to establish its anticoagulant reversal effects in a first in human study. Aripazine (PER977), a small molecule designed to bind to UFH, LMWH, fondaparinux, and NOACs (edoxaban, apixaban, rivaroxaban, dabigatran), prevents anticoagulant binding to their endogenous targets, thereby reversing anticoagulation. Aripazine restores normal hemostasis in external (rat tail transection) and internal (liver laceration) bleeding models and corrects abnormal coagulation assays.

METHODS: A Phase I-II, 7 cohort, 2 period, ascending dose (5–300 mg) trial with aripazine alone and following 60 mg edoxaban evaluated aripazine and edoxaban PK and PD as well as biomarker suitability for anticoagulation reversal.

RESULTS: Aripazine alone showed no serious adverse events and no pro-coagulation signal (D-dimer, F1.2, TFPI). Beginning at 50 mg and above full reversal of 60 mg edoxaban anticoagulation with no rebound over 24 hours was demonstrated. Aripazine re-established clot fibrin integrity altered by edoxaban (scanning electron micrographs). When plotted against each other, whole blood clotting time (WBCT) demonstrated good correlation ($r^2 = 0.84$) with edoxaban PK levels and established WBCT as the most sensitive biomarker for anticoagulation reversals by aripazine.

CONCLUSION: Aripazine is safe and well tolerated at doses that reverse edoxaban anticoagulation. In preclinical *in vivo* studies, aripazine reverses the anticoagulant effect of other NOACs as well as UFH, LMWH and fondaparinux suggesting a similar effect in humans. Its advantages include small size, unlikely immunogenic reactions; single bolus injection; quick onset (<10 minutes); and prolonged effects. WBCT correlates well with edoxaban PK levels and is a suitable biomarker for clinical trials.

19. Exacerbations of congestive cardiac failure are associated with elevated INRs in patients on warfarin. *Greg Roberts, B.Pharm., FSHP*, Michaela Delcampo, B.Pharm. (hons), MClinPharm; Pharmacy Department, Flinders Medical Centre, Bedford Park, Australia

PURPOSE: Hypoxia during exacerbations of Congestive Cardiac Failure (CCF) and Chronic Obstructive Pulmonary Disease (COPD) potentially decreases warfarin clearance. We set out to compare warfarin sensitivity during CCF or COPD exacerbation with hospitalized controls, and with warfarin sensitivity during disease stability.

METHODS: Case-controlled observational study in a tertiary teaching hospital, South Australia. Warfarin sensitivity was defined as INR per daily mg dose of warfarin. Case-note analyses of hospitalized patients experiencing CCF exacerbation (n=37), COPD exacerbation (n=20), and acute admissions unrelated to CCF or COPD (controls, n=60) were performed.
RESULTS: During out-patient periods of disease stability there was no difference in warfarin sensitivity or INR across groups. Compared to warfarin sensitivity during disease stability, the increase in admission warfarin sensitivity was 94% for CCF patients ($p<0.0001$), 59% for COPD ($p=0.003$) and 24% for control ($p=0.002$). At admission, warfarin sensitivity in both the CCF group (1.62(1.27)) and COPD group (1.03(0.79) was greater compared to controls (0.91(0.52) $p<0.0001$ and 0.04 respectively). The CCF group also had higher admission INR compared with controls (3.77(1.66) and 2.62(0.97) respectively, $p<0.001$), but the COPD group did not (3.07(1.95), $p=0.15$). CCF patients required greater intervention with vitamin K than controls (14% vs 0%, $p=0.007$). In the CCF group, patients with NYHA3&4 had elevated admission INR (4.22(1.94) compared to NYHA 1&2 patients, (3.11(0.78)), $p=0.042$) and a non-significant trend for elevated warfarin sensitivity (125% and 50% respectively, $p=0.059$).
CONCLUSION: CCF and COPD patients were more sensitive to warfarin during disease exacerbation, with CCF exacerbation producing the most pronounced effect on warfarin sensitivity. Patients with more severe pre-existing CCF were most prone to elevated INRs during an exacerbation. The changes in warfarin sensitivity had clinically significant management implications. The role of alternative oral anticoagulants should be explored for patients experiencing CCF exacerbations.

20. Evaluation of oral anticoagulants for extended treatment of venous thromboembolism using a mixed treatment comparison meta-analysis. *Jennifer L. Donovan, Pharm.D.*, Abir O. Kanaan, Pharm.D., Brett Rollins, Pharm.D., Matthew A. Silva, Pharm.D.; MCPHS University, Worcester, MA
PURPOSE: Target-specific oral anticoagulants are used to treatment venous thromboembolism (VTE). Warfarin is an established treatment for VTE and though these agents have been compared to placebo or warfarin, direct comparisons between the target-specific oral anticoagulants for extended VTE treatment have not been conducted. We evaluated the efficacy and safety of warfarin and target-specific oral anticoagulants for extended VTE treatment using a mixed-treatment comparison network meta-analysis.
METHODS: EMBASE and MEDLINE (from 1960 to November 2013) were searched to identify randomized controlled trials in humans published in English that investigated the extended use (for at least 6 months) of oral anticoagulants in adult patients with confirmed VTE. Key articles were cross-referenced for additional studies. Endpoints were recurrent VTE or death from any cause, deep vein thrombosis (DVT), and nonfatal-pulmonary embolism (PE), major bleeding, and non-major or clinically relevant bleeding. Data were screened, evaluated, and entered into ADDIS (version 1.16.4) to generate direct and indirect comparisons of the various anticoagulants across each study. Data were reported as rate ratio (RR) and 95% credible interval (CrI).
RESULTS: Ten trials were analyzed, aggregated, and represented over 14,000 patients. No significant differences were found for the combined endpoint of VTE or death, non-fatal PE or DVT. Major bleeding was significantly higher for warfarin versus apixaban 4.24 (CrI 1.28–24.9). Assessment of non-major or clinically relevant bleeding did not identify any meaningful differences between agents.
CONCLUSION: Our meta-analysis found that apixaban, dabigatran, rivaroxaban, warfarin, and placebo were similarly effective for the extended treatment of VTE. Wide credible intervals with the target specific oral anticoagulants include the possibility of bleeding risks, also expected in a small, non-diverse network with few patients and most direct comparisons between placebo or warfarin. Patient characteristics, convenience, and cost may be the key factors in selecting an oral anticoagulant for extended VTE treatment.

21. Readmission rates in patients with post-operative atrial fibrillation after cardiothoracic surgery and the impact of pharmacotherapy. Long To, Pharm.D.[1], James S. Kalus, Pharm.D., BCPS, (AQ-Cardiology)[1], Carrie Nemerovski, Pharm.D.[1], Douglas L. Jennings, Pharm.D., AACC, BCPS (AQ-Cardiology)[2]; (1)Henry Ford Hospital, Detroit, MI; (2)Nova Southeastern University
PURPOSE: Post-operative atrial fibrillation (POAF) is one of the most common occurrences after invasive cardiac surgery and can result in major complications. Despite incidence reaching up to 40%, very little data is available on outcomes associated with these patients after hospital discharge. The purpose of this study was to characterize the risk of POAF-related readmission according to rate versus rhythm control.
METHODS: This single center, retrospective, observational cohort study included patients diagnosed with POAF after cardiothoracic surgery from August 2008 to August 2010. Left-ventricular assist device placement and heart transplant patients were excluded. The primary outcome was all-cause readmission during the first post-operative year. Additionally, hospital readmissions rates between the rate and rhythm control groups were explored.
RESULTS: Medical records of 253 patients were reviewed and 158 patients were included. All-cause readmission was 34.2%. The most common reason for readmission (42.6%) was complications related to post-operative atrial fibrillation (i.e, atrial fibrillation, stroke, bleeding. bradycardia), and the median time to readmission was 28 [IQR 8.65] days. There were no statistically significant differences in all-cause readmission rate between rate and rhythm control therapy (39.5% vs 32.5% respectively, $p=0.493$). Patients who were readmitted were older (71.5 yo vs 66.9 yo, $p=0.003$), and more had a history of diastolic heart failure (9.3% vs 1.9%, $p=0.034$), chronic kidney disease (16.7% vs 4.8%, $p=0.018$), and had undergone simultaneous coronary artery bypass surgery with aortic valve replacement (24.1% vs 7.7%, $p=0.004$).
CONCLUSIONS: Approximately 1 in every 3 patients diagnosed with POAF was readmitted within the first year after cardiac surgery. These readmissions occurred despite the frequent use of antiarrhythmic therapies, suggesting that the clinical ramifications of POAF may not be limited to the immediate post-operative period.

22. Effect of oral P2Y12 receptor inhibitors in acute coronary syndromes treated with and without percutaneous coronary intervention: a meta-analysis of nonsmokers. *William L. Bailey, Pharm.D.*[1], Firoozeh S. Salek, Pharm.D., Ph.D.[2], Udaya S. Tantry, Ph.D.[3], Kevin P. Bliden, BS, MBA[3], Paul A. Gurbel, M.D.[3]; (1)St. Louis College of Pharmacy, St. Louis, MO; (2)Department of Pharmacy, Robert Wood Johnson University Hospital, Rahway, NJ; (3)Sinai Center for Thrombosis Research, Cardiac Catheterization Laboratory, Baltimore, MD
PURPOSE: Current smokers have consistently benefitted from dual-antiplatelet therapy (DAPT) in various clinical outcome trials. However, the result from an *a priori* analysis of well-established nonsmokers with ACS in the CURE trial reported no treatment effect for the addition of clopidogrel to aspirin (ASA) versus ASA alone. To further test the hypothesis generated from CURE that smoking status influences the treatment effect of clopidogrel in ACS; we compared the relative rate of MACE (defined as nonfatal myocardial infarction, nonfatal stroke, or cardiovascular death) in well-established nonsmokers treated with both ASA and a new oral $P2Y_{12}$ receptor inhibitor (OPI) or clopidogrel.
METHODS: We screened and selected randomized clinical trials in ACS through May 31, 2014 that utilized recommended DAPT regimens for at least 12 weeks and reported comparative MACE effects. Trial cohort also met strict nonsmoker inclusion criteria. We conducted a meta-analysis using a fixed-effects model.
RESULTS: Three ACS trials were identified. However, eligible nonsmoker data that were collected and analyzed from one trial

were unavailable despite requests. Therefore, only *a priori* analyses from the remaining two trials were analyzed. In a meta-analysis of these ACS trials (N=10,270), there was no significant difference in rate of MACE for a new OPI versus clopidogrel in well-established nonsmokers [HR, 0.99 (95% CI, 0.88–1.11)].
CONCLUSION: In a meta-analysis of ACS trials, using a stringent nonsmoker definition, there was no difference in comparative OPI treatment-effect for MACE. This result is based on two large independent ACS trials and corroborates the unexpected MACE finding from the landmark clopidogrel trial that first suggested DAPT is not better than ASA alone in well-established nonsmokers with ACS. The lack of MACE reduction in well-established nonsmokers with ACS by a new OPI + ASA regimen may encourage the reassessment of benefit and risk of DAPT in nonsmokers with ACS.

23. Predictors of pocket hematoma following permanent pacemaker or implantable cardiac device implantation. *Brittany Melton, Ph.D., Pharm.D.*[1], Patricia Howard, Pharm.D., FCCP, BCPS (AQ Cardiology)[1], Abby Goerdt, Pharm.D.[2], Jessica Casey, Pharm.D., BCPS[2]; (1)School of Pharmacy, University of Kansas, Lawrence, KS; (2)Department of Pharmacy Inpatient Services, University of Kansas Hospital, Kansas City, KS
PURPOSE: To examine risk factors associated with pocket hematoma formation following cardiac device implantation.
METHODS: A retrospective cohort of adults undergoing permanent pacemaker (PPM) or implantable cardiac device (ICD) implantation between January 1, 2011 and December 31, 2012 was obtained from HERON (Healthcare Enterprise Repository for Ontological Narration), at a large academic teaching hospital. Data abstraction included demographics, comorbidities, medications and device type. The primary outcome was pocket hematoma formation within 30 days. Demographics were assessed using descriptive statistics; *T*-tests were used to assess demographic differences between the groups. Chi-square was used to compare hematoma formation between ICD and PPM patients and logistic regression was used to identify risk factors.
RESULTS: The final cohort consisted of 380 patients of whom 261 received a PPM and 119 received an ICD. ICD patients were significantly younger, with higher weights and heights (p=0.001, 0.028, and 0.001, respectively). The incidence of pocket hematoma was 18.5% among ICD patients compared to 5.7% among PPM patients (p<0.001). For ICD patients, significant predictors of pocket hematoma were continuous oral anticoagulation, history of valvular heart disease, and concomitant bleeding-risk medications (e.g. antiplatelets) (OR 4.927, 4.102, and 2.771, respectively). For PPM patients, continuous oral anticoagulation and rivaroxaban use were associated with increased risk of pocket hematoma (OR 3.282, 9.8, respectively).
CONCLUSION: In this cohort of and PPM and ICD patients, continuous oral anticoagulation increased the risk of developing a pocket hematoma three-five fold. Additionally, patients undergoing ICD implantation may be at greater risk if they have a history of valvular heart disease or are taking additional medications that increase bleeding risk. Findings of a substantially higher risk in PPM patients on rivaroxaban require further study due to the small number of patients on this drug. Patients should be assessed for these risk factors before undergoing device implantation and monitored closely.

24. Safety of continuous infusion ketorolac in postoperative coronary artery bypass graft surgery patients. *Meredith Howard, Pharm.D.*, Courtney Sheehan, Pharm.D., Robert Warhurst, Pharm.D.; Department of Pharmacy, Indiana University Health, Indianapolis, IN
PURPOSE: Limited literature is available regarding the use of continuous infusion ketorolac for analgesia in postoperative coronary artery bypass graft (CABG) patients. Despite boxed warnings and contraindications for use, ketorolac is still utilized in this population. This study was conducted to evaluate the safety of this practice.
METHODS: This retrospective cohort study assessed the safety of ketorolac infusion in CABG patients. The primary outcome studied was mortality and secondary outcomes were incidence of bleeding and myocardial infarction (MI). All patients who underwent isolated CABG surgeries and received continuous infusion ketorolac during the study period were included. An equal number of randomly selected isolated CABG patients served as controls. Data from electronic medical records and the Society of Thoracic Surgeons (STS) database was utilized to determine baseline characteristics and outcomes.
RESULTS: There were 178 patients who met inclusion for review; each group contained 89 patients. More patients in the control group underwent on-pump surgeries (78.6% vs 29.2%, p=0.01) and had higher median STS risk scores (1.1% vs 0.6%, p=0.003) compared with the ketorolac group. There was no difference in the primary outcome of mortality; 2.2% of patients in the ketorolac group and 3.3% of patients in the control group died (p=0.605). No patients experienced a MI. Additionally, there was no difference in the secondary outcome of bleeding incidence (p=0.61).
CONCLUSIONS: No association was found between continuous infusion ketorolac and an increased risk of mortality, MI, or bleeding events in postoperative CABG patients. Because of differences in baseline characteristics and the low incidence of the primary outcome, further research with equally matched groups or a larger patient population would be beneficial.

25. Dose related patterns of ventricular arrhythmia due to carvedilol withdrawal in patients with systolic heart failure. *Kazuhiko Kido, Pharm.D.*[1], Sara Brouse, Pharm.D.[1], Tracy Macaulay, Pharm.D.[1], Richard Charnigo, Ph.D.[2], Paul Anaya, M.D., Ph.D.[3]; (1)Pharmacy Services, University of Kentucky HealthCare, Lexington, KY; (2)Department of Statistics, University of Kentucky, Lexington, KY; (3)Gill Heart Institute, University of Kentucky HealthCare, Lexington, KY
PURPOSE: This study evaluates the impact of carvedilol dose changes on the ventricular arrhythmia event rates for patients with systolic heart failure and examines dose dependent effects of carvedilol withdrawal in dose reduction and discontinuation subgroups.
METHODS: This cohort study included patients with systolic heart failure receiving carvedilol therapy. Ventricular arrhythmia event rates were compared among carvedilol dose continuation, reduction and discontinuation groups. To assess dose dependent effects of beta-blocker withdrawal, dose reduction and discontinuation groups were divided into subgroups.
RESULTS: A total of 409 patients were divided into 262 patients in dose continuation group, 83 patients in dose reduction group, and 64 patients in dose discontinuation group. Dose discontinuation or reduction group had significantly higher ventricular arrhythmia event rates compared with dose continuation group (65.6% vs 33.7% vs 15.3%, p<0.001 for both comparisons). Dose discontinuation group also had a significantly higher ventricular arrhythmia event rate compared with dose reduction group (p<0.001). There were no significant differences in ventricular arrhythmia event rates among dose discontinuation or reduction subgroups.
CONCLUSION: Continuation of carvedilol therapy was associated with a substantially lower ventricular arrhythmia event rate compared with reduction or discontinuation of carvedilol therapy. Dose dependent effects of beta-blocker withdrawal in subgroup analyses of patients discontinuing and reducing carvedilol therapy were not found.

26E. Management of dyspepsia symptoms on dabigatran during RELY-ABLE: a long-term follow up of RE-LY patients. *Paul Reilly, Ph.D.*[1], Robby Nieuwlaat, Ph.D.[2], Jeff Healey, M.D.[2], Stephan Formella, M.D.[3], Lars Wallentin, M.D., Ph.D.[4], Salim Yusuf, D.Phil.[2], Stuart Connolly, M.D.[2]; (1)Boehringer Ingelheim, Ridgefield, CT; (2)McMaster University and Hamilton Health Sciences, Hamilton, ON, Canada; (3)Boehringer Ingelheim GmbH & Co. KG, Biberach, Germany; (4)Department of

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27E. Impact of selective serotonin reuptake inhibitor use on the effectiveness of clopidogrel therapy following coronary stent placement. *Alicia Mattson, Pharm.D., BCPS*[1], James Wolff, Pharm.D.[1], Michael Lewandowski, Pharm.D., BCPS[1], James Bischoff, Pharm.D.[2], Andrew Borgert, Ph.D.[3]; (1)Department of Pharmacy, Gundersen Health, La Crosse, WI; (2)Department of Pharmacy, North Memorial Medical Center, Robbinsdale, MN; (3)Department of Medical Research, Gundersen Health, La Crosse, WI

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28. An evaluation of factors associated with QTc-Interval prolongation in patients receiving propofol. *Michael Scalese, Pharm.D., BCPS*[1], Holly Herring, Pharm.D., BCPS[1], R. Chris Rathbun, Pharm.D., BCPS[2], Grant Skrepnek, Ph.D., Rph[1], Toni Ripley, Pharm.D., FCCP, BCPS[1]; (1)The University of Oklahoma College of Pharmacy, Oklahoma City, OK; (2)Department of Clinical and Administrative Sciences, College of Pharmacy, University of Oklahoma Health Sciences Center, Oklahoma City, OK

PURPOSE: Multiple case reports suggest an association between propofol use and corrected QT-Interval (QTc) prolongation in the presence of clinical confounders. The objective of this study was to evaluate the relationship between clinical factors and QTc-prolongation among patients receiving propofol.

METHODS: This was a retrospective analysis spanning from 2006–2012 of admitted patients ≥18 years old with cardiovascular disease who had received a minimum propofol infusion duration of 3 hours. A multivariate, Gaussian generalized linear model (GLM) regression was used to assess the association of post-infusion QTc-interval (QTc_2) and propofol use after controlling for pre-infusion QTc-interval (QTc_1), age, gender, weight, serum albumin level, use of amiodarone or other QTc-prolonging medications, and Charlson Comorbidity Index for case-mix severity. An offset was incorporated that controlled for the time measurement from propofol initiation to QTc_2. An *a priori* alpha was defined at 0.05 for statistical significance.

RESULTS: Overall, 96 patients met the study's inclusion criteria, averaging 56.1 ± 14.1 years of age and weight of 86.1 ± 25.0 kg with 37.5% being female. Results of the multivariate regression among those receiving propofol indicated a significant association ($p<0.05$) between QTc_2 and QTc_1 ($\beta = 0.563$, CI_{95} 0.346, 0.780), weight ($\beta = -0.459$, CI_{95} −0.891, −0.278), and amiodarone use ($\beta = 25.630$, CI_{95} 0.632, 50.628). A post-hoc subgroup analysis (n=32) of patients not receiving any QT-prolonging medications also suggested a significant association of QTc_2 with QTc_1 ($\beta = 0.714$, CI_{95} 0.420, 1.008) and weight. ($\beta = -0.663$, CI_{95} −1.314, −0.013).

CONCLUSION: The risk of QTc-prolongation may be increased in patients with cardiovascular disease who are administered propofol in the setting of low body weight and increased baseline QTc-Interval. Further research is needed to determine the precise threshold for when these confounders confer risk.

29. Evaluation of subtherapeutic international normalized ratio (INR) management strategies in patients with mechanical heart valves. Kelly Bartsch, Pharm.D., BCPS[1], *Marguerite Hevezi, Pharm.D., CLS, CDE*[2], Andrea Hirsch, Pharm.D., BCPS, CLS[2], Diana Vinh, Pharm.D., BCPS[2], Tiffany Chang, Pharm.D.[2], Virginia Mitchell, Pharm.D., BCPS, CLS[2]; (1)Ambulatory Care, The Ohio State University Wexner Medical Center, Columbus, OH; (2)The Ohio State University Wexner Medical Center, Columbus, OH

PURPOSE: The objective of the study is to compare the outcomes associated with the use of each of three management strategies for subtherapeutic international normalized ratios (INR) in patients with mechanical heart valves. Strategies include warfarin adjustment, bridging with low molecular weight heparin (LMWH), or unfractionated heparin (UFH). Primary outcomes include bleeding events, thrombotic events, ED visits or hospitalizations, or any documented mortality within three months of the subtherapeutic INR.

METHODS: This retrospective chart review included adult patients with mechanical heart valves managed by a provider in a central Ohio outpatient clinic of The Ohio State University Wexner Medical Center in the departments of cardiology, cardiothoracic surgery, electrophysiology, or pharmacy between January 1, 2012 and September 30, 2013. Baseline demographics and valve information were collected and patient thrombotic and bleeding risks were determined using the 2012 CHEST guidelines and Outpatient Bleeding Risk Indices. Secondary outcomes include comparison of mortality rates and ED visits/hospitalization by strategy selected, and a comparison of strategy choice by provider department.

RESULTS: 114 patients were included in the study with a total of 464 subtherapeutic episodes during the study period. Twenty-six adverse outcomes occurred including five deaths that were not definitively linked to the use of anticoagulants. Further data analysis is ongoing.

CONCLUSION: Patients with mechanical heart valves are at an increased risk of thrombosis and receive lifelong warfarin therapy. Several studies have examined the best course of therapy for warfarin initiation and peri-operative management, and support the use of UFH or LMWH. However, to date no studies have evaluated the options for managing an incidental subtherapeutic INR experienced during maintenance therapy in this population. Consequently, management of these situations varies by site and clinician. Preliminary results of this study indicate that outpatient management may be appropriate for this patient population.

30. Incidence and risk factor analysis for alterations in hemostasis in mechanical circulatory support recipients. *Alex Lopilato, Pharm.D.*[1], Christina T. Doligalski, Pharm.D., BCPS[1], Christiano Caldeira, M.D.[2]; (1)Department of Pharmacy, Tampa General Hospital, Tampa, FL; (2)Florida Advanced Cardiothoracic Surgery, Tampa General Hospital, Tampa, FL

PURPOSE: Mechanical circulatory support (MCS) is associated with hemostatic complications. We describe the incidence and risk factors for gastrointestinal bleeding (GIB) and pump thrombosis (PT) to optimize patient selection/management.

METHODS: An IRB-approved retrospective review of first MCS implants between 10/1/2011-9/30/2013 at a single-center was conducted. Endpoints included epidemiological and risk factor analyses for GIB and PT. Descriptive statistics, chi-squared, and *t*-tests were used.

RESULTS: Sixty-four patients received continuous-flow MCS. The twelve-month incidence of GIB and PT was 23.4% and 12.5%. The 1-, 3-, and 6-month rate of PT was 1.6%, 6.25%, and 12.5%, respectively. Time to first GIB was 72.6 days (9-160). All PT required pump exchange. Females (50% vs 16%, p=0.026) and patients without antiplatelet therapy (12.5% vs 50%, p=0.046) were at increased risk of PT. No pre-implant co-morbidities were associated with PT. Infection was not identified as a risk factor in our cohort (25% vs 51.8%, p=0.156). Mean INR preceding event was not different than non-event patients (2.1 vs 2.24, p=0.24). Regarding biomarkers preceding event, elevated plasma free hemoglobin (pfHg) did not reach significance (75% vs 58%, p=0.383) while lactate dehydrogenase was elevated significantly (744 vs 298, $p<0.001$), indicating its role as a more sensitive marker of PT. No pre-implant factors were associated with GIB. Post-implant risk factors for GIB included infection (80% vs 38.8%, p=0.005) and infrequent elevations in pfHg (13.3% vs 63.3%, $p<0.001$). Increased pump speed as a GIB risk factor was confirmed (HeartMate II 9560 rpm vs 9490 rpm, $p<0.001$; Heartware 2949 rpm vs 2710 rpm, $p<0.001$). Anticoagulation/antiplatelet therapy did not affect GIB: mean INR preceding event was not different than non-event patients (2.21 vs 2.27, p=0.67) and antiplatelet use was not different (46.7% vs 46.9%, p=0.985).

CONCLUSION: MCS is associated with early hemostatic-related morbidity. Few pre-implantation risk factors were elucidated; however, post-implantation factors including antiplatelet therapy, infection, and pump speed were identified.

31. Effect of intravenous post-operative anticoagulation on thrombotic and bleeding complications after implantation of a Jarvik 2000 left ventricular assist device. *Jenna Siskey, Pharm.D.*[1], Ian Hollis, Pharm.D.[1], Brett Sheridan, M.D.[2]; (1) Department of Pharmacy, University of North Carolina Medical Center, Chapel Hill, NC; (2)Division of Cardiothoracic Surgery, University of North Carolina Medical Center, Chapel Hill, NC

PURPOSE: The Jarvik 2000 is an investigational, continuous-flow left ventricular assist device (LVAD). Patients implanted with LVADs require lifelong anticoagulation, most commonly with oral warfarin, to prevent thrombotic events such as embolic strokes or pump thrombosis. The need to bridge patients to warfarin with intravenous (IV) unfractionated heparin (UFH) in the immediate post-operative period is less certain. Studies of patients with a Heartmate II LVAD who were not bridged with IV UFH have shown similar thrombotic risk with reduced bleeding risk compared to patients who were bridged. The objective of this study is to evaluate the effects of IV post-operative anticoagulation on thrombotic and bleeding complications after implantation of a Jarvik 2000.

METHODS: This was a retrospective medical record review. Adult patients implanted with the Jarvik 2000 at University of North Carolina Medical Center from 2005 to 2013 were included. Patients were categorized into two study groups: Group A used an IV anticoagulant as a bridging agent and Group B did not use a bridging agent. Thrombotic and bleeding events were compared between groups.

RESULTS: Twenty-six patients were included in the study, fourteen in group A and twelve in group B. In the first 30 days post implantation, bleeding events occurred in 36% (5/14) and 42% (5/12) of patients in groups A and B, respectively. In the first 180 days post implantation, thrombotic events occurred in 14% (2/14) and 17% (2/12) of patients in groups A and B, respectively.

CONCLUSION: While limited by retrospective design and small patient numbers, we report numerically similar rates of bleeding and thrombotic events independent of IV anticoagulant use as a bridging agent. Future studies are warranted to further evaluate the safety and efficacy of omitting an IV anticoagulant prior to anticoagulation with warfarin in the immediate post-operative period after implantation with a Jarvik 2000.

32. Initial characterization of cytochrome P450-derived eicosanoids as a predictive biomarker in coronary artery disease. *Akinyemi Oni-Orisan, Pharm.D.*[1], Katherine N. Theken, Pharm.D., Ph.D.[1], Robert N. Schuck, Pharm.D., Ph.D.[1], Matthew L. Edin, Ph.D.[2], Alan L. Hinderliter, M.D.[3], George A. Stouffer, M.D.[3], Darryl C. Zeldin, M.D.[2], Craig R. Lee, Pharm.D., Ph.D., FCCP[1]; (1) Division of Pharmacotherapy and Experimental Therapeutics, UNC Eshelman School of Pharmacy, Chapel Hill, NC; (2) Environmental Cardiopulmonary Disease Group, National Institute of Environmental Health Sciences, Research Triangle Park, NC; (3)Division of Cardiology, UNC School of Medicine, Chapel Hill, NC

PURPOSE: Arachidonic and linoleic acids are metabolized by cytochrome P450 (CYP) epoxygenases into epoxy-eicosanoids (EETs and EpOMEs, respectively), which are subsequently hydrolyzed by soluble epoxide hydrolase (sEH) into dihydroxy-eicosanoids (DHETs and DiHOMEs). Inhibition of sEH evokes protective effects in the cardiovascular system in preclinical models, and has emerged as a novel therapeutic target for coronary artery disease (CAD). However, the relationship between epoxy- and dihydroxy- eicosanoid levels and the presence and severity of CAD has not been rigorously characterized. Therefore, we determined the relative predictive utility of sEH metabolism biomarkers in discriminating between CAD patients and healthy volunteers to lay the foundation for future research.

METHODS: A panel of 16 eicosanoid metabolites derived from the CYP epoxygenase-sEH, CYP omega-hydroxylase, and lipoxygenase metabolic pathways were quantified in plasma via high performance liquid chromatography–tandem mass spectrometry (HPLC-MS/MS) and compared between stable CAD patients (N=82) and healthy volunteers (N=36). Eicosanoid profile differences were examined using partial least squares discriminant analysis (PLS-DA), metabolite set enrichment analysis, unsupervised hierarchical clustering, and receiver operating characteristic (ROC) analyses. The false discovery rate was used to minimize the impact of multiple comparisons.

RESULTS: Multiple metabolomic analyses demonstrated that CAD patients could be discriminated from healthy controls using the 16-metabolite eicosanoid profile. Metabolite set enrichment analysis revealed that the CYP epoxygenase-sEH pathway was the most markedly altered eicosanoid pathway in CAD patients versus controls ($p=2.5 \times 10e-6$). The 12,13-EpOME:12,13-DiHOME ratio, an established biomarker of sEH metabolic activity, was the strongest individual predictor of CAD status (AUC 0.80, 95% CI 0.71–0.87, $p=9.4 \times 10e-8$). Consistent results were obtained following stratification by multiple potential confounding factors.

CONCLUSIONS: Biomarkers of sEH activity may be promising diagnostic tools for CAD; validation in an independent population is necessary. Moreover, these data lay the foundation for future research evaluating the therapeutic utility of sEH inhibition in CAD.

33. Outcomes of a pharmacist-managed heart failure medication titration clinic. *Shubha Bhat, Pharm.D.*[1], Mayank Kansal, M.D.[2], Thomas Stamos, M.D.[2], George Kondos, M.D.[2], Vicki L. Groo, Pharm.D.[1]; (1)Department of Pharmacy Practice, University of Illinois at Chicago; (2)Department of Medicine, University of Illinois at Chicago

PURPOSE: A medication titration clinic (MTC) was developed to optimize guideline directed medical therapy (GDMT) for heart failure (HF) patients. MTC patients had ACE inhibitor (ACEi), angiotensin receptor blocker (ARB), and/or beta blockers (BB) titrated to target dose per 2010 HF Society of America guidelines by a pharmacist during face to face visits. The pharmacist had authority to independently make medication changes. We evaluated MTC efficacy outcomes.

METHODS: Single center retrospective chart review of adults with HF (EF $\leq$ 40%) referred to MTC or managed by cardiology (C) alone from 7/6/11 to 7/31/13. Patients managed by the HF service were excluded. Demographics, vitals, basic metabolic panel, and medical history were collected. HF medication regimen was collected at baseline and final visit. The primary endpoint was number of patients on target or maximum tolerated dose of GDMT. Unpaired student's t-test was utilized for continuous variables and chi-square test for categorical variables

RESULTS: Fifty-five MTC and 112 C patients met the inclusion criteria. Baseline characteristics were similar except MTC patients had lower BUN, less coronary disease and a shorter time since HF diagnosis.

	MTC (avg ± SD)	C (avg ± SD)	p Value
Age (years)	60 ± 16	64 ± 15	0.20
NYHA FC	1.75 ± 0.70	1.79 ± 0.66	0.72
SBP (mmHg)	131 ± 25	129 ± 20	0.47
HR (bpm)	77 ± 14	75 ± 14	0.47
Target dose achieved n (%)			
ACEi or ARB baseline	21 (38.2)	57 (50.9)	0.12
ACEi or ARB final	44 (80)	64 (57.1)	<0.01
BB baseline	9 (16.4)	43 (38.4)	0.01
BB final	46 (83.6)	63 (56.3)	<0.01
Provider visits >3 months n (%)	11 (20)	81 (72.3)	<0.01

CONCLUSION: Patients managed in the pharmacist-managed MTC were more likely to received GDMT despite a shorter duration of follow-up than those managed in a general cardiology clinic.

Clinical Administration

34. Examination of collaboration, communication, and professional activity awareness among faculty and non-faculty pharmacists at an affiliated academic institution. *Laura Siemianowski, Pharm.D., BCPS*, Sanchita Sen, Pharm.D., BCPS, Brandon Patterson, Pharm.D., Ph.D.; Department of Pharmacy Practice and Pharmacy Administration, Philadelphia College of Pharmacy, Philadelphia, PA

PURPOSE: The need for pharmacy faculty to be actively engaged in clinical practice is increasing in parallel to the importance of clinical, site-based education for pharmacy schools. As models for practicing educators are developed, issues emerge that can lead to polarization between personnel working in academia and the practice site(s). This study examined the collaboration and communication among practicing pharmacists at one affiliated academic institution. Additionally, professional activity awareness was measured across a variety of pharmacists' activities expected to occur at an academic health center.

METHODS: A web-based, confidential survey was developed, piloted, and distributed to 44 faculty and non-faculty pharmacists at a large academic health system. Communication was assessed using a 5 item measure with a 4-point Likert scale (Strongly Agree, Agree, Disagree, Strongly Disagree). Collaboration was assessed using a 5 item measure with a 4-point Likert scale. Professional activity awareness was measured using a 16 item measure with a 4-point Likert-type scale (Fully Aware, Somewhat Aware, Somewhat Unaware, Fully Unaware) comprised of pharmacy practice, teaching, service, and research.

RESULTS: The response rate was 77%. Of the respondents, 32% and 67% were pharmacy faculty and non-faculty, respectively. Overall, most pharmacists had a negative view of communication (79.4%) and collaboration (58.8%). However, on a 100-point scale, awareness of pharmacists' activities in the department was high (70.4 ± 21.2). Awareness of activities (versus unawareness) ranged from 61.8% ("design and/or conduct of pharmacy practice research") to 97.1% ("utilizing supplemental health information" and "providing medication therapy management").

CONCLUSION: Communication and collaboration can be measured across pharmacists' roles in an academic health center. Negative perceptions on group-level communication and collaboration are not associated with less professional activity awareness. Future research could explore involvement in pharmacists' activities and relationship development across pharmacists' roles.

35. Development and initial validation of the Academic Health Center Pharmacists' Activity Index. *Brandon Patterson, Pharm.D., Ph.D.*, Laura Siemianowski, Pharm.D., BCPS, Sanchita Sen, Pharm.D., BCPS; Department of Pharmacy Practice and Pharmacy Administration, Philadelphia College of Pharmacy, Philadelphia, PA

PURPOSE: Affiliations between health systems and colleges of pharmacy are increasing which creates more opportunities for practicing pharmacists to participate in traditionally academic activities (teaching, research, and service). Pharmacist activity indices capture the variety of tasks pharmacists engage in. Accurate measurement of pharmacists' activities is important for many reasons, including compensation, quality improvement, and strategic planning. The purpose of this study was to develop an activity index that accurately captures the involvement of faculty and non-faculty pharmacists working in an academic health system.

METHODS: Two clinical pharmacy faculty members developed an initial list of pharmacists' activities focused on teaching, practice, service and research. Modifications were made after they shared the initial list with non-faculty pharmacists at a large academic health center. A web-based, confidential survey was developed, piloted, and distributed to 44 faculty and non-faculty pharmacists. Sixteen activity items (7 practice, 5 teaching, 3 service, and 1 research) were included in the final survey. Activity involvement was measured for the 16 activities using a 5-point frequency scale (All of the Time, Often, Sometimes, Rarely, Never). Desired involvement was measured for the 16 activities using a 3-point scale (More Involved, About the Same, Less Involved).

RESULTS: The response rate was 77%. Of the respondents, 32% and 67% were faculty and non-faculty pharmacists, respectively. Significant variation in pharmacists' involvement was identified. Non-faculty pharmacists had statistically ($p<0.05$) more involvement in "managing the medication use process" and "utilizing internal information technology" while faculty pharmacists were statistically ($p<0.05$) more involved in "rounding" and "pharmacy practice research". More than half of the pharmacists desired more involvement in pharmacy practice research (52.9%).

CONCLUSION: The Academic Health Center Pharmacists' Activity Index is a useful tool for quantifying pharmacists' activities across activity domains for practicing faculty and non-faculty pharmacists in academic health centers.

Community Pharmacy Practice

36E. Managing patients with type 2 diabetes from the "Sweet Spots" in the community. Zexuan Koh, B.Sc. (Pharmacy)[1], Melanie Siaw, B.Sc. (Pharmacy)[1], Parry Zhang, B.Sc. (Pharmacy)[2], *Joyce Lee, Pharm.D., BCPS, BCACP*[1]; (1)Department of Pharmacy, Faculty of Science, National University of Singapore, Singapore; (2)Department of Pharmacy, NTUC Unity Healthcare Co-operative Ltd., Singapore

Presented at to be presented at 24th Singapore Pharmacy Congress, Singapore October 18–19, 2014.

37. A smoking cessation model that integrates social media in hospitalized patients post-discharge. *Neha Vora, Pharm.D.*[1], Roger Smalligan, M.D.[2], Rahul Chandra, M.D.[2], Shanna James, Pharm.D.[1], Rachel Basinger, Pharm.D., BCPS[1], Jill Frost, Pharm.D.[1], Christine Acker,[3], Jana Hutcherson, B.A.[2]; (1) Department of Pharmacy Practice, Texas Tech Health Science Center School of Pharmacy - Amarillo, Amarillo, TX; (2)Internal Medicine, Texas Tech Health Science Center School of Medicine - Amarillo, Amarillo, TX; (3)Department of Respiratory, Northwest Texas Hospital, Amarillo, TX

PURPOSE: In the United States, smoking remains the most challenging public health issue. Smoking cessation programs that leverage social media can potentially improve smoking cessation rates. The purpose of this pilot study is to determine if providing nicotine replacement therapy (NRT) to patients during hospitalization in conjunction with educational classes plus reminders via social media can help achieve higher smoking cessation rates.

METHODS: Patients were enrolled during hospital admission and consented and completed an initial questionnaire to rate nicotine dependence. Carbon monoxide levels were collected at the time of consent and at each follow-up visit to determine smoking habits. Patients were encouraged to sign up for social network resources such as: motivational text messaging, Facebook, and/or the QuitNow! application. A two week supply of nicotine patches and/or gum were prescribed at discharge. Four follow-up visits were scheduled at two week intervals to assess compliance, teach educational classes, and dispense additional NRT as deemed necessary. The change between carbon monoxide levels at baseline and the end of study will be compared using the paired t-test. The study is projected to end in September 2016.

RESULTS: To date, we have enrolled 69 patients. Among these, 42% have HTN, 32% have COPD, 17% have T2DM, 16% have CHF, 12% have CAD, 10% have asthma. Sixty patients have a baseline CO level and the average level is 4 ppm. Nine patients have so far attended the educational classes. Among the 9, 6 patients have attended the first follow-up visit, 2 have attended 2

follow-up visits, and 1 has attended 3 follow up visits. Travel expenses and a lack of social networking technology has limited follow-up appointments. New strategies are being explored to increase patient attendance.
CONCLUSION: We believe receiving continuous positive feedback using social media will improve patient's smoking cessation rates.

Critical Care

38E. Incidence of enteral nutrition intolerance in critically ill patients receiving vasopressor therapy. *Sarah Vest, Pharm.D.*[1], Diana Wells, Pharm.D., BCPS[2], Amber Hutchison, Pharm.D., BCPS[2], Christine Cicci, Pharm.D., BCPS[1], Jennie Swearengen, Pharm.D., BCPS[1]; (1)East Alabama Medical Center, Opelika, AL; (2)Harrison School of Pharmacy, Auburn University, Auburn, AL

Presented at Southeastern Residency Conference, Athens, GA, May 1–2, 2014; American Society of Health System Pharmacists Midyear Clinical Meeting, Orlando, FL, Dec 8–12, 2013 (Preliminary results).

39. Knowledge about neuromuscular blocking agents for respiratory failure among medical intensive care unit nurses: a multicenter survey. *Erin N. Frazee, Pharm.D.*[1], Heather A. Personett, Pharm.D.[1], Seth Bauer, Pharm.D., BCPS[2], Amy Dzierba, Pharm.D.[3], Joanna Stollings, Pharm.D.[4], Lindsay Ryder, Pharm.D.[5], Jennifer Elmer, DNP[6], Craig Daniels, M.D.[7], Sean Caples, DO[7]; (1)Mayo Clinic, Rochester, MN; (2)Department of Pharmacy, Cleveland Clinic, Cleveland, OH; (3)Department of Pharmacy, NewYork-Presbyterian Hospital, New York, NY; (4) Department of Pharmaceutical Services, Vanderbilt University Medical Center; (5)Department of Pharmacy, The Ohio State University Wexner Medical Center; (6)Department of Nursing, Mayo Clinic; (7)Pulmonary and Critical Care Medicine, Mayo Clinic
PURPOSE: The purpose of the present study was to describe critical care nurse knowledge of the therapeutic properties, adverse effects, and monitoring parameters associated with neuromuscular blocking agents (NMBA).
METHODS: This was a prospective, multicenter, survey of medical intensive care unit nurses between July 2012 and May 2013. The web-based survey instrument was designed, pre-tested and administered under the direction of a multidisciplinary group of individuals.
RESULTS: Responses were analyzed for 160 individuals (22% of eligible nurses). The majority of respondents were able to correctly identify NMBA as non-analgesic (93%) and non-anxiolytic (83%). The perceived durations of action of NMBA varied widely and few nurses demonstrated familiarity with patient-specific drug elimination considerations. Seventy percent of respondents recognized the independent associations between NMBA and foot drop, muscle breakdown, and corneal ulceration. Pressure ulcers and a history of neuromuscular disease were the patient-characteristics perceived to most heighten the risk of NMBA use.
CONCLUSIONS: The recent increase in NMBA utilization for severe respiratory failure is set against a backdrop of concerns about harm with these high-risk drugs. Critical care nurses, often responsible for the bedside administration of these therapies, are knowledgeable about the importance of concurrent analgesia and sedation during NMBA. Routes of elimination, duration of action, and adverse effects were less commonly known. The findings can be applied by ICU and medication safety pharmacists, alike, to promote focused education and quality improvement initiatives targeted at the safe implementation of these agents in practice.

40E. Vancomycin pharmacokinetic parameters in patients with acute brain injury undergoing controlled normothermia. *Kathryn Morbitzer, Pharm.D.*[1], J. Dedrick Jordan, M.D., Ph.D.[2], Emily Durr, Pharm.D.[3], Denise Rhoney, Pharm.D.[1]; (1)Division of Practice Advancement and Clinical Education, UNC Eshelman School of Pharmacy, Chapel Hill, NC; (2)Department of Neurology and Neurosurgery, University of North Carolina at Chapel Hill School of Medicine, Chapel Hill, NC; (3)Department of Pharmacy, University of North Carolina Hospitals, Chapel Hill, NC

Presented at the Neurocritical Care Society Annual Meeting, Seattle, WA, Sept 11–14, 2014.

41. Delirium in mechanically-ventilated intensive care patients: effect of sedation and risk factors. *Marian Gaviola, Pharm.D.*[1], Karen Petros, Pharm.D.[2], Michael Regier, Ph.D.[3], Alison Wilson, M.D.[4], John Honaker, B.S.[3]; (1)Department of Pharmaceutical Services, WVU Healthcare, Morgantown, WV; (2)West Virginia University Healthcare, Morgantown, WV; (3)Department of Biostatistics, West Virginia University, Morgantown, WV; (4) Division of Trauma Acute Care Surgery, West Virginia University, Morgantown, WV
PURPOSE: Delirium incidence varies based on pharmacologic treatment provided in the intensive care unit (ICU) as well as baseline risk factors with which patients present. Benzodiazepines have been associated with increased risk of delirium. Current institutional assessment tools for delirium and sedation include the Confusion Assessment Method for the ICU (CAM-ICU) and the Richmond Agitation Sedation Scale (RASS). The purpose of this study was to describe the cumulative impact of sedative use with baseline risk factors.
METHODS: The occurrence of delirium and coma were retrospectively assessed in 56 mechanically ventilated patients admitted to the medical and surgical ICU. The proportion of delirium- and coma-free days in patients receiving midazolam, propofol, dexmedetomidine, or no sedatives was compared and a Poisson regression model was created to identify significant risk factors for the development of coma and delirium during ICU admission. Sedative effects on ICU length of stay (LOS), intubation and ventilation time were also assessed.
RESULTS: Patients receiving dexmedetomidine had the highest proportion of delirium- and coma-free days (57.1%) while those receiving no sedatives had the highest proportion of delirium-free days (61.3%). In both outcomes, midazolam was associated with the lowest incidence (37.8%, 43%). The Poisson regression model identified a history of alcoholism, admission Glasgow Coma Scale (GCS) score and midazolam use as significant risk factors for the development of delirium while only the GCS score and midazolam use were associated with the development of coma. Midazolam use was also associated with increased time requiring intubation and ICU LOS. An additional delirium day may be expected for every 20 ICU days in patients receiving midazolam for sedation.
CONCLUSION: Midazolam use is associated with increased incidence of delirium in mechanically ventilated, critically ill patients and its effect is augmented in patients with a history of alcoholism.

42. Patient outcomes based on hypoglycemic events during therapeutic hypothermia. Ana Negrete, Pharm.D., BCPS, Yiwen Chang, Pharm.D., Jennifer Lehneman-Smith, Pharm.D., BCPS, *Carrie S. Oliphant, Pharm.D., BCPS (AQ Cardiology)*; Department of Pharmacy, Methodist University Hospital, Memphis, TN
PURPOSE: Therapeutic hypothermia (TH) is recommended following return of spontaneous circulation (ROSC) secondary to cardiac arrest in patients who remain comatose. The current American Heart Association guidelines for TH propose a target blood glucose level between 144 mg/dL and 180 mg/dL in critically ill patients as a Class IIb recommendation. While there is a large body of evidence to show the deleterious effects of hypoglycemia in critically ill patients, there is limited evidence specific to patients undergoing TH.

METHODS: A retrospective chart review was conducted in 117 patients who underwent TH after cardiac arrest with ROSC between 05/01/2009 and 12/31/2013. Patients were stratified based on the single lowest whole blood glucose (BG) reading into one of four groups based on the severity of hypoglycemia. The primary outcome was to evaluate the effect of hypoglycemia on survival to hospital discharge. Discharge disposition, length of stay (LOS) and the time BG was in the target range (100–150 mg/dL per institutional TH protocol) were evaluated as secondary endpoints.
RESULTS: The primary outcome of survival to hospital discharge was not significant between the four groups (p=0.63). In addition, there was a non-significant relationship between the single lowest BG on discharge disposition (p=0.84) and LOS (p=0.16). Blood glucose control was found to be in the target range of 100–150 mg/dL approximately half of the time (54.5%). A subgroup analysis revealed a 3.7% increase in survival to hospital discharge for every hour the BG was in target range.
CONCLUSION: These results indicate that discharge disposition does not correlate with the single lowest BG reading; however, there may be an association with the duration of time that BG was in the target range and survival to hospital discharge. Future research is warranted to validate our findings, particularly the association between maintenance of target BG and survival.

43. The impact of a pharmacist-managed acid suppression program on inappropriate therapy in the intensive care unit. *Mitchell S. Buckley, Pharm.D., FASHP, FCCM, BCPS*[1], Andrew Park, Pharm.D.[1], Clint Anderson, Pharm.D., BCPS[1], Jeffrey Barletta, Pharm.D.[2], Dale Bikin, Pharm.D.[1], Laura Wicks, Pharm.D.[1], Cheryl O'Malley, M.D.[3], Richard Gerkin, Jr., M.D., M.S., FACP, FACMT[4], Sandra L. Kane-Gill, Pharm.D., M.Sc., FCCM, BCPS[5]; (1)Department of Pharmacy, Banner Good Samaritan Medical Center, Phoenix, AZ; (2)Department of Pharmacy Practice, Midwestern University, College of Pharmacy-Glendale, Glendale, AZ; (3)Internal Medicine, Banner Good Samaritan Medical Center, Phoenix, AZ; (4)Graduate Medical Education Research, Banner Good Samaritan Medical Center, Phoenix, AZ; (5) University of Pittsburgh School of Pharmacy, Pittsburgh, PA
PURPOSE: Critically ill patients are at risk of experiencing gastrointestinal (GI) bleeding resulting from stress-related mucosal disease (SRMD). Although appropriate utilization of acid suppression therapy (AST) for stress ulcer prophylaxis (SUP) should be limited to those patients at highest risk, inappropriate use remains a concern. The purpose of this study was to evaluate the impact of a pharmacist-managed AST program on inappropriate SUP utilization in the intensive care unit (ICU).
METHODS: A retrospective, pre and post study design was conducted in adult ICU patients at a large academic medical center. Rates of inappropriate SUP in all ICU patients were recorded over two nonconsecutive months before (January 2011) and after (January 2012) the implementation of a novel pharmacist AST management program. Inappropriate SUP was defined as those patients on AST without any risk factors for SRMD-related GI bleeding. Subjects were excluded if AST was used for any appropriate indication or continuation of home therapy. The pharmacy program included prescriptive authority for AST under a collaborative practice agreement enabling the pharmacist to initiate, modify, and discontinue SUP based upon risk factor assessment.
RESULTS: A total of 341 patients (pre-group, n=174; post-group, n=167) were evaluated for inappropriate SUP. The incidence of inappropriate SUP was significantly decreased in the post-group compared to pre-implementation (9.3% vs 21.7%, respectively; p<0.001). The mean duration of inappropriate SUP significantly decreased comparing the pre- and post-groups (5.4 ± 7.5 days vs 3.3 ± 4.3 days, respectively; p=0.006). Inappropriate continuation of AST upon hospital discharge significantly decreased from 29.9% to 3.6% in the pre- and post-groups, respectively (p<0.001).
CONCLUSIONS: SUP is common in the ICU and inappropriate utilization of AST remains significant. This novel pharmacist-managed program improved appropriate utilization of SUP in the ICU and decreased inappropriate continuation of AST upon hospital discharge.

44E. The impact of chlorhexidine mouthwash prophylaxis on ventilator-associated events. *Emmanuel Enwere, Jr., Pharm.D., MS*[1], Kathryn Elofson, Pharm.D.[2], Anthony Gerlach, Pharm.D., BCPS, FCCM[3]; (1)The University of Texas MD Anderson Cancer Center; (2)Huntsman Cancer Hospital, University of Utah Hospitals & Clinics; (3)The Ohio State University Wexner Medical Center

Presented at the Great Lakes Residency Conference, West Lafayette, Indiana, April 23–25, 2014.

Drug Information

45. Drug Information Practice and Research Network needs assessment survey. *Jennifer Phillips, Pharm.D., BCPS*[1], Dianne May, B.S., Pharm.D., BCPS[2], J. Russell May, B.S., Pharm.D., FASHP[2], Erin Timpe Behnen, Pharm.D, BCPS[3], Allison Bernknopf, Pharm.D., BCPS[4], Sabrina W. Cole, Pharm.D., BCPS[5], Cathy Ficzere, Pharm.D., BCPS[6], Michael Gabay, Pharm.D., JD, BCPS[7], Jennifer Nieman, B.A., Pharm.D., BCPS[8]; (1)Chicago College of Pharmacy, Midwestern University, Downers Grove, IL; (2) Department of Clinical and Administrative Pharmacy, University of Georgia College of Pharmacy, Augusta, GA; (3)Southern Illinois University Edwardsville School of Pharmacy, Edwardsville, IL; (4)Homer Stryker M.D. School of Medicine, Ferris State University/Western Michigan University, Kalamazoo, MI; (5)Wingate University School of Pharmacy, Wingate, NC; (6)Department of Pharmacy Practice, Belmont University College of Pharmacy, Nashville, TN; (7)College of Pharmacy, University of Illinois at Chicago, Chicago, IL; (8) Department of Pharmacy Relations & Clinical Decision Support, The Nebraska Medical Center, Omaha, NE
PURPOSE: A survey was conducted of the Drug Information Practice and Research Network (DI PRN) members to identify awareness and usage of key products and services offered by the DI PRN.
METHODS: An anonymous 23 question survey, developed by the DI PRN Membership Committee, was sent via e-mail to all members of the DI PRN. A reminder e-mail was sent 1 month after the initial e-mail. Members were informed that the results of the survey would be used by the DI PRN leadership to enhance the products and services offered. Survey results were tabulated and assessed.
RESULTS: Survey responses were received from 67 of the 300 members (22.3% response rate). Responders represented all geographical areas: northeast (11.3%), midwest (41.5%), south (32.1%) and the west (15.1%). Only 8 of 67 (11.9%) attended the 2013 DI PRN business meeting, however, over 95% indicated they would participate if there were an alternative method of attending such as a webinar. The services and products most often indicated as valuable were the listserv (64.2%), programming at the annual meeting (31.3%), opinion papers (31.3%), newsletters (26.9%), and the business meetings (25.4%). Less than 6% of responders indicated that a service was not valuable. Many responders were not aware of services and products offered. The most common were the website (47.8%), opinion papers (41.8%), breakfast tables at the spring meeting (40.3%) and newsletters (40.3%). Responders submitted 13 ideas for future programming, 10 ideas for potential research projects, and 16 ideas to enhance member engagement.
CONCLUSIONS: Survey results will be helpful in giving direction to the DI PRN for improving the services and products offered. Actions needed include improving communication about the availability of services and products, making business meetings more assessable, and regularly seeking input on programming, potential research projects, and ways to enhance members' engagement.

Education/Training

46. Gamification of pharmacy practices – what students want for their education. David Poh, B.Sc. (Pharmacy)[1], Huan Ying Chang, B.Sc. (Pharmacy)[1], Li Lian Wong, Pharm.D.[1], John Yap, M.A.[2], *Kevin Yap, Ph.D., SRPharmS*[1]; (1)Department of Pharmacy, Faculty of Science, National University of Singapore, Singapore; (2)Computer Centre, National University of Singapore, Singapore

PURPOSE: Serious games, which are digital games that have a purpose beyond entertaining the player, are becoming increasingly popular in the digital age. This study aims to determine the types of gaming aspects that pharmacy students would like to play in a serious game for their pharmacy practice education.

METHODS: A cross-sectional study was conducted using a self-administered survey, which obtained students' responses on their preferences regarding various gaming aspects (reward systems, game settings, storylines, viewing perspectives and gaming styles) and for a hypothetical gaming scenario (authentic simulation or post-apocalyptic fantasy). Ethics approval was obtained from the university's Institutional Review Board. Descriptive statistics, chi-squared and Fisher's exact tests were used for statistical analysis.

RESULTS: Response rate was 72.7% (497/684 undergraduates). The most popular game reward system was unlocking mechanisms (25.7%). The most popular storylines were adventurer (30.6%) and authentic pharmacy-related plots (24.7%). Most students preferred fantasy/medieval/mythic (52.9%) and modern (24.5%) settings. However, lower year undergraduates preferred modern settings less (19.9% for years 1 and 2 vs 28.9% for years 3 and 4, p=0.022). Similar proportions of students chose the different gaming styles (competitive 30.1%, cooperative 32.7% and collaborative 37.2%). One-third preferred a two-dimensional top-down viewing perspective (32.2%) and over half preferred a post-apocalyptic fantasy scenario (57.9%). Males preferred the post-apocalyptic scenario more than females (69.0% vs 50.7%, p<0.001).

CONCLUSION: This is the first study that has identified the types of gaming aspects that pharmacy students want for their education. In general, they want a fantasy/medieval/mythic post-apocalyptic game setting, based on an adventurer storyline with an unlocking mechanism reward system. They prefer a two-dimensional top-down perspective and a collaborative gaming style. However, a balance between real-life and fantasy environments needs to be struck for a game that caters towards training students for pharmacy practices.

47E. Rubric reliability in evaluating oral case-based presentations in a Drug-Induced Diseases elective. *Sarah A. Nisly, Pharm.D.*[1], Alex Isaacs, Pharm.D.[2], Alison Walton, Pharm.D.[3], Meredith Howard, Pharm.D.[4]; (1)Butler University College of Pharmacy and Health Sciences & Indiana University Health, Indianapolis, IN; (2)Department of Pharmacy Practice, Purdue University & Eskenazi Health, Indianapolis, IN; (3)Department of Pharmacy Practice, Butler University College of Pharmacy and Health Sciences, Indianapolis, IN; (4)Department of Pharmacy Practice, Butler University College of Pharmacy and Health Sciences & Indiana University Health, Indianapolis, IN

Presented at Accepted for poster presentation at the AACP Annual Meeting.

48. Development, pilot, and quality assessment of a pharmacogenomics education program for pharmacists. *Christine M. Formea, Pharm.D.*[1], Wayne T. Nicholson, M.D., Pharm.D.[2], Kristen B. McCullough, Pharm.D.[1], Julie L. Cunningham, Pharm.D.[3], Julianna A. Merten, Pharm.D.[1], John D. Zeuli, Pharm.D.[1], Eric T. Matey, Pharm.D.[1], Garrett E. Schramm, Pharm.D.[1], Kelly K. Wix, Pharm.D.[1], Carolyn R. Vitek, M.S.[4], Darcy M. Richardson, MBA[4]; (1)Hospital Pharmacy Services, Mayo Clinic, Rochester, MN; (2)Department of Anesthesiology, Mayo Clinic, Rochester, MN; (3)Department of Hospital Pharmacy Services; College of Medicine Mayo Clinic, Mayo Clinic, Rochester, MN; (4)Center for Individualized Medicine, Mayo Clinic, Rochester, MN

PURPOSE: Pharmacogenomics is a rapidly growing field. Of particular importance to our institution are drug-gene pairs that have been implemented in the electronic medical record with computer decision support for prescribers. Pharmacists are the institution's front line for management of pharmacogenomics questions and issues since they are well-educated in the therapeutic management of drugs. We describe the development and pilot of a pharmacist education program and results of quality assurance assessments.

METHODS: A pharmacogenomics education program was developed, implemented and its quality assessed at a large academic health system. Inpatient and outpatient pharmacists were the intended audience for the competency-based education. The educational content was focused on pharmacogenomics principles for drug-gene pairs and integrated institutional decision trees and resources into the short, online programs that were delivered by the institutional health science educational system (Blackboard). In order to evaluate the effectiveness of the educational program, a competency was given before and after the module.

RESULTS: Of the 284 pharmacists, the Pharmacogenomics Introduction module was completed by 232 pharmacists (82% completion) and the Pharmacogenomics Hypersensitivity module was completed by 217 pharmacists (76% completion). The Introduction module demonstrated an average Pre-test score of 47.9, an average Post-test score of 93, and an average change of 45.1 points. The Hypersensitivity module demonstrated an average Pre-test score of 51.4, an average Post-test score 96.6, and an average change of 45.2 points.

CONCLUSION: Short, targeted competencies delivered via institutional education systems showed success in increasing inpatient and outpatient pharmacists' understanding of pharmacogenomics topics that focus on point-of-care prescribing needs.

49. The effect of quizzes on student preparation prior to a flipped classroom. *Asad Patanwala, Pharm.D.*, Brian Erstad, Pharm.D., John Murphy, Pharm.D.; Pharmacy Practice and Science, The University of Arizona College of Pharmacy, Tucson, AZ

PURPOSE: The flipped classroom involves some learning of content by students ahead of time, so that class time can be spent on interactive exercises. This is thought to facilitate a higher level of learning compared to traditional lecture techniques. The content provided ahead of time is usually in the form of recorded lectures. However, the extent to which students prepare prior to class varies. The purpose of this study was to determine the effect of quizzes on student preparation prior to a flipped classroom.

METHODS: This cross-sectional study was conducted in a college of pharmacy therapeutics course in the United States during the spring semester of 2014. The course includes a critical care module, which was taught using the flipped classroom format. All content was provided in the form of lecture videos that students were to watch prior to class. Multiple short videos were created for each topic rather than one long video. Class time was then spent discussing patient cases. For half of the sessions there was an electronic quiz due prior to class. The objective was to determine the effect of a quiz on whether or not students watched the videos. A logistic mixed effect model was used to determine the odds of watching the videos, using students as a random effect and presence of a quiz as a fixed effect.

RESULTS: There were 100 students in the class and all were included in the study. Students were significantly more likely to watch the videos when a quiz was required (OR 6.3, 95% CI 5.0 to 7.8; p<0.001). The proportion of total possible viewing events was also higher when a quiz was required (80% vs 59%; p<0.001, adjusted for clustering).

CONCLUSION: Quizzes improve student preparation prior to the flipped classroom.

50. Residency application scoring tool to predict positive onsite interviews. *Sarah A. Nisly, Pharm.D.*[1], Meredith Howard, Pharm.D.[2], Alex Isaacs, Pharm.D.[3], Tate Trujillo, Pharm.D.[4]; (1) Butler University College of Pharmacy and Health Sciences & Indiana University Health, Indianapolis, IN; (2)Department of Pharmacy Practice, Butler University College of Pharmacy and Health Sciences & Indiana University Health, Indianapolis, IN; (3)Department of Pharmacy Practice, Purdue University & Eskenazi Health, Indianapolis, IN; (4)Indiana University Health, Indianapolis, IN

PURPOSE: To assess the relationship between residency application components and positive onsite interview scores in a large, multi-site residency program.

METHODS: Candidate applications for the traditional post-graduate year 1 (PGY1) pharmacy practice residency program at Indiana University Health include a curriculum vitae, letter of intent, three letters of recommendation, and a candidate survey. The candidate survey included specific questions about desired rotations, past experiences, why an interest in the program, and career goals. Each application packet was reviewed and scored by three independent reviewers. Once reviewed and scored, utilizing a program specific scoring tool, candidates were offered an onsite interview. Participation in the onsite interview included individual interviews with six to nine preceptors, each preceptor providing an interview score. Average scores for each application component were compared to average interview scores. Each component was assessed for a positive or negative relationship to the average interview score. Analysis was done using Spearman's correlation coefficients in SPSS version 21.

RESULTS: A total of 213 candidates were eligible for inclusion during the study period, from 2009–2013. Complete information was located and included on 200 applicants (94%). Survey questions demonstrating a positive correlation included essays about best and worst job and why they have in interest in our program ($p<0.05$). A positive interview score was associated with positive letters of recommendation and prior publications ($p<0.05$). Finally, each packet is reviewed for candidate "fit" within our program and a discretionary point is available for reviewers to award. Candidates awarded this discretionary point also correlated with positive onsite interviews ($p<0.05$).

CONCLUSION: Components of the residency application may be used to predict positive onsite interviews at our institution. This type of analysis may be done to help streamline the application review process and potential narrow the application requirements to items predicting a good fit for any program.

51. Pharmacy resident publication success: factors of success based on abstracts from a regional meeting. *Paul Stranges, Pharm.D., BCPS, BCACP*[1], Scott Vouri, Pharm.D., BCPS, CGP[1], Frances Bergfeld, Pharm.D. Candidate, Mallory Crain, Pharm.D. Candidate, Neha Jindal, Pharm.D. Candidate, Megan Landrum, Pharm.D. Candidate, Sarah Lindauer, Pharm.D. Candidate, Zachary Mueller, Pharm.D. Candidate, Ashley Reich, Pharm.D. Candidate, Lince Thomas, Pharm.D. Candidate; St. Louis College of Pharmacy, St. Louis, MO

PURPOSE: To determine the rate of publication among pharmacy resident research projects in a region of the United States and to compare characteristics of published and unpublished projects.

METHODS: Research project abstracts from the Great Lakes Pharmacy Residency Conference in 2003, 2005, and 2007 were reviewed. Two independent investigators collected all study data. Data on residency year, state, institution, study design, and if results were reported were extracted from available abstracts. Publication rate was determined systematically using a search algorithm within the following databases: Scopus, International Pharmaceutical Abstracts, and Pubmed. Kappa-statistic was used to determine inter-rater variability. Descriptive statistics were used to analyze nominal and continuous data. Univariate and multivariate regression analysis was used to determine characteristics of publication success. Sensitivity analysis was performed on projects successfully published.

RESULTS: Information was extracted from 655 abstracts in which 76 abstracts were published (11.4%). Publication rate trended down over the 3 years analyzed (2003 = 12.9%, 2005 = 12.2%, 2007 = 9.9%; p=0.57). Mean time to publication from abstract presentation was 24.5 months and 83% of projects were published within pharmacy journals. Study design (interventional, observational, cross-sectional, or service development, p=0.115), direction of inquiry (prospective or retrospective; p=0.146), intervention of interest (drug, human, or other; p=0.096), results in abstract (p=0.096), and institution type (university-affiliated, veterans affairs, community-hospital, or retail; p=0.001) were entered into the multivariate model. Cross-sectional design (OR 3.6), human (OR 1.9) and other (OR 2.1) interventions, and university-affiliated residency (OR 2.6) remained significant for likelihood of publication.

CONCLUSION: Publication rate of pharmacy resident research projects presented at the Great Lakes Pharmacy Residency Conference is low, but is consistent with other regions of the United States. Study design and focus may influence chance of project publication as well as institution-type, which may have unique research resources, training, and mentorship.

52. Tracking patient encounters and performed clinical skills to determine student competency in advanced pharmacy practice experiences. *Chrystian R. Pereira, Pharm.D.*[1], Jody Lounsbery, Pharm.D.[1], Ila M. Harris, Pharm.D.[2], Jean Moon, Pharm.D.[1], Sarah M. Westberg, Pharm.D.[1], Claire Kolar, Pharm.D.[1]; (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: The objective of this study is to determine if the exposure to patient encounters or clinical skills relates to student clinical competency.

METHODS: Students were instructed to track the number of patients seen for 10 different medical conditions and the number of times 9 different clinical skills were performed during 5-week ambulatory care APPEs. At the end of each APPE block, preceptors assessed the students' stage of skill as novice, advanced beginner, competent, proficient or expert for each medical condition and clinical skill.

RESULTS: Over a 19 month period, 37 students were evaluated in 6 ambulatory care APPE sites. Students recorded 1541 patient encounters and 984 clinical skills. Student exposure to the medical conditions ranged from an average of 1.76 patients in women's health to 7.21 patients in anticoagulation. The number of clinical skills performed ranged from 1.6 asthma action plans to 4.8 drug consults. All conditions combined, the average number of patients seen by students rated below competent was 4.09 compared to 4.85 patients for students rated as competent or above, p=0.04. Among the individual medical conditions no statistical relationship was found between average patient and preceptor-rated competence. All clinical skills combined, the average number of skills performed by students rated below competent was 2.67 compared to 3.77 skills performed by students rated as competent or above, $p<0.001$. Among individual clinical skills, a statistical relationship was found with asthma education: 2.91 experiences (below competent) compared to 4.55 experiences (competent or above), p=0.03.

CONCLUSION: The number of patients seen as well as the number of skills practiced affects the competency of students. However, we are more confident, given the level of significance (p-value), that the number of skills practiced affects competence compared to medical conditions.

53. Incorporating diabetes nutrition education into the advanced pharmacy practice experience. *Anne Ottney, Pharm.D.*; Pharmacy Practice/Family Medicine, Ferris State University/Sparrow/MSU Family Medicine Residency Program, Lansing, MI

PURPOSE: Medical nutrition therapy is at the core of diabetes management; however, at present, the pharmacy curriculum falls

short in terms of preparing pharmacy students to provide nutrition counseling to patients with diabetes. The purpose of this project was to increase pharmacy student confidence and ability in providing nutrition education to people with diabetes.
METHODS: A pre and post-test was administered to students on their first and last day of an APPE ambulatory care rotation. Each test contained 20 knowledge-based questions on nutritional topics that relate to diabetes management as well as a brief (5 question) survey assessing student confidence and ability to provide lifestyle modification education to patients with diabetes. During the course of each 6 week rotation, students were exposed to patients with diabetes and discussions aimed at enhancing their confidence and ability to provide nutrition education to people with diabetes.
RESULTS: A total of 14 matched surveys were collected over the course of the study period. The mean knowledge pre-test score was 13.2 (66%). The mean knowledge post-test score was 14.9 (75%), indicating a statistically significant mean increase from the pre to post test score of 1.7 (95% CI: 0.7–2.7, p=0.002). Compared to the pre-rotation assessment, students were more likely to agree or strongly agree that they felt comfortable talking to patients with diabetes about nutrition (29% pre vs 93% post), felt confident in discussing dietary recommendations for a patient with diabetes (43% pre vs 93% post), and could design a basic meal plan for a patient with diabetes (21% pre vs 57% post) by the end of their 6 week rotation.
CONCLUSION: Although limited by a small sample size, this survey-based project demonstrated that intentional, directed interventions can improve student confidence and knowledge in providing nutrition education to people with diabetes.

54. Alternative methods of interprofessional communication simulations: using technology to enhance interprofessional education. *Matthew Kostoff, Pharm.D., BCPS*, Tiffany Shin, Pharm.D., BCACP, Ann Heble, Pharm.D. Candidate, Brian Kempin, Pharm.D. Candidate, Astyn Miller, Pharm.D. Candidate, Nicholas Patykiewicz, Pharm.D. Candidate, Sarah P. Shrader, Pharm.D., BCPS; University of Kansas School of Pharmacy, KS
PURPOSE: Incorporating interprofessional education (IPE) in the pharmacy curriculum provides students with skills for collaborative healthcare. Schools of pharmacy unaffiliated with an academic health sciences campus face challenges in providing IPE experiences. This study describes the implementation of IPE simulations using technology and determined the impact on students' attitudes, confidence and performance related to interprofessional communication.
METHODS: Third-year pharmacy students were randomly assigned to one of three IPE activities as part of a required course. Simulations engaged students from medicine, nursing, and health professions without meeting face-to-face using communication technology. Activities included SBAR telephone, online transition of care, and medication management discharge. Students completed the validated, 20-item Attitude Toward Healthcare Teams Scale (ATHCTS) prior to and after course participation. Written reflection papers and student satisfaction surveys (using a five-item Likert scale, 1 = strongly disagree to 5 = strongly agree) were completed after participation in each activity. Course instructors evaluated student performance using rubrics. Data were analyzed using descriptive statistics and Mann–Whitney *U* test. This study was approved by the institutional review board.
RESULTS: Of 163 students, 138 (84.7%) and 132 (81%) completed the pre- and post-ATHCTS survey, respectively. Students showed positive attitudes at baseline, but significant positive changes occurred for 5 out of 20 items (p value<0.05). Overall themes of reflection papers: (i) recognized benefits gained from using technology for interprofessional communication (ii) reinforced the role/value of the pharmacist in interprofessional collaboration (iii) gained confidence in interprofessional communication. The student survey (98% responded) demonstrated satisfaction with the experience (mean score 4.1). Improvements in performance rubrics were seen following interprofessional collaboration.
CONCLUSION: Students demonstrated positive satisfaction, attitudes and performance towards alternative methods of interprofessional communication. Implementation of IPE activities using technology is a feasible and effective way for "free-standing" pharmacy schools to incorporate IPE into their curriculum and help fulfill ACPE accreditation standards.

55. A method for pharmacy resident candidate screening prior to interview. *Michael J. Peeters, Pharm.D., M.Ed., BCPS*[1], Todd E. Gundrum, Pharm.D., BCPS[2], Julie A. Murphy, Pharm.D., BCPS, FASHP, FCCP[1]; (1)University of Toledo College of Pharmacy, Toledo, OH; (2)Department of Pharmacy Services, University of Toledo Medical Center, Toledo, OH
PURPOSE: Prior studies had examined autobiographical screening format among medical student applicants and demonstrated a 'halo effect bias' with single-rater scoring; though some others have questioned its practical impact. We evaluated a multiple independent sampling (MIS) format for initial screening of Post-Graduate Year-1 (PGY-1) pharmacy practice resident candidates' applications prior to on-site interviews.
METHODS: The University of Toledo Institutional Review Board approved this retrospective study. Our screening tool for PGY-1 pharmacy residency candidates consisted of eight domains, each scored using a 5-point Likert scale. During the 2014 residency recruitment season, two raters (A&B) evaluated all eight domains while two other raters (C&D) each evaluated two domains. For all raters (A-D), scores for two domains (different for the different raters, though the same for all applicants) were summed to a total application score (ie, the MIS method); this was compared to single-raters' total application scores. For statistical comparison of single-rater and MIS data, inter-component reliabilities were analyzed; intra-correlation coefficients were examined for consistency among raters. For practical significance, actual selection differences were analyzed.
RESULTS: Forty-six applications were evaluated to determine 24 invitations for on-site interviews. Among raters, inter-rater consistency (by intra-class correlation) was 0.855 (p<0.001). Inter-component reliability differed as well; rater A = 0.742, rater B = 0.728, MIS = 0.579 (Cronbach's alpha; lower better). Single-raters and MIS-raters agreed on 21 interview invitations, one rater and MIS on one further invitation, and all differed on the remaining two (8%) invitations. MIS raters reported faster, more confident scoring of applications, specific to those domains evaluated.
CONCLUSION: Halo bias was seen with the single-rater format, and two interview invitations were negatively impacted. For pharmacy resident screening, an MIS format appeared to be a thorough method promoting fairness for applicant screening and was faster to complete. As pharmacy residency applications continue to grow, an efficient method of screening seems imperative.

56. Comparison of knowledge and confidence of pharmacy students and community members before and after a smoking cessation seminar. Justin J. Sherman, M.C.S., Pharm.D.[1], Brett Smith, Pharm.D.[2]; (1)School of Pharmacy, The University of Mississippi School of Pharmacy, Jackson, MS; (2)Department of Pharmacy, G.V. (Sonny) Montgomery Veterans Affairs Medical Center, Jackson, MS
PURPOSE: Training programs of various intensities and durations have been implemented to assist healthcare providers and community members in leading smokers in a quit attempt. The objective of this study was to compare knowledge and confidence of pharmacy students and community members before and after a smoking cessation seminar.
METHODS: After approval from the institutional review board, pharmacy students and community members were recruited for two-hour educational interventions. Topics covered included smoking health risks, benefits of quitting, behavioral, cognitive, and stress-management techniques, smoking cessation medications, and how to start a formal class. Pre- and post-intervention questionnaires were given to all participants with comparisons made via Student's or Paired *T*-tests, as appropriate.

RESULTS: Knowledge scores increased significantly ($p<0.05$) after the educational intervention for pharmacy students (n=30) and community members (n=8). Confidence scores increased significantly for pharmacy students ($p<0.05$), but not for community members. Pharmacy students had significantly greater knowledge score changes (53.7%, pre-intervention; 81.8%, post-intervention; $p<0.05$) versus community members (32.1%, pre-intervention; 50.1%, post-intervention; $p<0.05$). In contrast, there was no significant difference in the change of confidence scores between students and community members, except for counseling confidence scores (2.13 vs 1.8, for students versus community members, respectively; $p<0.05$).
CONCLUSION: Pharmacy students and community leaders exhibited increased knowledge after a smoking cessation educational intervention, and pharmacy students had increased confidence scores. Confidence scores did not change significantly for community members. More intensified educational interventions or programs of longer duration may be needed in the future to increase community leaders' confidence in leading smokers in a quit attempt.

57. Assessing medical residents' knowledge on the use of inhalers. *Sara Dadayan, Pharm.D.*[1], Sarah Muench, Pharm.D.[1], Holly H. Chiu, Pharm.D.[2], Tania Shamoun, M.D.[2]; (1)Department of Pharmaceutical Services, Beaumont Hospital Royal Oak, Royal Oak, MI; (2)Beaumont Hospital-Royal Oak, Royal Oak, MI
PURPOSE: This study was conducted to assess the knowledge and technical skills of medical residents on the use of metered dose inhalers (MDIs) and selected forms of dry powder inhalers (DPIs) before and after an educational session provided by a clinical pharmacist.
METHODS: First and second year Internal Medicine residents participated in a pre-assessment survey that evaluated their knowledge on the use of inhalers. Each resident was also assessed individually on inhaler technique by a clinical pharmacist using a checklist. Following the survey and technique assessment, an educational session reviewing the different types of inhalers and their proper usage was given to the residents. Residents completed a post-assessment survey and were again assessed on inhaler technique approximately 4 weeks after the educational session.
RESULTS: A total of 31 medical residents participated in the survey in the pre-assessment period compared to only 15 residents in the post-educational period. There was a statistically significant improvement in the overall test scores in the post-educational session compared to the pre-assessment period (mean $\pm$ SD 68.2% $\pm$ 10.3% vs 50.7% $\pm$ 13.2%; $p<0.001$).The inhaler technique of both the MDI and the DPIs was as well superior following the educational session. The percentage of residents scoring more than 50% of the steps correctly after the educational session was 100% for MDI, 86.6% for diskus, 73.33% for flexhaler and 86.6% for handihaler compared to 29%, 16.12%, 6.4%, 16.12% respectively in the pre-assessment period ($p<0.001$).
CONCLUSION: The educational session provided by a clinical pharmacist showed a significant improvement in the medical residents' knowledge and inhaler technique. Future studies are needed to assess the sustained benefits of this intervention on retention of knowledge and appropriate handling of inhaler devices.

58. Pharmacy student opinions and performance following implementation of a "flipped classroom". *Amy C. Donihi, Pharm.D.*; University of Pittsburgh School of Pharmacy, Pittsburgh, PA
PURPOSE: To assess pharmacy student perceptions and exam performance after the redesign of a required course as a "flipped classroom".
METHODS: The first half of Pharm 5223 Gastroenterology/Nutrition, a 2-credit course in the second year of the PharmD curriculum was redesigned and delivered as a "flipped classroom". Each week, students watched short pre-class videos as a means to introduce foundational knowledge, and they spent class time participating in interactive case-based active learning activities. Topics included gastroesophageal reflux disease (GERD), peptic ulcer disease (PUD), constipation and diarrhea, and simple nausea/vomiting. The exam consisted of the same multiple choice exam questions (35% recall of knowledge, 65% case-based application and analysis) used in previous year when these topics were taught using traditional lecture-based methods. Average exam score was compared to previous year. Following the exam, students were asked to complete a survey consisting of eight 5-point Likert scale questions and an open-ended question regarding their perception of this teaching method.
RESULTS: Majority of 102 students (83%) preferred or strongly preferred being able to view lecture videos prior to class so class time could be used to learn to practically apply the material, and 85% felt prepared for the case-based classroom activities after watching the pre-class videos. Most students (80%) felt confident in their ability to manage patients with disease states covered in the course. Open ended responses were generally positive; a few students did not like having to spend time outside the class to watch lecture videos. Compared to previous year, average exam score increased from 80.2 $\pm$ 9.9% to 82.8 $\pm$ 9.4% ($p=0.048$).
CONCLUSION: Most pharmacy students welcomed implementation of a "flipped classroom" and appreciated the opportunity to have more in-class hands-on activities to practice applying their newly-gained knowledge. Students performed slightly better on the exam after the course was redesigned.

59. Preparing U.S. pharmacists for patient centered care: the ADAPT online education program. Andrea L. Pierce, Pharm.D.[1], *Leticia R. Moczygemba, Pharm.D., Ph.D.*[1], Michael Czar, Ph.D., RPh[2], Philip Emberley, B.Sc. (Pharm.), MBA, Pharm.D.[3], Gary R. Matzke, Pharm.D.[1]; (1)Department of Pharmacotherapy and Outcomes Sciences, Virginia Commonwealth University School of Pharmacy, Richmond, VA; (2)Carilion New River Valley Medical Center; (3)Canadian Pharmacists Association
PURPOSE: The ADapting pharmacists' skills and Approaches to maximize Patient's drug Therapy effectiveness (ADAPT) e-learning program was developed by a consortium of Canadian pharmacists to prepare pharmacists for patient-centered care (PCC). We selected this approach to prepare pharmacists to deliver PCC as part of our Centers for Medicare and Medicaid Innovation Center Project. In this report we share the initial outcomes of this educational program.
METHODS: ADAPT, presents a standard approach to medication assessment, team collaboration, patient assessment, evidence-based decision-making, and documentation. Two pharmacist cohorts completed the 20 week program from October 2012 to March 2013 (n=13) and August 2013 to January 2014 (n=10). Participants were surveyed at the mid-point and end of the program to determine its impact on their confidence in providing PCC and elicit feedback about their perceptions of the program. Descriptive statistics were used to analyze Likert-type questions and a content analysis was performed to analyze responses to open-ended questions.
RESULTS: Pharmacists' confidence in PCC improved for all modules. 89% of pharmacists reported their patient interviewing, documentation, and developing and implementing care plans skills improved upon program completion. Evidence-based clinical decision-making improved the least (61% reporting increased confidence). The content analysis identified the modules on interviewing and documentation as the most valuable and likely to result in changes to the pharmacists' practice. The opportunity to learn from colleagues was cited as a strength of the program.
CONCLUSION: This educational program is a feasible means to prepare pharmacists to deliver PCC in acute care and primary care settings.

60. Impact of a teaching certificate program on pharmacy resident self-confidence with various aspects of academia. *Julie A. Murphy, Pharm.D., BCPS, FASHP, FCCP*[1], Amie D. Brooks, Pharm.D., FCCP, BCPS, BCACP[2], Christy Burrows-Grandstaff, Pharm.D.,

BCPS[3], Erika Michalski, M.Ed.[2], Lindsay Bell, Pharm.D. Candidate[2], John M. Burke, Pharm.D., BCPS, FCCP, FASHP[2]; (1) University of Toledo College of Pharmacy, Toledo, OH; (2)St. Louis College of Pharmacy, St. Louis, MO; (3)St. Luke's Hospital, Chesterfield, MO

PURPOSE: To evaluate the effectiveness of a pharmacy resident teaching certificate program, Resident Education Academy (REA), on pharmacy residents' level of confidence with and understanding of various aspects of academia.

METHODS: This retrospective cohort study was approved by the St. Louis College of Pharmacy (STLCOP) Institutional Review Board. REA consists of knowledge, application, and practice-based components. During the fall, residents attend 11 on-campus workshops covering various aspects of academia. Groups of residents (2–4) collaboratively develop materials for a team-taught elective course in the spring. Throughout the year, residents meet with an experienced faculty mentor 5–10 times to receive feedback on course materials including lecture objectives, handouts, slides, active learning activities, multiple choice items, and assessment cases. From 2007 through 2013, St. Louis metropolitan area post-graduate year-1 (PGY-1) and PGY-2 pharmacy residents participating in REA completed a 21-question, 5-point Likert scale, pre- and post-survey at the beginning and end of the residency year, respectively. Survey questions related to the resident's level of confidence with various aspects of academia (14 questions), perceived understanding of academia (5 questions), and level of interest in pursuing a career in academia (2 questions). The Wilcoxon signed rank test was utilized for data analysis.

RESULTS: Ninety-eight pharmacy residents completed pre- and post-surveys. With all related questions, level of confidence ($p<0.001$) and perceived understanding ($p<0.001$) improved. There was no change in level of interest in pursuing a career in academia ($p=0.585$).

CONCLUSION: A pharmacy resident teaching certificate program improves pharmacy residents' level of confidence with various aspects of academia and their perceived understanding of academia. When entering the residency year, an individual most likely knows if they are going to pursue a career in academia. A pharmacy resident teaching certificate program is not likely to change this goal.

61. Perceived skill challenges and possible solutions for ACCP EDTR PRN members accomplishing scholarly activity. Jennifer N. Clements, Pharm.D., BCPS, CDE, BCACP[1], Melody L. Hartzler, Pharm.D., AE-C[2], Amy Franks, Pharm.D.[3], Tracy Sprunger, Pharm.D.[4], Lamis Karaoui, Pharm.D., BCPS[5], Douglas Steinke, Ph.D.[6], *Tina Denetclaw, Pharm.D., BCPS*[7]; (1)Presbyterian College School of Pharmacy, Clinton, SC; (2)Cedarville University School of Pharmacy, Cedarville, OH; (3)Department of Pharmacy Practice, College of Pharmacy, University of Arkansas for Medical Sciences, Little Rock, AR; (4)Butler College of Pharmacy and Health Sciences, Butler University, Indianapolis, IN; (5)Department of Pharmacy Practice, School of Pharmacy, Lebanese American University, Byblos, Lebanon; (6)Manchester Pharmacy School, University of Manchester, Manchester, UK; (7) Department of Clinical Pharmacy, School of Pharmacy, University of California, San Francisco, San Francisco, CA

PURPOSE: The Education and Training (EDTR) Practice and Research Network (PRN) Scholarly Activities Committee (SAC) was charged to obtain a global perspective of the PRN members' deficiencies for conducting scholarly activities in order to develop a plan of action to assist members' pursuit of scholarly activities.

METHODS: An IRB-approved, 76-question survey was created by a subcommittee of the SAC using SurveyMonkey® and offered through the PRN listserv to all EDTR PRN members from May 2, 2014 to May 18, 2014. Three reminders were sent to PRN members while the survey remained open. Statistical analysis was performed using chi square or Fisher's exact tests comparing groups.

RESULTS: Of 516 EDTR PRN members, 121 (23.4%) participated in the survey. Of these, 104 (85.9%) were pharmacists, 13 (10.7%) were students, and 4 (3.3%) were residents. Sixty-five (62.5%) of pharmacists responders (Group 1) indicated they do not feel they have sufficient skills or administrative support to accomplish the volume or kinds of scholarly activity they would like to conduct, while 39 (37.5%) of pharmacist responders (Group 2) feel that they do. The two groups did not differ in their formal training to conduct research ($p=0.472$). However, Group 2 had significantly higher faculty standing ($p=0.03$), comfort and confidence level in research activities ($p<0.001$), and access to network of collaborators ($p<0.001$), while Group 1 had significantly more formal education in teaching and learning ($p=0.03$). No differences were seen among all groups for interest in various potential EDTR PRN programs to help members pursue scholarly activities. Sixty percent of more of all participants expressed interest in 5 specific potential programs.

CONCLUSION: This study identifies a significant need among the EDTR PRN membership to augment skills in conducting scholarly work, and suggests a plan for the EDTR PRN to assist in addressing that need.

62. Student perceived benefit of integrating patient safety into a pharmacy curriculum. *Edward T. Van Matre, Pharm.D.*[1], Katy E. Trinkley, Pharm.D.[2], Scott W. Mueller, Pharm.D.[2], Robert L. Page, II, Pharm.D., MSPH, FCCP, FAHA, BCPS[2], Kavita V. Nair, Ph.D.[2]; (1)University of Kentucky HealthCare, Lexington, KY; (2)University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO

PURPOSE: Teaching patient safety to healthcare professional trainees is imperative to develop a future workforce capable of optimally caring for patients and preventing deleterious adverse events. Despite the need for educating healthcare professionals on patient safety, there is limited literature describing integration of patient safety education into curriculum of healthcare professionals, including pharmacy. Therefore, the proposed study objective is to evaluate the effectiveness of integrating patient safety education into a pharmacy curriculum.

METHODS: The WHO patient safety curriculum was adapted into the curriculum of second-year pharmacy students (P2's) as a self-study, followed by in-class and experiential application of a root cause analysis (RCA). To determine the value, an electronic and anonymous post-survey was administered to 151 P2's and 159 third-year pharmacy students (P3's). The P3's served as a control group who had not had formal patient safety education. The survey consisted of five demographic and seven, 4-point Likert-scale questions to assess perceived value and abilities. Likert-scale questions were also grouped into positive/negative binary responses. Ordinal data were compared using Wilcoxon rank sum test and binary data using the 2–tailed Fisher's exact test.

RESULTS: The survey response rate was 53%, with 90 P2's and 75 P3's completing the survey. Considering ordinal responses, significantly more P2's reported better ability to describe patient safety and its purpose ($p=0.0092$), describe factors that influence patient safety ($p=0.0055$) and conduct a RCA ($p<0.001$). Considering binary responses, P2's also reported significantly better ability to conduct a RCA compared to P3's (88.9% positive vs 58.7%, respectively; $p\leq0.001$). Although positive, there were no differences in perceived benefit of the education on their future careers or desire for such additional education.

CONCLUSION: Both classes perceived patient safety education to be valuable; however, formal education resulted in some significant improvements in perceived understanding, including ability to conduct a RCA.

63. Different educational methods for health system pharmacists with diverse backgrounds. *Shannon Holt, Pharm.D., BCPS*, Roseann Richards, Pharm.D., Lynn Eschenbacher, Pharm.D., MBA, FASHP; Department of Pharmacy, WakeMed Health & Hospitals, Raleigh, NC

PURPOSE: This study was completed to determine if small group case discussions (SGCD) increase the consistency of applying institution specific aminoglycoside dosing standards (ISADS) in different clinical situations and maintain core competencies.

METHODS: A single-center observational study was completed with community hospital decentralized clinical pharmacists (DCPs) employed from August 2013 to June 2014. In August 2013, aminoglycoside educational presentations were conducted to maintain competency when designing a complete drug therapy plan. This was followed by 2 sessions of SGCD to assess if DCPs retained and applied ISADS consistently across different clinical scenarios. Responses from SGCD session 1 reflected the effectiveness of presentations, and was compared to SGCD session 2 which reflected the effectiveness of SGCD. A survey was completed to determine DCPs preferred method of continuing education.
RESULTS: DCPs included in SGCD: 38 in session 1 and 31 in session 2. 17 DCPs were excluded due to non-attendance of session 1. The majority of DCPs had less than 6 year of experience and worked on inpatient floor units. Overall responses consistent with ISADS increased from 71% after educational presentations to 89% after SGCD (p=0.0005). Responses consistent with ISADS increased for the normal renal function scenario (65% to 84%, p=0.089), trauma prophylaxis scenario (76% to 97%, p=0.019), and pregnancy scenario (50% to 81%, p=0.007). No change was found in the reduced renal function scenario (95%). Overall responses for monitoring and management consistent with ISADS increased (61% to 65%, p=0.412). 37/49 DCPs (76%) prefer SGCDs over other educational methods and 85% felt comfortable discussing answers in SGCDs.
CONCLUSION: SGCDs significantly increased retention and application of ISADS in different clinical settings by 18% compared to educational presentations. SGCD is the preferred educational method by DCPs with diverse backgrounds. Future evaluation will be conducted in 6–12 months to assess long-term retention of SGCD material.

64. Pharmacy student and preceptor interventions and student perspective on a medical mission trip. *Gina M. Prescott, Pharm.D., BCPS*[1], Carolyn Hempel, Pharm.D., BCPS[2]; (1)State University of New York at Buffalo, Buffalo, NY; (2)State University of New York at Buffalo School of Pharmacy and Pharmaceutical Sciences, Buffalo, NY
PURPOSE: To describe the student-pharmacist and preceptor roles on a medical mission team through documentation of medical interventions and to determine if students perceived the medical mission trip as beneficial to their pharmacy education.
METHODS: Pharmacy students (n=21) and preceptors (n=4) worked in interdisciplinary teams to optimize medication use. A retrospective review of 1402 patient encounters during 6 clinic days within underserved regions of the Dominican Republic was conducted. Prescribed medications and student/pharmacist interventions were analyzed by descriptive statistics. Post-trip survey data based off a Likert Scale was used to determine satisfaction with the medical mission trip experience.
RESULTS: Medication Counseling (n=662) was the most common intervention, followed by dose optimization (n=553), formulary interchange (n=59), medication selection (n=33), and provision of drug information (n=20). The most commonly prescribed medications included vitamins (n=859), antibiotics/antifungals (n=312), acetaminophen (n=305), and ibuprofen (n=237). Pediatric dosing was completed or adjusted for 458 medication orders. Sixteen students completed the post-trip survey. Students perceived the medical care provided (median=5), knowledge acquired (median = 5) and team aspects (median = 5) as valuable. Areas for improvement consisted in providing emotional/spiritual care (median = 3) to patients and serving as a student leader (median = 4).
CONCLUSION: Pharmacists serve the interdisciplinary medical mission team in multiple areas during the medication dispensing process on a medical mission trip. Students perceived the trip to be beneficial to their pharmacotherapeutic knowledge as well as their understanding of the components of a medical mission trip. Further consideration for discussing emotional/ spiritual care may need to be explored.

Emergency Medicine

65E. Impact of clinical pharmacists on initiation of post-intubation analgesia in the emergency department. *Lamies Abuakar, Pharm.D., BCPS*, Erin Robey-Gavin, Pharm.D., BCPS; Mercy Hospital and Medical Center, Chicago, IL

Presented at the American Society of Health System Pharmacists Midyear Meeting, Las Vegas, NV, December 2–6, 2012.

66. Assessment of phenytoin loading practices in obese patients in the emergency department and the impact of an emergency medicine pharmacist. *Abby Bailey, Pharm.D.*[1], Stephanie Baker Justice, Pharm.D.[1], Martina Holder, Pharm.D.[1], Natalie Walker, Pharm.D. Candidate 2014[2], Penny Webber, Pharm.D. Candidate 2014[2], Kyle Weant, Pharm.D.[3]; (1)Department of Pharmacy Services, University of Kentucky HealthCare; (2)University of Kentucky College of Pharmacy; (3)Public Health Preparedness and Response, North Carolina Department of Health and Human Services
PURPOSE: Phenytoin is one of the most common anticonvulsants agents used for the acute treatment of seizures, particularly in the Emergency Department (ED). Certain patient populations, such as the obese population, have been shown to present unique dosing challenges. Many times doses are arbitrarily 'capped' for fear of overdosing. Emergency Medicine clinical pharmacists (EPh) have been shown to optimize the care of patients receiving phenytoin therapy in other settings, demonstrating reductions in seizure activity, duration of therapy, and cost.
METHODS: Medical records of patients presenting from January 2009–December 2011 that were >18 years old, evaluated in the University of Kentucky ED, and were prescribed intravenous phenytoin were reviewed. Patients weighing >100 kg were compared with those weighting <100 kg to identify differences in dosing strategies and outcomes in obese patients. To evaluate the impact of the presence of an EPh, patients with an order for intravenous phenytoin placed during the EPh's hours of 1300–2300 were compared to those with an order placed between 2300–1300.
RESULTS: A total of 117 patients were included in the statistical analysis, of which 42 (36%) weighed >100 kg. Patients >100 kg received significantly lower weight-based phenytoin doses (16.0 vs 18.6 mg/kg, p=0.0001). Those >100 kg who received <15 mg/kg were found to have significantly lower post-load concentrations than those that received >15 mg/kg regardless of total dose (11.5 vs 16.5 mcg/mL; p=0.003). The presence of an EPh was found to result in significantly higher rates of post-load concentrations in the therapeutic range across all groups (72.4% vs 53.7%; p=0.04).
CONCLUSION: The available data suggests that artificial total dose limitations in overweight patients yields significantly lower post-load concentrations, potentially delaying initial seizure control in the acute setting. The presence of EPhs at the bedside increases the success of initial phenytoin dosing strategies in this population.

67. Identification of rate-limiting steps in the provision of thrombolytics for acute ischemic stroke. *Elise Fleishaker, Pharm.D.*[1], Abby Bailey, Pharm.D.[2], Stephanie Baker, Pharm.D.[1], Kyle Weant, Pharm.D.[3]; (1)University of Kentucky Chandler Medical Center; (2)Department of Pharmacy Services, University of Kentucky HealthCare; (3)North Carolina Department of Health and Human Services
PURPOSE: Tissue plasminogen activator (tPA) is the only therapy shown to improve outcomes in patients with acute ischemic stroke. The American Heart Association has set a goal of achieving a door-to-needle time (DTN) of ≤60 minutes in at least 50% of patients presenting with acute ischemic stroke. The purpose of this study was to analyze the possible barriers that may delay tPA administration beyond the 60 min target within the emergency department (ED) of an academic medical center.

METHODS: A retrospective chart review was conducted from February 2011 to October 2013. Patients were included if they were admitted through the ED with a diagnosis of acute ischemic stroke and received tPA.
RESULTS: Of the 130 patients that met inclusion criteria, 56 (43.1%) received tPA in a DTN time of ≤60 minutes from ED arrival. There were several factors identified to be statistically significantly different in those receiving tPA >60 minutes from ED arrival: time to ED physician consultation, neurologist arrival, blood sample acquisition and laboratory result time ($p<0.05$ for all comparisons). Correlation analysis demonstrated that there were several independent variables significantly associated with receipt of tPA within ≤60 minutes: time from admission to ED physician consultation (p=0.011), receipt of computerized tomography (CT) scan ($p<0.0001$), blood sample acquisition ($p<0.0001$), lab results (p=0.003), and neurology service arrival ($p<0.0001$).
CONCLUSION: In our retrospective study, factors associated with delay in tPA administration include time from hospital arrival to: ED physician consultation, neurologist arrival, blood sample acquisition and laboratory result time. These findings highlight the importance of prompt physician evaluation, close proximity of the CT scanner to the ambulance bay, as well as a quick turnaround time on laboratory values. The development of protocols to ensure the rapid receipt of tPA therapy should focus on limiting any potential delay these steps may cause.

68. Evaluation of antihypertensive medications and door-to-needle time with recombinant tissue plasminogen activator for acute ischemic stroke. *Steven F. Nerenberg, Pharm.D.*, Craig Cocchio, Pharm.D., BCPS; Ernest Mario School of Pharmacy, Rutgers, The State University of New Jersey, Piscataway, NJ
PURPOSE: The objective of this study was to determine which antihypertensive medication results in the shortest door-to-needle (DtN) time with recombinant tissue plasminogen activator (rt-PA) for the treatment of acute ischemic stroke (AIS).
METHODS: Eligible patients who were greater than 18 years of age and received an IV antihypertensive medication prior to receiving rt-PA for AIS from January 1st, 2009 through February 28th, 2014 were included. Patients were grouped by the initial antihypertensive received and a secondary analysis based on the number of antihypertensives received. The primary outcome was the difference in mean DtN time between initial antihypertensive medication groups.
RESULTS: Of the 57 patients who met inclusion criteria, n=9 (15.8%) received hydralazine, n=38 (66.7%) received labetalol, n=8 (14%) received nicardipine and n=2 (3.5%) received nitroglycerin as the initial antihypertensive medication. The mean (±SD) DtN times for hydralazine, labetalol, nicardipine, and nitroglycerin were 77.1 (±24.9) minutes, 60.5 (±24.4) minutes, 81.8 (±26.6) minutes and 88 (±24) minutes, respectively (p=0.049). The proportion of patients with a DtN time of less than or equal to 60 minutes were as follows: hydralazine 22.2% (2/9), labetalol 57.9% (22/38), nicardipine 25.0% (2/8), and nitroglycerin 0.0% (0/2) and was not statistically different (p=0.06). The mean (±SD) DtN times for patients who received one, two, or three antihypertensives were 66.8 (±25.9) minutes, 74.1 (±29.3) minutes and 57.9 (±20.4) minutes, respectively (p=0.4).
CONCLUSION: There was a statistically significant difference in door-to-needle time between patients who received hydralazine, labetalol, nicardipine or nitroglycerin as their initial antihypertensive medication. Use of labetalol as the initial antihypertensive may result in significantly shorter DtN time with rt-PA for AIS.

69. Is CURES the cure? A prospective, observational study of the impact of a priori knowledge of controlled substance history. *Justin Warren, Pharm.D.*[1], Roneet Lev, M.D.[2], Lisa Mueller, Pharm.D.[1], Yelena Atlasevich, Pharm.D.[1], Harminder Sikand, Pharm.D.[1]; (1)Department of Pharmacy, Scripps Mercy Hospital, San Diego, CA; (2)Department of Emergency Medicine, Scripps Mercy Hospital, San Diego, CA
PURPOSE: Evaluate the impact of *a priori* knowledge of a patient's controlled-substance prescription history on incidence of (i) opioids administered in emergency department (ED) and (ii) prescriptions for opioids provided at discharge in patients that met a predefined drug-seeking behavior (DSB) criterion.
METHODS: Medical records and CURES (Controlled Substance Utilization Review and Evaluation System) report of patients seen in the ED in March 2013 were reviewed as control cohort. Prospective cohort was collected 1 year later in March, 2014. Patient's medical history, controlled substance history, ED medication administration records, ED visits history, and CURES report prior to and 30 days post visit were collected. Opioid doses were standardized to oral morphine equivalents.
RESULTS: 327 patients (165 control, 162 prospective) enrolled. An equal proportion of patients meeting DSB criteria were seen in the control and prospective cohorts (20.9% vs 20.4%, p=0.913). There was no significant difference in the proportion of patients who received an opioid in the ED (52.1% vs 49.8%, p=0.218), mean oral morphine equivalents given in the ED (13.86 ± 4.87 mg vs 10.19 ± 5.04 mg, p=0.375), or incidence of opioid prescriptions given upon discharge (43.6% vs 40.7%, p=0.654). There was a significant increase in the incidence of opioid prescriptions written for those not meeting DSB criteria in the prospective cohort (68.1% vs 83.3%, p=0.048) and a significant decrease in the incidence of opioid prescriptions written for those meeting DSB criteria in the prospective cohort (31.9% vs 16.7%, p=0.037).
CONCLUSION: CURES report at the point of prescribing did not significantly change the incidence of opioids given in the ED. However, it did significantly decrease the incidence that patients meeting DSB criteria received an opioid at discharge, and significantly increased the incidence in those who did not meet DSB. CURES report review provides clinicians with a useful tool in assessing appropriate opioid prescribing.

70. Evaluation of infection rates among patients who received piperacillin/tazobactam versus cefazolin and gentamicin for type III open fracture prophylaxis in a rural medical center. *Jenessa Redfern, Pharm.D.*[1], Meghan Groth, Pharm.D.[1], Wesley McMillian, Pharm.D.[1], Scott Wasilko, M.D.[2], Craig Bartlett, M.D.[2]; (1)Pharmacy, Fletcher Allen Health Care, Burlington, VT; (2)Orthopedics, Fletcher Allen Health Care
PURPOSE: The primary objective was to compare surgical site infection (SSI) rates at 1 year in patients who received a cefazolin and gentamicin versus piperacillin/tazobactam. Secondary outcomes included evaluation of SSI at 30 days as well as rates of non-union, death, and rehospitalization related to type III fracture at 1 year.
METHODS: This study was a retrospective medical record review of patients treated for type III open fractures at Fletcher Allen Health Care (FAHC) in Burlington Vermont between January 2004 and December 2012. Members of the orthopedic surgery team performed a medical record review to determine diagnosis of type III open fractures. Outcomes were compared using chi-square tests for categorical variables and Student's *T* tests for continuous variables. A p value of <0.05 was considered statistically significant.
RESULTS: Surgical site infection at 1 year occurred in 13 of 38 patients in the cefazolin plus gentamicin group and 11 of 35 patients in the piperacillin/tazobactam group (34.2% vs 31.4%; p=0.800). Secondary outcomes were also similar between the groups.
CONCLUSION: At our institution, the use of piperacillin/tazobactam as compared to cefazolin plus gentamicin for antibiotic prophylaxis in patients who sustained a type III open fracture showed similar rates of SSI as well as nonunion, death, and rehospitalizations at 1 year post-injury.

71. Evaluation of door-to-needle time for alteplase in ischemic stroke before and after primary stroke center certification. *Bradford McDaniel, Pharm.D.*[1], Lisa Deal, Pharm.D., BSN[2]; (1) Department of Pharmacy, Carilion Clinic, Roanoke, VA; (2) Carilion Clinic, Roanoke, VA

PURPOSE: The Joint Commission may recognize hospitals as "Primary Stroke Centers" which signifies that institution's capabilities and commitment to improved acute stroke care and long-term outcomes. Our primary goal was to assess time to tissue plasminogen activator (rtPA) administration in patients presenting to the emergency department with acute ischemic stroke before and after Primary Stroke Center certification.
METHODS: Retrospective chart review identified patients treated at our hospital with IV rtPA before and after PSC certification from July 1, 2008 to July 31, 2013. Included subjects were grouped based on treatment period. The two groups were compared for the primary endpoint of time to rtPA administration. Secondary analysis compared core components of the primary stroke center certification designation including appropriate addition of venous thromboembolic prophylaxis and anti-thrombotic prophylaxis. rtPA administration times for the 2 cohorts were compared using a 2-sample *t*-test and core measures were compared with a chi-squared analysis.
RESULTS: Baseline characteristics between the two groups were similar. The mean time for rtPA administration pre-certification was 95.3 minutes compared to 72.9 minutes post-certification (p=0.003). Compliance with the goal recommendation of initiation of rtPA within 1 hour was determined to be significant with zero cases compliant during the pre-certification period and a 52.2% compliance rate during the post-certification period (p=0.001).
CONCLUSION: The implementation of requirements to obtain and maintain PSC certification has resulted in a statistically significant improvement in time to rtPA administration. We have seen improvements in compliance rates of the core measures, including meeting the 60 minute recommended time to rtPA administration.

Endocrinology

72E. Canagliflozin reduces serum uric acid in patients with type 2 diabetes mellitus. *Michael Davies, Ph.D.*[1], Angelina Trujillo, M.D., FACE[2], Ujjwala Vijapurkar, Ph.D.[3], Chandrasekharrao V. Damaraju, Ph.D.[3], Gary Meininger, M.D.[3]; (1)Diabetes - Medical Affairs, Janssen Scientific Affairs, LLC, Raritan, NJ; (2)Janssen Scientific Affairs, LLC, Raritan, NJ; (3)Janssen Research & Development, LLC, Raritan, NJ

Presented at the 74th Scientific Sessions of the American Diabetes Association (ADA), San Francisco, CA, June 13–17, 2014.

73E. Canagliflozin monotherapy provides reductions in both A1C and body weight in patients with type 2 diabetes mellitus. *Michael Davies, Ph.D.*[1], William Canovatchel, M.D.[2], Ujjwala Vijapurkar, Ph.D.[2], Gary Meininger, M.D.[2]; (1)Diabetes - Medical Affairs, Janssen Scientific Affairs, LLC, Raritan, NJ; (2)Janssen Research & Development, LLC, Raritan, NJ

Presented at the 23rd Scientific and Clinical Congress of the American Association of Clinical Endocrinologists (AACE), Las Vegas, NV, May 14–18, 2014.

74E. Association of medication adherence with psychological distress in relation to types of antidiabetic medications among patients with uncontrolled type 2 diabetes. Melanie Siaw, B.Sc. (Pharmacy), *Joyce Lee, Pharm.D., BCPS, BCACP*; Department of Pharmacy, Faculty of Science, National University of Singapore, Singapore

Presented at 74th American Diabetes Association Scientific Sessions, San Francisco, CA, June 13–17, 2014.

75E. Significance of hypoglycemia in patients with type 2 diabetes mellitus in primary care. *Frank Lavernia, M.D.*[1], Donna Tomky, MSN RN C-NP CDE FAADE[2], Theresa McGhee, B.Sc.[3], Terry Dex, Pharm.D.[4], Mehul Dalal, Ph.D.[4], Jeffrey Frimpter, MPH[5], Wei Zhou, MSc[6], John Stewart, M.Sc.[6], Aleksandra Vlajnic, M.D.[4]; (1)North Broward Diabetes Center, Coconut Creek, FL; (2)ABQ Health Partners, Albuquerque, NM; (3)AbsoluteCARE Medical Center, Atlanta, GA; (4)Sanofi US, Inc., Bridgewater, NJ; (5)Doctor Evidence, Santa Monica, CA; (6)Sanofi Canada, Laval, QC, Canada

Presented at the American Diabetes Association 74th Scientific Sessions, San Francisco, CA, June 13–17, 2014. Presented at joint meeting of the International Society of Endocrinology and the Endocrine Society: ICE/ENDO 2014, Chicago, IL, June 21–24, 20.

76E. ABC goal attainment in patients with type 2 diabetes mellitus in US primary care.. *Edward Shahady, M.D.*[1], Jodi Strong, APNP, CDE, BC-ADM, CPT[2], Terry Dex, Pharm.D.[3], Mehul Dalal, Ph.D.[3], Jeffrey Frimpter, MPH[4], Wei Zhou, M.Sc.[5], John Stewart, M.Sc.[5]; (1)Florida Academy of Family Physicians, Jacksonville, FL; (2)Ministry Medical Group, Stevens Point, WI; (3)Sanofi US, Inc., Bridgewater, NJ; (4)Doctor Evidence, Santa Monica, CA; (5)Sanofi Canada, Laval, QC, Canada

Presented at the American Diabetes Association 74th Scientific Sessions, San Francisco, CA, June 13–17, 2014. Presented at joint meeting of the International Society of Endocrinology and the Endocrine Society: ICE/ENDO 2014, Chicago, IL, June 21–24, 20.

77. Sitagliptin associated pancreatic carcinoma: a review of the FDA AERS database. *Angela Nagel, Pharm.D., BPS*, Gabriela Cipriano, Pharm.D., Nabila Ahmed-Sarwar, Pharm.D., BPS, Robbertvan Manen, M.Sc., Jack Brown, Pharm.D., M.S., BPS; Wegmans School of Pharmacy, St. John Fisher College, Rochester, NY
PURPOSE: Sitagliptin is a dipeptidyl peptidase-4 (DPP-4) inhibitor used in the treatment of type 2 diabetes mellitus in adults, as adjunct to diet and exercise to improve glycemic control. During phase III studies, sitagliptin was shown to cause toxicity to the pancreas, including pancreatitis. To date there is limited information available regarding its association with pancreatic carcinoma. Our goal was to qualitatively and quantitatively review available information in the AERS database in order to provide clinicians with a general understanding of the comparative occurrence of sitagliptin use and pancreatic carcinoma and any clinically relevant characteristics that may be useful in identifying patients at risk.
METHODS: We used Empirica Signal software to query AERS from November 1968 to December 31, 2012. The software was used to calculate a disproportionality statistic, namely the Empirical Bayesian Geometric Mean (EBGM), for reports of sitagliptin -associated pancreatic carcinoma. The FDA considers an EBGM significant if the 5th percentile of the distribution is at least two (EB05 > 2.0). With use of a disproportionality analysis, sitagliptin was compared with all agents listed in AERS.
RESULTS: Overall there were 100 cases of pancreatic carcinoma reported during this time period. An EB05 of 10.3 was determined for sitagliptin compared to all other agents included in AERS. Based on the available data patient characteristics were: 44% males, average age of 70 y/o and average duration of treatment with sitagliptin of 460 days. At the time of the report none of the reported cases recovered and of these there were 28 reported deaths.
CONCLUSION: There appears to be a statistical association between sitagliptin use and pancreatic carcinoma. Additional clinical studies are needed to further explore this statistical association.

78E. Insulin versus glucagon-like peptide-1 receptor agonist as first injectable therapy in primary care. *Mark Warren, M.D., FACE*[1], Hallie Brown, B.S.[2], Andres DiGenio, M.D.[3], Carl Friedrichs, III, M.D.[2], Jeffrey Frimpter, MPH[4], Bryan Johnstone, Ph.D.[5], John Stewart, M.Sc.[6], Mehul Dalal, Ph.D.[5]; (1)Physicians East, P.A.,

Greenville, NC; (2)Anasazi Medical Associates, Santa Fe, NM; (3)Isis Pharmaceuticals, Inc., Carlsbad, CA; (4)Doctor Evidence, Santa Monica, CA; (5)Sanofi US, Inc., Bridgewater, NJ; (6) Sanofi Canada, Laval, QC, Canada

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79E. A clinical trial of propolis supplementation on type II diabetic patients treated with gliclazide and metformin. *Noha Hashem, M.Sc.*[1], AbdelHameed Elshamy, Ph.D.[2], Maram Maher, M.D.[3], Osama A. Badary, Ph.D.[4]; (1)Department of Pharmacy Practice and Clinical Pharmacy, Faculty of Pharmaceutical Sciences and Pharmaceutical Industries, Future University, Cairo, Egypt; (2) Department of Pharmaceutics, Faculty of Pharmacy, Ain Shams University, Cairo, Egypt; (3)Department of Internal Medicine and Endocrinology, Faculty of Medicine, Ain Shams University, Cairo, Egypt; (4)Department of Clinical Pharmacy, Faculty of Pharmacy, Ain shams University, Cairo, Egypt

Presented at International Pharmaceutical Federation (FIP), Dublin, Ireland, August 31–September 5, 2013.

80E. Real-world characteristics of patients with type 2 diabetes mellitus at A1C goal (≤7%) compared with patients not at goal (>7%): the Diabetes FORWARD study. *Eric Harman, M.D.*[1], John Stewart, M.Sc.[2], Wei Zhou, M.Sc.[2], Jeffrey Frimpter, MPH[3], Aleksandra Vlajnic, M.D.[4]; (1)Mountain Region Family Medicine, Kingsport, TN; (2)Sanofi Canada, Laval, QC, Canada; (3)Doctor Evidence, Santa Monica, CA; (4)Sanofi US, Inc., Bridgewater, NJ

Presented at joint meeting of the International Society of Endocrinology and the Endocrine Society: ICE/ENDO 2014, Chicago, IL, June 21–24, 2014.

81E. Demographics, clinical, and treatment patterns in African Americans with type 2 diabetes mellitus in primary care. *Theresa Cho, M.D.*[1], Manuel Quinones, M.D.[2], Terry Dex, Pharm.D.[3], Mehul Dalal, Ph.D.[3], Jeffrey Frimpter, MPH[4], John Stewart, M.Sc.[5], Aleksandra Vlajnic, M.D.[3]; (1)Ventura County Medical Center, Ventura, CA; (2)Talbert Medical Group, Anaheim, CA; (3)Sanofi US, Inc., Bridgewater, NJ; (4)Doctor Evidence, Santa Monica, CA; (5)Sanofi Canada, Laval, QC, Canada

Presented at the American Diabetes Association 74th Scientific Sessions, San Francisco, CA, June 13–17, 2014.

82. Real-world characteristics and A1C outcomes in younger (<70 years) and older (≥70 years) patients with type 2 diabetes mellitus: the Diabetes FORWARD study. *Andrea Videlefsky, M.D.*[1], John Stewart, M.Sc.[2], Aleksandra Vlajnic, M.D.[3], Terry Dex, Pharm.D.[3], Mehul Dalal, Ph.D.[3]; (1)Urban Family Practice Associates, Marietta, GA; (2)Sanofi Canada, Laval, QC, Canada; (3)Sanofi US, Inc., Bridgewater, NJ

PURPOSE: Type 2 diabetes mellitus (T2DM) management in non-institutionalized patients is predominantly provided by primary care practices. A good understanding of treatment decisions is lacking. We compared characteristics and outcomes of patients with T2DM aged ≥70 years with patients aged < 70 years.

METHODS: The Diabetes FORWARD study is a longitudinal, practice-based study that evaluates practice patterns, patient experiences, and outcomes in the management of T2DM in the US, using data from electronic medical records and surveys. Patient age at time of enrollment was used for group assignment.

RESULTS: Of 2195 enrolled patients, 1967 were eligible based on availability of data. Older patients (aged ≥ 70 years) had somewhat lower education levels (p=0.0095), a lower BMI (31.4 kg/m^2 vs 35.4 kg/m^2, p<0.0001) and lower A1C values at baseline (7.0% vs 7.4%, p<0.0001) when compared with younger patients (aged < 70 years). Only a small proportion of patients in each group reported that hypoglycemia was a significant or extremely significant problem (severe: 6.7% vs 5.7%; nocturnal 5.9% vs 8.7%; not significant for both). Older patients, when compared with younger patients, had a better opinion of their health status (rated very good: 28% vs 20%, p=0.0011). For both older and younger patients similar changes in A1C were observed at follow-up (9 months: −0.11% vs −0.04%, not significant), although more older patients met A1C goals (9 months: 66% vs 50%, p=0.0009).

CONCLUSION: These results are consistent with the findings of the National Health and Nutrition Examination Survey analysis (2007–2010), in which elderly patients were more likely to reach A1C goals. Despite having significantly more co-morbidities, elderly patients have better T2DM control. New approaches are needed to help patients, especially in younger age groups, achieve target treatment goals.

83E. Lower risk of hypoglycemic events with dapagliflozin than glipizide over 4 years in a phase 3 study. Katja Rohwedder, M.D.[1], Shamik Parikh, M.D.[2], Eva Johnsson, M.D.[3], *Andrea Traina, Pharm.D., BCPS, BCACP*[4]; (1)AstraZeneca, Wedel, Germany; (2)AstraZeneca, Wilmington, DE; (3)AstraZeneca, Mölndal, Sweden; (4)AstraZeneca, Fort Washington, PA

Presented at American Diabetes Association – 74th Annual Scientific Sessions, San Francisco, CA, June 13–17, 2014.

84E. Efficacy and safety of saxagliptin as monotherapy in patients with type 2 diabetes: a pooled analysis. Boaz Hirshberg, M.D.[1], Brian Bryzinski, M.D.[1], John Xu, Ph.D.[1], John Monyak, Ph.D.[1], Nayyar Iqbal, M.D.[2], *Jeffrey Frye, Pharm.D.*[3]; (1)AstraZeneca, Wilmington, DE; (2)Bristol-Myers Squibb, Princeton, NJ; (3) AstraZeneca, Fort Washington, PA

Presented at Presented at the American Diabetes Association – 74th Annual Scientific Session, San Francisco, CA, June 13–17, 2014.

Family Medicine

85. A qualitative investigation describing human resource infrastructure roles and responsibilities in practice-based research networks. *Brandon Patterson, Pharm.D., Ph.D.*[1], Shanrae'l Stoner, Pharm.D. (Candidate)[2], William Douecette, Ph.D.[3], Barcey Levy, M.D., Ph.D.[3], Barry Carter, Pharm.D.[3], Julie Urmie, Ph.D.[3], Mary Schroeder, Ph.D.[3]; (1)Department of Pharmacy Practice and Pharmacy Administration, Philadelphia College of Pharmacy, Philadelphia, PA; (2)IA; (3)University of Iowa College of Pharmacy, Iowa City, IA

PURPOSE: Practice-based research networks (PBRNs) have been established as a means for physicians and other health care members to create practice improvement through the generation of new knowledge. PBRNs are complex organizations, often with many stakeholders making evaluative efforts difficult. Limited research has been conducted on human resource infrastructures utilized by PBRNs.

METHODS: Interviews with PBRN directors and non-director participants were conducted. A semi structured interview guide including questions on identifying positive and negative performances of non-director participants of PBRNs and decision-making practices within their PBRNs was used. AHRQ recognized PBRNs were stratified by geographic distribution and sampled to allow diverse representation. Qualitative analysis was performed with two coders who developed an initial code list, iteratively coded data using the original list along with new codes grounded in data, and formed consensus definitions of emergent themes.

RESULTS: Thirty-two interviews were conducted. Interviewees reported that PBRN directors should be experienced in research

and practice, supportive, accessible, collaborative and possess organizational acumen. Interviewees perceived network coordinators as possessing a diversity of jobs and skillsets necessary to manage or coordinate the day-to-day functions of the PBRN. Some network coordinators placed greater emphasis in management of research processes. Network coordinator motivations included having ample resource support and other staff. Interviewees perceived that other principle or co-investigators needed to possess strong collaborative skills in addition to bringing good scientific knowledge in applying for funding and designing research. Previous experience and adaptability were important motivational forces in principle/co-investigators. Finally, motivating factors of clinician members of PBRNs included a patient care focus and minimization of effort required in projects, while a "What's in it for me?" attitude seemed to decrease participation.
CONCLUSIONS: Many participants reported significant overlap in responsibilities, furthering the mission and success of their PBRNs. However, motivational influences for each of the roles differed.

86E. Impact of cough and the common cold on productivity and quality of life: results from the US Attitudes of Consumers toward Health, Cough, and Cold Survey. *Peter Dicpinigaitis, M.D.*[1], Ronald Eccles, DSc[2], Michael Blaiss, M.D.[3], Mark Wingertzahn, Ph.D.[4]; (1)Division of Pulmonary Medicine, Albert Einstein College of Medicine and Montefiore Medical Center, Bronx, NY; (2)Common Cold Centre, Cardiff School of Biosciences, Cardiff, Wales, UK; (3)Allergy Immunotherapy, Merck & Co., Roswell, GA; (4)Global Clinical Development, Pfizer Consumer Health, Madison, NJ

Presented at the International Conference of the American Thoracic Society, San Diego, CA, May 16–21, 2004.

87. Survey of student pharmacists' awareness and intention to practice in patient-centered medical homes. *Andrea L. Pierce, Pharm.D.*, Leticia R. Moczygemba, Pharm.D., Ph.D., Gary R. Matzke, Pharm.D.; Department of Pharmacotherapy and Outcomes Sciences, Virginia Commonwealth University School of Pharmacy, Richmond, VA
PURPOSE: To assess student pharmacists' opinions on: (i) the roles and responsibilities of pharmacists in patient-centered medical homes (PCMHs), (ii) the core elements and functions of PCMHs, and (iii) the behavioral intention to practice in PCMHs.
METHODS: The link to an online survey was e-mailed to the deans of student affairs at 8 U.S. schools and colleges of pharmacy for distribution to students in April 2014.
RESULTS: A total of 227 surveys were completed, response rate 6.5%. Students in each professional year were well represented: 31%, 21%, 23%, and 25%, from 1st, 2nd, 3rd, and 4th year students, respectively. Over 90% of student pharmacists agreed that assessment of a patient's medication-related needs, adherence, experiences, and medication-related problems should be among the primary roles of PCMH pharmacists. In contrast, 53% and 56% believed measuring patient vital signs and performing physical assessments (e.g. diabetic foot inspections) were essential roles. Only 52% believed other healthcare providers would welcome pharmacists on the PCMH team. 60% of respondents had exposure to PCMHs in their curriculum; however, only 42% indicated their school's faculty encouraged careers in PCMHs. Finally, 36% and 48% of students, respectively, believed job opportunities in PCMHs will be available for them upon graduation and that payment mechanisms to support pharmacist inclusion in PCMHs in the future would be available. 48% of respondents indicated they intend to practice in a PCMH if the opportunity were available.
CONCLUSION: Student pharmacists' have a basic understanding of PCMHs and pharmacist's roles therein. Perceived barriers to inclusion in PCMHs included acceptance by other providers, job opportunities, and payment mechanisms. Student views on pharmacists' need to perform patient assessment skills as PCMH team members is a stark contrast with the reality that this is a key element in the provision of comprehensive medication and chronic disease state management.

88E. Improving Health for At-Risk Rural Patients (IHARP): identification and resolution of medication related problems. *Leticia R. Moczygemba, Pharm.D., Ph.D.*[1], Heidi Wengerd, Pharm.D.[2], Andrea L. Pierce, Pharm.D.[1], Michael Czar, Ph.D., RPh[2], Tanvi Patil, Pharm.D.[2], Nikisa Blevins, Pharm.D.[2], Karen Williams, Pharm.D.[2], Courtney Dickerson, Pharm.D.[2], Kelley Mills, Pharm.D.[2], William Lee, BPharm, MPA[2], Gary R. Matzke, Pharm.D.[1]; (1)Department of Pharmacotherapy and Outcomes Sciences, Virginia Commonwealth University School of Pharmacy, Richmond, VA; (2)Carilion New River Valley Medical Center

Presented at the All Together Better Health VII International Conference on Interprofessional Practice and Education, Pittsburgh, PA, June 6–8, 2014.

89. Revisiting Project Re-Engineered Discharge (RED): the impact of a pharmacist telephone intervention on hospital readmission rates. *Michelle Mancuso, Pharm.D.*[1], Gail Sanchez, Pharm.D.[1], Mark Douglass, Pharm.D.[2]; (1)Department of Pharmacy, Boston Medical Center, Boston, MA; (2)Department of Pharmacy Practice, Northeastern University School of Pharmacy, Boston, MA
PURPOSE: Project Re-Engineered Discharge (RED) is a discharge nurse education (DNE) and pharmacist follow-up telephone intervention protocol that was shown to significantly decrease re-hospitalization. The specific value of the pharmacist intervention was not originally evaluated. The objective of this study was to determine the impact of a pharmacist telephone intervention during the transition of care process on the rate of unplanned hospitalization within 30 days of patient discharge.
METHODS: A retrospective chart review was completed for patients who received DNE counseling and were discharged to home from the family medicine service at Boston Medical Center from July, 2012–May, 2013. Patients were stratified into two groups: contacted/intervention, and unable to contact/no intervention. The primary outcome was the rate of unplanned hospital utilization, including emergency room visits and readmissions, within 30 days of discharge. Secondary endpoints included number of pharmacist interventions and time spent on phone calls.
RESULTS: There were 401 patients identified; 277 patients received a pharmacist telephone intervention and 124 patients were unable to be contacted. Baseline characteristics did not differ between the two groups, with the exception of a higher prevalence of substance abuse in the non-intervention group (41.9% vs 21.3%, $p<0.001$). The rate of unplanned hospitalization (visits/patient) was significantly reduced in the intervention group, compared to the unable to contact group (0.227 vs 0.519, $p<0.001$). Pharmacists made a total of 128 interventions and spent an average of 22 minutes on each telephone intervention.
CONCLUSION: Patients unable to be contacted by a pharmacist after hospital discharge were more likely to be readmitted or visit the emergency room in the 30 days following discharge. A pharmacist telephone intervention as part of a comprehensive discharge protocol can positively impact patients during the transition of care process by reducing incidence of unplanned hospital utilization.

90. Evaluation of diabetes outcomes after implementation of clinical pharmacy services in an employer-sponsored family medicine clinic. *Holly Gurgle, Pharm.D., BCACP, CDE*[1], Carrie McAdam-Marx, RPh, M.S., Ph.D.[2], Mukul Singhal, B.S.[2], Peter Weir, M.D., MPH[3]; (1)Department of Pharmacotherapy, University of Utah College of Pharmacy, Salt Lake City, UT; (2)Department of Pharmacotherapy & Pharmacotherapy Outcomes Research Center, University of Utah College of Pharmacy, Salt Lake City,

UT; (3)ARUP Family Health Clinic, ARUP Laboratories, Salt Lake City, UT
PURPOSE: Diabetes is a prevalent and costly condition for employers. The purpose of this study was to evaluate the impact of clinical pharmacy services on diabetes outcomes in an employer-sponsored family medicine clinic.
METHODS: This retrospective cohort analysis was based on electronic medical record data from a clinic diabetes registry with data from 9/1/2011 through 2/28/2014. Included patients completed at least one visit with the pharmacist between 9/1/2012 and 12/28/2014 (index date), had an A1c value on index date (−60 to +7 days) and at least one follow-up A1c recorded 60–365 after index date. The primary outcome was change in A1c from baseline to follow-up measured as the mean of all A1c values documented 60–365 days post index date. Secondary outcomes included: attainment of A1c <7%, A1c <9.0%, BP <140/90 mmHg, and LDL <100 mg/dL in patients above these goals at baseline. Paired t-tests and chi-square tests were used to determine significance of the observed changes in clinical outcomes.
RESULTS: Of 212 patients in the diabetes registry, 70 met inclusion criteria. Baseline mean (SD) A1c was 8.52% (2.33), BP was 130.5 (15.1)/81.9 (8.3) mmHg, LDL was 101.4 mg/dL (31.5), and number of visits with the clinical pharmacist was 5.1 (4.0). A significant reduction in A1c of −0.60% (2.09) (p=0.02) was observed from baseline to follow-up overall. A significant number of patients above target values at baseline attained targets at follow-up for A1c <7.0% (6 of 48; p=0.01), A1c <9.0% (14 of 26; p<.001), SBP (4 of 13; p=0.03), DBP (5 of 7; p=0.005) and LDL (11 of 23; p<.001).
CONCLUSION: Clinical pharmacy services offered in an employer-sponsored family medicine clinic are associated with improved diabetes outcomes including reduction in A1c, and greater goal attainment for A1c, DBP, and LDL.

91. Clinical and economic outcomes of a collaborative diabetes management program in an employer-sponsored family medicine clinic. *Holly Gurgle, Pharm.D., BCACP, CDE*[1], Carrie McAdam-Marx, RPh, M.S., Ph.D.[2], Mukul Singhal, B.S.[2], Peter Weir, M.D., MPH[3]; (1)Department of Pharmacotherapy, University of Utah College of Pharmacy, Salt Lake City, UT; (2)Department of Pharmacotherapy & Pharmacotherapy Outcomes Research Center, University of Utah College of Pharmacy, Salt Lake City, UT; (3)ARUP Family Health Clinic, ARUP Laboratories, Salt Lake City, UT
PURPOSE: This study evaluates outcomes associated with an employer-sponsored diabetes management program (DMP).
METHODS: Starting 1/1/2013, diabetes-related copays were waived for insulin, generic diabetes medications, testing supplies, and the employer's family medicine clinic office visits. The DMP also included access to the employer-clinic based clinical pharmacist. Data from 2012 and 2013 were collected from the clinic diabetes registry and the employer's benefit manager. Clinical outcomes were assessed in patients with baseline and follow-up A1c. The first A1c after 1/1/2013 defined patient index date; the mean of A1c values documented 60–365 days after index date defined follow-up. Costs were assessed in registry patients with 2012 and 2013 cost data. Primary outcomes were changes in A1c and total medical cost per patient. Secondary outcomes included goal attainment for BP (<140/90 mmHg), A1c (<7%) and LDL (<100 mg/dL) for patients not at goal on index date. *T*-tests and chi-square tests identified changes in clinical outcomes and cost.
RESULTS: Of 212 patients in the diabetes registry in 2013, 169 patients met inclusion criteria for clinical outcomes analyses. Mean (SD) age was 50.3 (12.3) years, 51.0% were female, and 127 (86.4%) were managed by the clinic. Baseline mean A1c was 7.9% (1.95); 88 patients (59.9%) had a baseline A1c ≥7.0%. There was a significant reduction in A1c from index to follow-up of −0.33% (1.63) (p=0.01), and 20 (22.7%) with A1c ≥7.0% at baseline attained goal at follow-up (p<0.001). For those not at goal at baseline, goal was achieved for SBP (51.7%, p<0.001), DBP (45.5%, p=0.011), and LDL (27.3%, p<0.001) after DMP implementation. Mean (median) total cost for 169 registry patients with cost data was $7046 ($3154) in 2013 versus $7471 ($2690) in 2012 (p=0.61).
CONCLUSION: A collaborative DMP implemented in an employer-sponsored family medicine was associated with improved clinical outcomes with no increase in cost.

Gastroenterology

92. Fluoroquinolone sequential therapy for *Helicobacter pylori*. *Sheila Wilhelm, Pharm.D., BCPS*[1], Anela Mihaescu, Pharm.D. Candidate[2], Pramodini Kale-Pradhan, Pharm.D.[3]; (1)Department of Pharmacy Practice, Wayne State University, Eugene Applebaum College of Pharmacy & Health Sciences and Harper University Hospital, Detroit, MI; (2)Department of Pharmacy Practice, Wayne State University, Eugene Applebaum College of Pharmacy & Health Sciences, Detroit, MI; (3)Department of Pharmacy Practice, Wayne State University, Eugene Applebaum College of Pharmacy & Health Sciences and St. John Hospital and Medical Center, Detroit, MI
PURPOSE: Resistance of *Helicobacter pylori* (*H. pylori*) to first line standard therapy is increasing globally leading to exploration of alternative treatment regimens. Once such alternative is a fluoroquinolone-based sequential regimen which consists of 5–7 days of proton pump inhibitor and amoxicillin therapy followed by 5–7 days of proton pump inhibitor, fluoroquinolone and metronidazole or tinidazole therapy. This meta-analysis compares quinolone-based sequential therapy to first-line treatment for *H. pylori* infection.
METHODS: Medline, PubMed, and Cochrane Library CENTRAL database were searched for randomized controlled trials (RCTs), published in full in English. Included trials compared fluoroquinolone-based sequential therapy to guideline recommended first line treatment regimens in *H. pylori* treatment-naive adults. All selected trials confirmed *H. pylori* infection prior to treatment as well as post-treatment eradication. Meta-analysis was performed with Review Manager 5.2. Treatment effect was determined with a random effects model by the Mantel-Haenszel method and reported as a risk ratio (RR) with 95% confidence interval (CI).
RESULTS: Six RCTs met the inclusion criteria. 648 of 729 patients receiving fluoroquinolone-based sequential therapy and 521 of 724 patients receiving standard regimens achieved eradication (RR 1.21; 95% CI: 1.08–1.35). Adverse effects reported in three of the trials were comparable for all treatments (RR 0.99; 95% CI: 0.76–1.29). Additionally, there was not a statistical difference in the adverse effects prompting the discontinuation of therapy (RR 1.03; 95% CI: 0.34–3.09). Eradication rate appeared similar among the trials with respect to duration of therapy and daily dose of fluoroquinolone.
CONCLUSION: Fluoroquinolone-based sequential therapy is a reasonable treatment alternative for first line eradication of *H. pylori*.

93. Omega-3 long-chain polyunsaturated fatty acids enhance tight junction formation in intestinal epithealial cells. *Emma M. Tillman, Pharm.D., Ph.D.*[1], Peihong Guan, B.S.[1], Dr. Radhakrishna Rao, Ph.D.[2]; (1)University of Tennessee Health Science Center College of Pharmacy, Memphis, TN; (2)The University of Tennessee Health Science Center
PURPOSE: Parenteral nutrition-associated liver disease (PNALD) is one of the most devastating complications affecting children with intestinal failure. Parenteral nutrition is associated with loss of epithelial barrier function, leading to intestinal dysfunction and the transit of luminal toxins (lipopolysaccharide and tumor necrosis factor) into the host, which is thought to play a role in the development of PNALD. Omega-3 polyunsaturated long-chain fatty acids (ω3PUFA) have been shown to be efficacious for the treatment of PNALD although the mechanism is unknown. The aim of this study was to evaluate the effects of ω3PUFA on tight junction formation in intestinal epithelial cells.

METHODS: Intestinal epithelial (Caco-2) cells were grown on polycarbonate membranes in Transwell inserts for 8 days with and without ω3PUFA. Paracellular permeability measured by Transepithelial Electrical Resistance (TER) and unidirectional flux of FITC-inulin on day two, four, six, and eight. In addition, cell monolayers were fixed, incubated with primary antibodies for the tight junction proteins (ZO-1, occludin, and claudin-3), and fluorescence was visualized using a laser scanning confocal microscope.
RESULTS: Treatment of cells with ω3PUFA for 6 days resulted in enhanced barrier function. Specifically, Caco-2 cells incubated with 0.01 μM and 0.1 μM ω3PUFA resulted in TER of 1047 ± 364 Ohms/cm^2 and 1462 ± 50 Ohms/cm^2, respectively. This was significantly higher than Caco-2 monolayers grown under standard conditions resulting in TER of 451 ± 164 Ohms/cm^2 ($p<0.05$). Additionally, unidirectional flux of FITC-inulin was 0.8 ± 0.6% flux/hour/cm^2 and 0.5 ± 0.3% flux/hour/cm^2 in cells incubated with 0.01 μM and 0.1 μM ω3PUFA, respectively. This was significantly lower than control, which resulted in 8.3 ± 6.3% flux/hour/cm^2 ($p<0.05$).
CONCLUSION: The presence of ω3PUFA was associated with enhanced epithelial barrier function, indicating an enhanced assembly of tight junctions. Further studies are needed to determine the role of ω3PUFA on intestinal barrier function and the interplay between intestinal and liver disease.

94. Multivariate analysis of factors that influence improvement in nonalcoholic fatty liver disease (NAFLD) after pioglitazone treatment. *Marina Kawaguchi-Suzuki, Pharm.D.*[1], Fernando Bril, M.D.[2], Beverly Orsak, R.N.[3], Carolina Ortiz-Lopez, M.D.[3], Romina Lomonaco, M.D.[2], Kenneth Cusi, M.D.[2], Reginald Frye, Pharm.D., Ph.D.[1]; (1)Department of Pharmacotherapy and Translational Research, College of Pharmacy, University of Florida, Gainesville, FL; (2)Division of Endocrinology, Diabetes and Metabolism, College of Medicine, University of Florida, Gainesville, FL; (3)Division of Diabetes, University of Texas Health Science Center at San Antonio, San Antonio, TX
PURPOSE: The aims of this study were to investigate the clinical outcomes of patients with nonalcoholic fatty liver disease (NAFLD) and prediabetes/diabetes after pioglitazone treatment and to identify factors that contribute to observed variability in drug response.
METHODS: A two-phase clinical study was conducted. Pioglitazone 45 mg/day was administered to 58 patients with biopsy-proven NAFLD (age: 54 ± 9 years [mean ± SD], male: 76%, BMI: 34 ± 4 kg/m^2, diabetes 53%) for 18 months (39 randomized to pioglitazone in the first placebo-controlled blinded phase and 19 started on pioglitazone during the second open-label phase). A liver biopsy was obtained at baseline and after 18 months of therapy to assess histological improvement as the primary outcome. Medication adherence was assessed by pill counts. Concentrations of pioglitazone and its active metabolites (hydroxypioglitazone and ketopioglitazone) were determined by liquid chromatography tandem mass spectrometry and included in the multivariate analysis with baseline variables.
RESULTS: Fifty five patients completed the follow-up biopsy. In patients treated with pioglitazone, steatosis ($p<0.0001$), inflammation ($p<0.0001$), ballooning ($p<0.0001$), and the overall NAFLD activity score (NAS; $p<0.0001$) were improved. The medication adherence rate was 96.1 ± 3.3%. The measured concentrations of pioglitazone, hydroxypioglitazone, and ketopioglitazone were 306 ± 354 ng/mL, 819 ± 473 ng/mL, and 264 ± 160 ng/mL respectively. Changes in NAS were explained by baseline NAS ($r^2=0.23$, $p<0.0001$), pioglitazone concentrations ($r^2=0.21$, $p<0.0001$), and gender ($r^2=0.06$, $p=0.01$). The metabolite concentrations and other baseline variables (e.g. diabetes mellitus and/or metabolic syndrome, age, ethnicity, and BMI) were not significant factors to explain variability in the NAS improvement in the multivariate analysis.
CONCLUSION: The concentrations of pioglitazone and its active metabolites were shown to be markedly variable. Large differences in steady state drug concentrations were observed despite high medication adherence. Baseline NAS, pioglitazone concentrations, and gender were important factors contributing to variability in the clinical outcome of NAFLD.

95E. Discordance between patient and healthcare provider reports of the burden of opioid-induced constipation. *Catherine Datto, M.D., M.S.*[1], Robert LoCasale, Ph.D., M.S.[1], Krista A. Payne, M.Ed.[2], Chris Sexton, Ph.D.[3], Karen Yeomans, B.Sc.[2]; (1)AstraZeneca Pharmaceuticals, Wilmington, DE; (2)United BioSource Corporation, an Express Scripts Company, Montreal, QC, Canada; (3)Evidera, Bethesda, MD

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96. The impact of a clinical pharmacist-managed acid suppression program on inappropriate therapy in general ward patients. *Mitchell S. Buckley, Pharm.D., FASHP, FCCM, BCPS*[1], Clint Anderson, Pharm.D., BCPS[1], Andrew Park, Pharm.D.[1], Jeffrey Barletta, Pharm.D.[2], Dale Bikin, Pharm.D.[1], Richard Gerkin, Jr., M.D., M.S., FACP, FACMT[3], Laura Wicks, Pharm.D.[1], Cheryl O'Malley, M.D.[4], Sandra L. Kane-Gill, Pharm.D., M.Sc., FCCM, FCCP[5]; (1)Department of Pharmacy, Banner Good Samaritan Medical Center, Phoenix, AZ; (2)Department of Pharmacy Practice, Midwestern University, College of Pharmacy-Glendale, Glendale, AZ; (3)Graduate Medical Education Research, Banner Good Samaritan Medical Center, Phoenix, AZ; (4)Internal Medicine, Banner Good Samaritan Medical Center, Phoenix, AZ; (5)University of Pittsburgh School of Pharmacy, Pittsburgh, PA
PURPOSE: Acid suppression therapy (AST) is commonly prescribed in hospitalized patients and has been associated with deleterious outcomes although this remains debatable. High rates of inappropriate AST initiated in the hospital and continued upon hospital discharge have been reported. The purpose of this study was to evaluate the impact of a clinical pharmacy program on inappropriate AST rates in a general ward patient population.
METHODS: A retrospective, pre and post study design was conducted in adult general ward patients at a large academic medical center. Rates of inappropriate AST in all patients were recorded over two nonconsecutive months before (January 2011) and after (January 2012) the implementation of a novel pharmacist AST management program. Inappropriate AST was defined as those patients administered therapy without an indication for treatment. Subjects were excluded if AST was used for any appropriate indication or continuation of home therapy. The pharmacy program included prescriptive authority for AST under a collaborative practice agreement enabling the pharmacist to discontinue therapy in patients without an indication and not taking as a home medication prior to hospital admission.
RESULTS: A total of 1749 patient were evaluated for inappropriate AST in the study period with 793 patients (pre-group, n=589; post-group, n=204) meeting inclusion criteria. The rate of inappropriate AST significantly decreased following implementation of the pharmacy-managed program compared to the pre-implementation period (4.9% vs 30.9%, respectively; $p<0.001$). The mean duration of inappropriate AST significantly decreased comparing the pre- and post-groups (4.4 ± 5.3 vs 2.1 ± 1.8, respectively; $p<0.001$). The rate of patients inappropriately continued on AST upon hospital discharge in the pre- and post-groups were 36.2% and 5.4%, respectively ($p<0.001$).
CONCLUSIONS: This novel program granting clinical pharmacists prescriptive authority for AST under a collaborative practice agreement decreased inappropriate AST utilization during hospitalization and upon hospital discharge.

Geriatrics

98. Assessment of medication counseling and medication knowledge in an older adult population in a VA outpatient clinic. *Jason Moss, Pharm.D.*[1], Ramonna Cvelich, Pharm.D.[2], Cathleen Colon-Emeric, M.D., MHS[3], Jack Twersky, M.D.[3]; (1)Campbell University/

Durham VA GRECC, Durham, NC; (2)Duke Regional Hospital, Durham, NC; (3)Duke University Medical Center/Durham VA GRECC, Durham, NC
PURPOSE: To describe older adult patients' or caregivers' assessment of medication counseling at a VA outpatient clinic and to determine satisfaction with education on medication changes and individual knowledge of medication changes.
METHODS: This was a prospective, quality improvement study. Adults greater than 65 years of age establishing primary care or consulted for a geriatric assessment in a VA geriatric outpatient clinic were eligible. Measurement tools included the Short Test of Functional Health Literacy Assessment (S-TOFHLA) for health literacy and the Medication Knowledge Assessment (MKA) for medication changes. Standardized interview questions that assessed subjects' satisfaction with communication of medication changes were administered using a 5-point Likert Scale. Open-ended questions were asked to evaluate current medication counseling practices. Descriptive statistics were used to describe results.
RESULTS: Of the 24 subjects included, 71% were independent in management of medications with a mean age of 84. Seventy-five percent of subjects were white, 21% black and 4% Hispanic. Twenty-five percent of subjects had an education through 11th grade or less with a mean S-TOFHLA of 32.2. Of the 24 subjects included, 19 had medication changes recommended with a mean of 3.4 changes. Seventy-nine percent of subjects agreed that they were able to remember the medication changes, and 68% of participants agreed that they understood the rationale for the medication change. Eighty-four percent agreed that they knew common side effects of each medication. Despite the proportion of patients who self-reported understanding and remembering medication changes, the mean MKA cumulative score was 47% and 14% on identifying a side effect.
CONCLUSION: Subjects were overall satisfied with the current medication counseling practices and reported understanding and remembering medication changes. However, low scores on the MKA indicate they did not fully comprehend medication changes. These results will help to focus counseling practices to ensure optimal adherence.

99. Risk of pneumonia in older adults using non-benzodiazepine hypnotics. *Stephen Jung, Pharm.D., BCPS*[1], Michele Spence, Ph.D.[2], Nina Escasa, Pharm.D., BCPS[3], Rita Hui, Pharm.D., M.S.[4], Eric Lee, M.D.[5], Nancy Gibbs, M.D.[6]; (1)Department of Clinical Development, OptumRx, Irvine, CA; (2)Pharmacy Outcomes Research Group, Kaiser Permanente, Downey, CA; (3)Drug Information Services, Kaiser Permanente, Downey, CA; (4) Pharmacy Outcomes Research Group, Kaiser Permanente, Oakland, CA; (5)Department of Internal Medicine, Kaiser Permanente West Los Angeles Medical Center, Los Angeles, CA; (6)Department of Family Practice, Kaiser Permanente Baldwin Park Medical Center, Baldwin Park, CA
PURPOSE: Current data have shown an increased risk of pneumonia with benzodiazepines and an increased risk of any infection with non-benzodiazepine (non-BZD) hypnotics. However, there has been no analysis specifically investigating the risk of pneumonia with non-BZD hypnotic use. The objective of this study was to evaluate the association between non-BZD hypnotic exposure and the risk of pneumonia in the elderly.
METHODS: This was a retrospective case–control study evaluating Kaiser Permanente patients age 65 years and older. Cases were defined as patients with a new diagnosis of pneumonia from January 2011 through December 2012, and were matched to controls in a 1:4 ratio by age, gender, and active enrollment. Unadjusted rates of pneumonia were compared between cases and controls, and conditional logistic regression was performed to adjust for covariates.
RESULTS: We identified 51,029 cases with pneumonia and matched 188,391 controls without pneumonia. 5.5% (2790) of cases had exposure to a non-BZD hypnotic, compared with 3.4% (6344) of controls. Exposure to non-BZD hypnotics was associated with an increased risk of pneumonia (OR = 1.14; 95% CI 1.08, 1.20). When stratified by proximity to index date, only current exposure (prescription within 30 days before the index date) was associated with an increased risk of pneumonia (OR = 1.27; 95% CI 1.19, 1.36). In comparing short-term and long-term exposure among current users (cumulative prescription days supply ≤90 days vs >90 days, respectively), short-term exposure was associated with a relatively higher risk of pneumonia (OR = 1.58; 95% CI 1.40, 1.78) compared with long-term use (OR = 1.16; 95% CI 1.06, 1.26).
CONCLUSION: Current use of non-BZD hypnotics in older adults is associated with an increased risk of pneumonia. Our findings provide additional rationale for reducing the use of high-risk medications like non-BZD hypnotics in older adults and to pursue safer alternatives for treating insomnia.

100. Adverse events associated with diphenhydramine use for insomnia in the elderly. *Marissa Cavaretta, Pharm.D., BCPS, BCACP*, Alexander Dellabella, Pharm.D. Candidate, Erika Goldberg, Pharm.D. Candidate, Alexandra Hanretty, Pharm.D. Candidate, Meghan Mitchell, Pharm.D. Candidate, Christina Rose, Pharm.D., BCPS, Jason Gallagher, Pharm.D.. FCCP, BCPS; Temple University School of Pharmacy, Philadelphia, PA
PURPOSE: Diphenhydramine use for insomnia predisposes elderly patients to adverse events (AEs), yet continues to be prescribed for this indication. This study was performed to quantify the AEs associated with diphenhydramine use in the elderly.
METHODS: This was a retrospective chart review of patients ≥65 years old who received at least one dose of diphenhydramine for insomnia at Temple University Hospital between March 2013 and April 2013. Delirium, altered mental status, and changes in fall risk were assessed from the medical record and considered drug induced if occurrence was within 24 hours of receiving the dose. Fall risk was evaluated using the Morse scale. Patients who increased Morse scale risk categories were considered at increased risk of falls. Predisposing factors that placed patients at risk for delirium and falls were also assessed, including comorbidities and concomitant medications. The Fisher's exact test was used to assess whether these risk factors were associated with increased AEs.
RESULTS: Fifty-one patients were included. Twenty-five patients (49%) experienced 34 negative outcomes in total.

Event	Number of events (% of total)
Any negative outcome	25 (49%)
Any symptom of delirium	15 (29%)
Acute change in mental status	13 (25%)
Agitation	3 (6%)
Documented delirium diagnosis	2 (4%)
Increase in fall risk	19 (37%)
New fall risk	14 (27%)
Fall	0 (0%)
Addition of antipsychotic medication	3 (6%)

Forty-four patients (86%) had predisposing risk factors for AEs and 27 (62%) of them experienced an AE. Four of the 7 patients (57%) without risk factors experienced AEs. The incidence of AEs was similar between groups (p=0.69).
CONCLUSION: Diphenhydramine use in the elderly was associated with significant AEs including mental status changes, fall risk increases and symptoms of delirium. The findings suggest a need to re-educate providers and eliminate prescribing of diphenhydramine for sleep in geriatric patients.

Health Services Research

101. Clinical and economic outcomes of pharmacist-led anticoagulation clinic in Hong Kong. Siu-Ling Leung, BPharm, MCP[1], Wing-yan Kong, BPharm, MCP[1], Li-hung Mo, BPharm, M.Sc., BCPS[1], Pauline Chu, MPharm, MRPharmS[1], *Joyce You, Pharm.D., BCPS*[2]; (1)Department of Pharmacy, Tuen Mun

Hospital, Hong Kong; (2)School of Pharmacy, The Chinese University of Hong Kong, Hong Kong
PURPOSE: Anticoagulation clinic (AC) is the recommended setting for outpatient care of warfarin therapy. A pharmacist-led anticoagulation clinic was established in Tuen Mun Hospital (TMH) of Hong Kong in 2008. This study aimed to examine the clinical and economic outcomes of pharmacist-led AC versus routine medical care (RMC) from the perspective of healthcare provider in Hong Kong.
METHODS: Records of patients receiving warfarin at TMH during the period 1 July 2008 to 30 July 2012 were reviewed. Patient demographic data, international normalized ratio (INR) measurements and hospital admissions for warfarin-related complications were documented. The percentage of patient-time within target INR range was estimated for each patient. Individual direct medical cost per month was calculated.
RESULTS: A total of 403 patient records (992 patient-years) were reviewed. Mean age was 66 ± 12.3 years and 49% were male. Major bleeding and major thromboembolic event rates were 8.5 and 2.4 per 100 patient-years, respectively. There was no significant difference in event rates between the two study groups. Patients in pharmacist-led AC (n=121) spent higher percent of time within target INR range than those of RMC group (n=282) (63% vs 48%, p<0.001). The mean cost per patient per month of pharmacist-led AC group (HKD666 ± 1685) was lower than the RMC group (HKD700 ± 1639) (USD1 = HKD7.8) (p<0.001).
CONCLUSION: Pharmacist-led AC was less costly and more effective in anticoagulation control for warfarin therapy than RMC in Hong Kong.

102E. Health-related quality of life in persons with apparent treatment-resistant hypertension taking at least four antihypertensives. *Steven Smith, Pharm.D., MPH*[1], Vahram Ghushchyan, Ph.D.[2], Anne Libby, Ph.D.[3]; (1)Department of Pharmacotherapy & Translational Research; Department of Community Health & Family Medicine, University of Florida, Gainesville, FL; (2)American University of Armenia, Armenia; (3)Department of Clinical Pharmacy, Skaggs School of Pharmacy and Pharmaceutical Sciences, University of Colorado, Aurora, CO

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Hematology/Anticoagulation

103. Analysis of new oral anticoagulant use in clinical practice. *Jared Sheley, Pharm.D., BCPS*, Crystal Hoffmann, Pharm.D., BCPS, CACP; St. Luke's Hospital, Chesterfield, MO
PURPOSE: To assess appropriate use of new oral anticoagulants (NOAC) at our institution and compare the efficacy and safety of different oral anticoagulants in clinical practice. There are no currently published direct comparisons of outcomes with NOAC in clinical practice.
METHODS: A retrospective chart review was conducted for the first 100 patients identified to receive one of the following oral anticoagulants beginning November 1, 2012: dabigatran, rivaroxaban, or warfarin. Apixaban was excluded due to insufficient sample size. The primary outcome was appropriate use of the NOAC. Secondary outcomes included major bleeding, clinically relevant non-major bleeding, or new thrombosis within 120 days. Risk factors for bleeding or thrombosis were assessed when >5 episodes occurred. The primary outcome was reported as percent appropriate. Secondary outcomes were analyzed by Fischer's exact for nominal data, with logistic regression utilized to determine risk factors.
RESULTS: Baseline characteristics were similar between groups, with >50% of patients being ≥age 70 and about half taking a concurrent antiplatelet medication. Appropriate use occurred in 76% of patients on dabigatran and 74% on rivaroxaban. Bleeding occurred in 10%, 11%, and 6% of patients on dabigatran, rivaroxaban, and warfarin, respectively, and new thrombosis occurred in 5%, 3%, and 2% of patients, respectively, with no statistically significant findings. The only risk factor identified as statistically significant was appropriate use of dabigatran (OR for bleeding = 0.17 [95% CI 0.04–0.65]).
CONCLUSION: Approximately 1 in 4 uses of NOAC were inappropriate, most commonly due to incorrect dosing for indication, renal function, and concurrent interacting medications. These results demonstrate room for improvement in appropriate use of NOAC as well as an increased role for pharmacists to monitor and adjust therapies during hospitalization.

104. Unfractionated heparin dosing in obese patients with venous thromboembolism. *Chau Chu, Pharm.D.*, Lindsay Arnold, Pharm.D.; Department of Pharmacy, Boston Medical Center, Boston, MA
PURPOSE: Unfractionated heparin (UFH) is commonly used for venous thromboembolism (VTE) and is dosed based on body weight. Literature is controversial surrounding the most appropriate dose in obesity. The objective of this study was to determine the average dose of UFH at which obese patients achieved therapeutic anticoagulation.
METHODS: We conducted a retrospective, single center study comparing obese (BMI ≥ 30) versus non-obese (BMI < 30) patients treated for VTE with UFH from September 1st, 2011 to August 31st, 2013. All patients over 18 years old with a primary or secondary diagnosis of VTE who received UFH for at least 24 hours were included. Patients who were pregnant or switched from UFH to low-molecular weight heparin before achieving therapeutic anticoagulation were excluded. Primary outcome was average UFH dose required to achieve therapeutic anticoagulation. Secondary outcomes were time to therapeutic aPTT, bolus doses and recurrent VTE. Safety endpoints included bleeding events and in-hospital mortality. A subgroup analysis of patients with a BMI >40 was conducted.
RESULTS: Of 601 patients identified, 282 were included in this analysis and classified as non-obese (n=174) and obese (n=108). There were no significant differences in age or gender and both groups were started on similar infusion rates. More patients in the obese group had a supratherapeutic PTT on initial draw (p=0.02). The infusion dose at two consecutive therapeutic PTTs was 17.3 units/kg/hour in the non-obese group versus 15.2 units/kg/hour in the obese group (p=0.002). There was no statistically significant difference in time to achieve therapeutic PTT or safety outcomes. The subgroup analysis showed a lower infusion dose required to achieve therapeutic anticoagulation between the morbidly obese and non-obese group (p=0.02).
CONCLUSION: Obese patients with a BMI >30 and VTE require a lower weight-based UFH dose to achieve therapeutic anticoagulation. Institutions should consider modifications to UFH protocols to adjust doses based on BMI classification.

105. Evaluation of a pharmacy-driven heparin-induced thrombocytopenia protocol: phase 1. Stuart Greaser, Pharm.D.[1], *Carmen B. Smith, Pharm.D., BCPS*[1], Matthew J. Korobey, Pharm.D., BCPS[2]; (1)St. Louis College of Pharmacy, St. Louis, MO; (2)Mercy Hospital St. Louis, St. Louis, MO
PURPOSE: Heparin-induced thrombocytopenia (HIT) is a serious complication occurring in approximately 1–3% of patients receiving heparin products. Due to the risk of thrombosis, alternate therapeutic anticoagulation should be initiated. The 4-T's screening tool for HIT has been shown to have a negative predictive value (NPV) of >99%. The purpose of this project is to determine the impact of a pharmacy-driven protocol incorporating the 4-T's score on identification of HIT.
METHODS: A quasi-experimental study design is being used to evaluate the difference in the proportion of positive HIT tests ordered before (phase 1) and after (phase 2) protocol implementation. Phase 1 included a retrospective review of HIT tests sent from 8/1/2012 through 8/31/2013. Patients >18 years of age with HIT tests ordered were screened with the 4-T's tool to determine risk category. Phase 2 will include development and implementa-

tion of a pharmacy-driven protocol to determine HIT probability based on the 4-T's score and will be retrospectively evaluated for patients suspected of having HIT.
RESULTS: A total of 182 HIT tests were ordered in phase 1. One patient (0.5%) had a high HIT probability, 60 patients (33%) had an intermediate probability, and 121 patients (66.5%) had a low probability. Fourteen tests were positive: 13 were intermediate or high probability and 1 was low probability. The NPV of HIT with a low probability was >99%.
CONCLUSION: The majority of patients having HIT tests ordered in phase one had a low probability according to a 4-T's screening tool indicating that current HIT testing criteria appears suboptimal. Incorporating the 4-Ts screening tool into a pharmacy-driven protocol may result in a significant reduction in unnecessary HIT testing and subsequent anticoagulation related cost.

106. Evaluation of anti-platelet factor-4 laboratory test ordering in the cardiovascular intensive care unit. *Kajal Patel, Pharm.D.*; Department of Pharmacy, Cleveland Clinic, Cleveland, OH
PURPOSE: Heparin-induced thrombocytopenia (HIT) is an IgG-mediated reaction resulting in platelet activation and hypercoagulability. Diagnosis is based on clinical and serologic findings. The 4Ts scoring system assists clinicians in determining the probability of HIT. Since thrombocytopenia is common after cardiac surgery, clinicians may suspect HIT and order lab tests even when the pre-test probability (4Ts score) is low. Due to high sensitivity and low specificity of the anti-PF4 ELISA, false positive results may lead to unnecessary HIT therapy, which presents bleeding risks and increased costs. The purpose of this study was to describe utilization of the anti-PF4 ELISA and economic impact of more efficient use of this test.
METHODS: A chart review (August 2012–July 2013) was conducted to characterize utilization of the anti-PF4 ELISA as appropriate or unnecessary based on pre-test probability and to evaluate potential economic impact of utilizing the 4Ts score prior to ordering HIT lab tests and treatments. Inclusion criteria consisted of adult post-cardiothoracic surgery patients exposed to parenteral heparin and ordered an anti-PF4 ELISA. A 4Ts score was calculated for each subject, and the anti-PF4 ELISA was deemed appropriate if the 4Ts score was intermediate or high. Data were analyzed using descriptive statistics.
RESULTS: The analysis included 162 anti-PF4 orders (95 patient-encounters). Forty-six percent of orders were associated with low pre-test probability, while 45% and 9% with intermediate and high pre-test probability, respectively. Thirteen (8%) anti-PF4 orders were positive. Based on the 4Ts score and clinical appropriateness of anti-PF4 orders, 48% were considered appropriate. The total potential cost-savings with elimination of unnecessary lab tests was $19,240, while that with elimination of unnecessary HIT therapy was $17,472.
CONCLUSION: This study showed over-use of the anti-PF4 ELISA and low incidence of clinical HIT in the study population. More efficient use of HIT lab tests may result in cost-savings.

107. Achievement of therapeutic anticoagulation with implementation of a new heparin dosing nomogram and monitoring with the anti-factor Xa assay. Harpreet Benipal, Pharm.D.[1], Todd E. Gundrum, Pharm.D., BCPS[1], Rose Jung, Pharm.D., MPH, BCPS[2], *Julie A. Murphy, Pharm.D., BCPS, FASHP, FCCP*[2]; (1) Department of Pharmacy Services, University of Toledo Medical Center, Toledo, OH; (2)University of Toledo College of Pharmacy, Toledo, OH
PURPOSE: In June 2009, the University of Toledo Medical Center's (UTMC) heparin protocol moved from weight-based dosing and aPTT monitoring to using total body volume estimates for dosing and anti-Xa monitoring. The purpose of this study was to assess the effectiveness of the previous dosing and monitoring protocol versus the current dosing and monitoring protocol in patients receiving a heparin infusion.
METHODS: This retrospective chart review was approved by the UTMC Institutional Review Board and conducted at a single teaching hospital. Data was collected from electronic and paper records from 6/01/2004 to 5/31/2009 for patients admitted prior to the initiation of the current dosing and monitoring protocol (pre-implementation group). Data for patients admitted after initiation of the current dosing and monitoring protocol (post-implementation group) was collected through electronic records from 7/01/2009 to 6/30/2013. The primary outcome was time to achieve a therapeutic anticoagulation. Secondary outcomes included percentage of tests in therapeutic range, number of monitoring tests per 24 hours, and number of dosage adjustments per 24 hours. Safety outcomes included major and minor bleeding events during hospitalization.
RESULTS: Fifty patients were included in each arm. Baseline characteristics were similar between groups. The primary outcome was achieved in 53.2 hours in the pre-implementation group compared to 34.1 hours in the post-implementation group (p=0.002). Overall, a greater percentage of tests were therapeutic in the post-implementation group compared to the pre-implementation group (70.8% vs 52.2%, p<0.02). At 24 hours, 48% of patients in the pre-implementation group achieved therapeutic anticoagulation compared to 74% in the post-implementation group (p=0.008). No significant differences in other secondary or safety outcomes were identified.
CONCLUSION: Compared to previous, the current heparin dosing and monitoring protocol at UTMC was able to achieve therapeutic anticoagulation sooner, maintain therapeutic anticoagulation longer, and attain therapeutic anticoagulation at 24 hours.

108. Effect of a comprehensive anticoagulation management program on attainment of therapeutic INRs following orthopedic surgery. *J. Bradley Williams, Pharm.D., BCPS*[1], Brian Kurtz, Pharm.D., BCACP[2], Mariam Hamadi, Pharm.D. Candidate[3], Kristen T. Pogue, Pharm.D., BCPS (AQ CV)[1], Sarah Hanigan, Pharm.D., BCPS[1], Elizabeth Renner, Pharm.D., BCACP, BCPS[2], Janice Norville, MSN, MSBA, RN[1], James Froehlich, M.D., MPH[1], Michael P. Dorsch, Pharm.D., M.S., BCPS, (AQ, CV)[1]; (1) University of Michigan Hospitals and Health Centers, Ann Arbor, MI; (2)Outpatient Anticoagulation Service, University of Michigan Hospitals and Health Centers, Ann Arbor, MI; (3) University of Michigan, College of Pharmacy, Ann Arbor, MI
PURPOSE: To determine the effectiveness of a comprehensive anticoagulation management service by comparing the time to first therapeutic INR value and time within therapeutic range (TTR) in orthopedic surgery patients before and after implementation.
METHODS: Following implementation of our comprehensive program, inpatient management of warfarin therapy was provided by clinical pharmacists, rather than the orthopedic surgery service, and the timeframe to post-discharge enrollment in the University of Michigan Outpatient Anticoagulation Service was reduced from 2–4 business days to 1 business day. Data was collected from the medical charts of patients who underwent major orthopedic surgery at the University of Michigan within 6 months before or after implementation of this service. Additional inclusion criteria were the use of warfarin for post-procedural anticoagulation and enrollment in the University of Michigan Outpatient Anticoagulation Clinic following discharge. Patients who underwent surgery during the week of the comprehensive program's implementation were excluded to minimize potential confounding during the transition period, as were patients on anticoagulant therapy immediately prior to their procedure, those who had undergone previous orthopedic surgeries, and those who had their post-procedural warfarin managed by an alternate provider. Data collected included: INRs, hemoglobin and hematocrit, weight, sex, race, procedure type, and reported bleeding.
RESULTS: Patients who received comprehensive management (n=109) had fewer days until first therapeutic INR post-intervention (7 days vs 10 days, p<0.001) and experienced a greater TTR (37.3% vs 29.2%, p=0.02) compared with the control cohort (n=94). Furthermore, more patients in the comprehensive group achieved a therapeutic INR (92.7% vs 81.9%, p=0.02).

CONCLUSION: Implementation of a comprehensive anticoagulation management service is associated with improved warfarin therapy-management, as evidenced by a significant decrease in time to first therapeutic INR and increased TTR.

HIV/AIDS

109. Topical application of tenofovir DF nanoparticles prevents HIV-1 vaginal transmission in humanized-BLT mice. *Christopher Destache, Pharm.D.*[1], Abhijit Date, Ph.D.[1], Zhe Yuan, M.S.[2], Guobin Kang, B.S.[2], Wuxun Lu, Ph.D.[2], For Yue Tso, Ph.D.[2], Charles Wood, Ph.D.[2], Qingsheng Li, Ph.D.[2]; (1)Department of Pharmacy Practice, Creighton University School of Pharmacy & Health Professions, Omaha, NE; (2)Center for Virology, University of Nebraska-Lincoln, Lincoln, NE
PURPOSE: Coitus-independent application of 1% tenofovir gel has not shown consistent efficacy in trials. Recently, we developed a thermosensitive (TMS) gel that increases viscosity at body temperature but remains liquid at room temperature. Tenofovir disoproxil fumarate (TDF) nanoparticles (NPs) incorporated into the TMS gel for vaginal administration was tested using HIV-1 humanized BLT (hu-BLT) mouse model.
METHODS: TDF NPs were fabricated using PLGA polymer and ion-pairing method. TDF NPs were incorporated into TMS gel (pH 4.5). Hu-BLT mice (n=13) were randomly divided into treatment (Rx, n=10) and control groups (Ctr, n=3). Mice in Rx and Ctr groups were intravaginally administered TMS gel with TDF NPs containing 0.1%, 0.5% w/v TDF or blank TMS gel, respectively. At 4 and 24 hour, post-treatment, Rx mice were vaginally challenged with two HIV-1 viruses (WITO.c/2474 and SUMA.c/2821) at 5×10^5 $TCID_{50}$ each. Ctr mice were challenged at 4 hour after TMS gel administration. Mice had weekly blood drawn for plasma viral load (PVL) using qRT-PCR for 4 weeks post-inoculation (PI). In the 4th week, HIV-1 vDNA in PBMCs was determined using digital drop PCR (ddPCR, detection limit 30 copies/mL).
RESULTS: TDF NPs were <100 nm (n=7) and entrapment of tenofovir was >90% by HPLC. All Ctr mice PVL were HIV-1 positive in 1–2 weeks PI. In contrast, 100% of Rx group (4 hour 0.1% TDF NPs, n=3 and 24 hour 0.5% TDF NPs, n=4) had no detectable PLV throughout the 4 weeks of follow-up ($p<0.02$; Mantel-Cox log-rank test). Rx groups demonstrated undetectable HIV-1 vDNA in PBMCs by ddPCR.
CONCLUSIONS: TDF NPs in TMS gel offers coitus-independent prevention from vaginal contraction of HIV-1 in a hu-BLT mouse model. This is the first step in assessing long-acting efficacy of TDF NPs + TMS gel combination as a HIV-1 prevention strategy.

110E. Switch from non-nucleoside reverse transcriptase inhibitor plus emtricitabine/tenofovir to elvitegravir/cobicistat/emtricitabine/tenofovir maintains HIV suppression and is well-tolerated. *Douglas Ward, M.D.*[1], David Wheeler, M.D.[2], Aimee Wilkin, M.D., MPH[3], John Rublein, Pharm.D.[4], Will Garner, Ph.D.[5], William Guyer, Pharm.D.[6]; (1)Dupont Circle Physicians Group, Washington, DC; (2)CARE-ID, Annandale, VA; (3)Internal Medicine, Section on Infectious Diseases, Wake Forest University School of Medicine, Winston Salem, NC; (4)Gilead Sciences, Inc., Durham, NC; (5)Biostatistics, Gilead Sciences, Inc., Foster City, CA; (6)Medical Affairs, Gilead Sciences, Inc., Foster City, CA

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111. Safety and tolerability of Stribild® in an HIV-infected population in the Southeastern United States. Caroline Derrick, Pharm.D.[1], Celeste Caulder, Pharm.D.[1], E. Kelly Hester, Pharm.D., BCPS, AAHIVP[2], Tyler Wagner, Pharm.D. Candidate[3], *P. Brandon Bookstaver, Pharm.D., BCPS (AQ-ID), AAHIVP*[4]; (1)South Carolina College of Pharmacy, University of South Carolina, Columbia, SC; (2)Auburn University Harrison School of Pharmacy, Auburn, AL; (3)University of South Carolina Honors College, Columbia, SC; (4)Department of Clinical Pharmacy & Outcomes Sciences, South Carolina College of Pharmacy, University of South Carolina, Columbia, SC
PURPOSE: Stribild® (elvitegravir/cobicistat/emtricitabine/tenofovir) is the only once-daily integrase inhibitor-based combination product available for the maintenance of HIV. Given the limited post-marketing safety data, we evaluated the prevalence of elevated serum creatinine (SCr), treatment-related adverse events, and discontinuation rates in an HIV-infected population receiving Stribild® in the Southeastern United States.
METHODS: This retrospective, pharmacoepidemiologic study evaluated HIV-infected patients receiving Stribild® therapy during an 18-month study period in two clinics in the Southeast (South Carolina and Alabama). Adult patients greater than 18 years of age with documented baseline and follow-up SCr values were included. Patient demographics, virologic outcomes, patient reported adverse events and pertinent laboratory data were collected. Study endpoints included: reason for Stribild® initiation, median change in SCr, incidence and type of treatment-related adverse events including acute kidney injury (AKI) defined by RIFLE criteria, and discontinuation rate. Factors associated with significant increases in SCr were assessed with regression analysis.
RESULTS: A total of 167 patients were prescribed Stribild® with 149 included for analysis. Patients were primarily African-American (110, 74%) males (97, 65%) with a median age of 39 (19–75). Stribild® was initiated for simplification of therapy in 32% of patients, followed by those that were treatment naïve (28%) or those who experienced adverse events on prior therapies (22%). Ninety-seven patients had any increase in SCr (65%), of which, 33 patients had an increase of at least 0.3 mg/dL (22%) and 8 patients had an increase of at least 0.5 mg/dL (5%), classified as AKI. Six patients (3.6%) discontinued therapy: four due to treatment-related adverse events, including one secondary to AKI; one due to a treatment failure with documented resistance; and one due to patient-reported difficulty.
CONCLUSION: Analysis suggests patients tolerate Stribild® with mild treatment-related adverse events, including AKI, and low discontinuation rates.

Infectious Diseases

112. Impact of antibiotic choice on pneumonia readmission rates. *Alice Hemenway, Pharm.D.*[1], Michael Naretta, M.S.[2]; (1) Department of Pharmacy Practice, UIC College of Pharmacy/ Rockford Memorial Hospital, Rockford, IL; (2)Michigan State University
PURPOSE: Studies show that certain patient variables are associated with a higher risk of being readmitted within 30 days of an index admission for pneumonia. However, there are limited studies addressing if choice of antibiotic affects readmission. The purpose of this study was to determine if the choice of antibiotic affects 30 day readmission following an index admission for pneumonia.
METHODS: This was a retrospective cohort study conducted between May 1, 2013 and March 31, 2014 at a 396 bed community hospital. Patients ≥18 who were admitted for pneumonia (determined by ICD-9 codes) were included. Patients were excluded if they died during the index admission, were transferred to another hospital, or were discharged with hospice. Known patient factors for readmission were collected. Empiric antibiotic choices (started within 24 hours of admission and lasting ≤ 3 days), antibiotics used for treatment (≥4 days), and a combination of both were evaluated. Readmission within 30 days and the reason for readmission were recorded. Linear regression analysis was performed to determine correlation between antibiotic choice and readmission rates while adjusting for known risk factors for readmission.
RESULTS: A total of 271 subjects were included. Readmission within 30 days occurred in 51 subjects (18.8%) of which 11 subjects presented with recurrent pneumonia. Empiric tobramycin

was associated with a 45.4% increase in risk of 30 day readmission for any cause ($p<0.01$). Treatment with vancomycin was associated with a 7.6% decrease in risk of readmission for recurrent pneumonia ($p<0.05$).
CONCLUSION: After controlling for patient factors associated with readmission, most antibiotics were not associated with readmission rates. However, two were associated with either an increase or decrease in risk of readmission. Further research is needed to evaluate causality for each of these antibiotics.

113. Utilization of a clinical bedside scoring system (ATLAS) to determine treatment regimens in patients with Clostridium difficile-associated diarrhea. *Jonathan Cho, Pharm.D.*, Rajendra Sharma, M.D., John Armitstead, M.S., RPh, FASHP, Sandy Estrada, Pharm.D., BCPS, AQ-ID; Lee Memorial Health System, Fort Myers & Cape Coral, FL
PURPOSE: New literature has validated a scoring system (ATLAS) using 5 clinical and laboratory parameters consisting of **A**ge, **T**reatment with systemic antibiotics for greater than 1 day, **L**eukocyte count, **A**lbumin, and **S**erum creatinine to help stratify patients with *Clostridium difficile*-associated diarrhea (CDAD). This study implemented ATLAS and ATLAS based CDAD treatment regimens to patients in order to reduce (i) readmission rates and (ii) length of stay.
METHODS: A total of 409 patients, 55 patients included, were reviewed from 4 community hospitals in Fort Myers and Cape Coral, FL. The data collected consisted of length of stay, history of CDAD, allergies, the 5 ATLAS laboratory parameters, and whether or not the patient was readmitted for CDAD within 30 and 90 days. Fisher's exact test was used to compare readmission data and Mann–Whitney *U* test was used to compare length of stay between the Pre-ATLAS and ATLAS based groups.
RESULTS: ATLAS based group showed lower 30 day readmission rates compared to Pre-ATLAS group (3.6% vs 14.7%, $p=0.0342$) and lower 90 day readmission rates (2.6% vs 22.5%, $p=0.0046$). The absolute risk reduction was 11.1% and 19.9% with number needed to treat of 10 and 6 respectively for 30 and 90 day readmission rate data. The median length of stay for ATLAS-based was lower than Pre-ATLAS (5 days vs 8 days, $p=0.0006$). The median length of stay from *Clostridium difficile* positive PCR to discharge was lower for ATLAS-based group (4 days vs 7 days, $p=0.0035$).
CONCLUSION: This study shows that an objective scoring system such as ATLAS shows statistical significance in reducing readmission rates and length of stay. This has a potential role in pharmacy practice as well as pharmacists now have the opportunity to calculate a patient's ATLAS score and recommend the optimal therapy for CDAD based on ATLAS scoring.

114. Beta-lactam monotherapy versus beta-lactam plus an aminoglycoside or ciprofloxacin in sepsis. *Mary Lenefsky, Pharm.D.*[1], Bryan D. Lizza, Pharm.D., BCPS[1], Erik Rachwalski, Pharm.D.[1], John S. Esterly, Pharm.D.[2]; (1)Department of Pharmacy, Northwestern Memorial Hospital, Chicago, IL; (2) Chicago State University College of Pharmacy, Chicago, IL
PURPOSE: Mortality from severe sepsis/septic shock approaches 25%. Despite a lack of clinical benefit in a recent meta-analysis, combination therapy with a beta-lactam and aminoglycoside or ciprofloxacin is often employed to improve survival. However, overexposure of antibiotics can increase adverse effects, hospital costs, and risk for superinfection. The objective of this study was to determine whether combination therapy in critically ill adults with sepsis/septic shock improves in-hospital survival.
METHODS: This was a retrospective cohort study performed at Northwestern Memorial Hospital from January to December of 2013. Patients with ICD-9 codes for sepsis and/or septic shock admitted to an intensive care unit (ICU) within 24 hours of diagnosis and one or more positive blood cultures for a gram negative pathogen were included. Patients were excluded if they were not inpatient at least 48 hours or did not meet guideline definitions for sepsis. Baseline demographics, clinical laboratory values, and microbiology data were recorded. Combination therapy was defined as administration of a beta-lactam with either an aminoglycoside or ciprofloxacin within 48 hours of diagnosis. The primary endpoint was in-hospital mortality. Secondary endpoints included vasopressor use, steroids, length of mechanical ventilation, and ICU length of stay. Continuous variables were analyzed using Student's *t*-test and categorical variables were evaluated using the Chi-square or Fisher's Exact test as appropriate.
RESULTS: 149 patient charts were reviewed, with 81 patient encounters included for analysis. 47 patients received double coverage, and 34 patients received single coverage. There were no significant differences at baseline between groups. In-hospital mortality did not differ significantly between groups ($p=0.51$). Days of mechanical ventilation, use of vasopressors or steroids and ICU length of stay were not significantly different between groups.
CONCLUSIONS: Combination therapy did not appear to impact the rate of in-hospital mortality. A larger sample size is needed to confirm our findings.

115. The impact of pharmacy-based immunization regulations on influenza vaccination rates. *Kevin McConeghy, Pharm.D.*[1], Coady Wing, Ph.D.[2]; (1)Department of Pharmacy Practice, University of Illinois at Chicago College of Pharmacy, Chicago, IL; (2) Department of Health Policy and Administration, University of Illinois at Chicago School of Public Health, Chicago, IL
PURPOSE: From the 1990s through 2000s, states have changed pharmacist occupational regulations to allow provision of vaccinations. Little is known about the effects of these changes. This study estimates the impact of pharmacy-based immunization (PBI) regulations on provider source for seasonal influenza vaccination and vaccination rates in the United States from 1996–2012.
METHODS: The evolution of PBI regulations was tracked in every state from 1996–2012. Changes in influenza vaccination rates were analyzed pre- and post-regulatory period in a quasi-experimental study design. Vaccination rates and provider source were determined from the National Behavioral Risk Factor Surveillance System (BRFSS). The primary outcomes were absolute % change (Δ) in the proportion vaccinated and proportion vaccinated in a physician office. The outcomes were regressed on regulatory changes and other individual covariates (age, gender etc.) in a linear probability model.
RESULTS: From 1996–2012, a total of 5,171,240 respondents were surveyed for the BRFSS. Excluding missing data, 3,866,450 respondents were included for analysis. Regulatory changes allowing PBI did not have a significant impact on the proportion vaccinated (Δ 0.5%, 95% Confidence Interval [CI]: −0.5, 1.5). However, after regulatory changes, certain subgroups such as those <65 years of age (Δ 3.7%, 95% CI: 0.1, 5.6), men (Δ 2.7%, 95% CI: 2, 3.3), those with health insurance (Δ 3.7%, 95% CI: 2.5, 4.9) and employed individuals (Δ 2.1%, 95% CI: 1, 2.5) had significant increases in vaccination rates. After PBI was implemented, there was a decrease in individuals receiving vaccinations in physician offices (Δ −1.7%, 95% CI: −2.7, −0.7).
CONCLUSION: PBI regulations promoting pharmacy-based immunization have had heterogeneous effects on vaccination rates. We observed increased vaccination rates in certain subgroups following changes in regulations (non-elderly, men, insured, employed) however the overall proportion of patients vaccinated did not substantially increase. Additionally, the regulations were associated with a decrease in vaccination receipt in physician offices.

116. Assessment of a vancomycin dosing protocol to achieve goal serum concentrations. *Kelly M. Percival, Pharm.D.*[1], Jena K. Cummins, Pharm.D.[1], Kristine M. Valenti, Pharm.D.[1], Stacy E. Schmittling, Pharm.D., BCPS[1], Scott J. Bergman, Pharm.D., BCPS[2]; (1)Department of Pharmacy, St. John's Hospital, Springfield, IL; (2)Department of Pharmacy Practice, Southern Illinois University Edwardsville School of Pharmacy, Springfield, IL

PURPOSE: The purpose of this study was to assess attainment of serum trough concentration goals after implementation of a pharmacy-managed vancomycin dosing guide.
METHODS: The electronic medical records of 349 inpatients admitted between February–September 2013 who received pharmacy-managed vancomycin dosing were reviewed. The guideline was weight-based dosing starting with 15 mg/kg every 12 hours and decreasing based on renal function. Those with a creatinine clearance (CrCl) below 20 mL/minutes or receiving dialysis were excluded. Patient demographics, serum creatinine (SCr), vancomycin indication, dosing regimen, and first serum trough concentration were collected. Incidence of nephrotoxicity was defined as an increase in SCr by 50%, or >0.5 mg/dL or a decrease by 50% in calculated CrCl from baseline on two consecutive days. The first serum trough concentration was assessed to be at goal based on indication. Analysis was performed to determine where changes in the dosing guide should occur based on CrCl.
RESULTS: The most common indication for vancomycin was pneumonia (42%). The median first serum trough concentration was 14.2 mg/dL. Goal troughs were initially achieved in 28% of patients. Most patients were subtherapeutic (49%) while 22% were supratherapeutic. Nephrotoxicity was identified in 6% of patients with the highest incidence in those having a CrCl 20–29 mL/minutes. Patients with a CrCl of 50–59, 30–39, and 20–29 mL/minutes achieved goal concentrations 35%, 33%, and 22% of the time, respectively.
CONCLUSION: Pharmacy-managed dosing achieved initial goal serum vancomycin concentrations in a minority of patients. Nephrotoxicity was rare but occurred most often in patients with the lowest estimated renal function. Those with CrCl of 20–39 and 50–59 mL/minutes were most frequently subtherapeutic and the dosing was increased in the guide to improve initial serum trough concentrations in these patients.

117. Antibiotic stewardship within the intensive care unit. *Marcus Lockhart, Pharm.D.*[1], Rani Madduri, Pharm.D.[1], Keith Goldstein, M.D.[2], Thom K. Nguyen, Pharm.D.[3], Philip Coco, Pharm.D.[1], Navin Philips, Pharm.D., B.S.[2]; (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: Antimicrobial agents are commonly prescribed medications within the intensive care unit. Antibiotic stewardship programs optimize clinical outcomes and minimize adverse consequences associated with suboptimal utilization of agents. This study was designed to measure the effects of an antibiotic stewardship initiative in the intensive care unit.
METHODS: This was a prospective study of fifty patients who received at least one dose of antibiotic therapy in a twelve bed intensive care unit at a community teaching hospital between February to April 2014. The pharmacotherapy resident made prospective antibiotic therapy recommendations based upon indication, likely pathogens, culture sensitivities and available formulary agents directly to the medical team. The primary outcome was time to de-escalation of antibiotic therapy and secondary outcomes included days of effective therapy and cost savings. Therapy was deemed effective if the empiric agent was appropriate for the site of infection and pathogen-driven therapy match culture and sensitivity reports.
RESULTS: Twenty four patients were enrolled in the study resulting in an average of 3.5 days until de-escalation. The total average antibiotic duration was approximately 13 days, of which 92.7 percent were considered effective antibiotic therapy. Twenty five interventions were made involving a de-escalation of the antibiotic regimen. Sixteen of these interventions were antibiotic de-escalations while nine interventions were discontinuations.
CONCLUSION: This study indicates the benefits of a pharmacist driven antibiotic stewardship program by optimizing antimicrobial utilization and total antibiotic exposure within the intensive care unit.

118. Correlation of cefpodoxime susceptibility with cefazolin and cefuroxime among urinary tract isolates. *David Bookstaver, Pharm.D.*, Christopher Bland, Pharm.D.; Department of Pharmacy, Eisenhower Army Medical Center, Fort Gordon, GA
PURPOSE: In 2014, the Clinical and Laboratory Standards Institute changed the guidelines for urinary tract isolates. They now recommend that cefpodoxime susceptibility can be extrapolated from the cefazolin result instead of cephalothin. The purpose of the study was to determine the accuracy of this correlation and whether cefuroxime was superior as a surrogate marker for cefpodoxime susceptibility.
METHODS: Automated susceptibility testing for cefazolin and cefuroxime was conducted on consecutive urine cultures with a colony count of at least 50,000 organisms via the Microscan© system. Only Escherichia coli, Klebsiella pneumoniae, and Proteus mirabilis isolates were included per the guidelines. Simultaneously, a manual E-test for cefpodoxime was placed on the culture plate, the minimum inhibitory concentration was determined, and susceptibility was based on the FDA-approved breakpoints. The interpretation for cefpodoxime was compared to that of the other 2 agents, and the categorical agreement, very major error, major error, and minor error rates were calculated. Fisher's exact test was used for comparisons.
RESULTS: A total of 284 isolates were assessed, and the susceptibility rate was 94.4% for cefpodoxime. The categorical agreement was 92.2% for cefazolin and was 85.2% for cefuroxime (p=0.01). However, the very major error rates were 63.6% for cefazolin and 18.2% for cefuroxime (p=0.08). Likewise, the major error rate was higher for cefazolin than cefuroxime, 4.4% versus 1.1%, respectively (p=0.03). The minor error rate was significantly lower for cefazolin (1.0%) than cefuroxime (13.2%) (p<0.01).
CONCLUSION: Cefazolin had a higher categorical agreement than cefuroxime. However, it was more likely to inaccurately predict resistance to cefpodoxime. The number of cefpodoxime-resistant isolates was too low to determine which agent was more likely to falsely predict susceptibility.

119. Evaluation of alternative alerts as a tool for antimicrobial stewardship. *Brett Van Rossum, Pharm.D.*; Department of Pharmacy, Froedtert and the Medical College of Wisconsin, Milwaukee, WI
PURPOSE: This study is a single-center, pre- and post-interventional analysis of hospital antibiotic utilization. The primary objective is to identify if alternative alerts built into the electronic medical record at the step of computerized provider order entry can reduce overall hospital prescription rates for two targeted antimicrobials: linezolid and moxifloxacin. The study will also assess provider response to the alerts, hospital costs for targeted agents, and the clinical rationale for prescribing these medications.
METHODS: The study intervention consists of computer-generated alternative alerts which activate upon order entry of the targeted antimicrobials. Data will be collected for all patients treated with linezolid or moxifloxacin during the pre- and post-intervention periods. Chart review was conducted for each patient to identify any clinical rationale for using either of the targeted agents instead of the preferred alternatives.
RESULTS: After alert implementation, the percent of hospitalized patients receiving linezolid decreased from 1.58% to 1.39% (p=0.56). Overall moxifloxacin prescription rates were similar between the two groups (3.65% vs 3.59%, p=1.0), but prescription for respiratory tract infections decreased slightly (19.2% vs 15.8%, p=0.26). A number of patients were treated with preferred alternative regimens as a result of the alerts, demonstrating a cost savings of over $6,000 to the hospital during the study period. A higher percentage of the patients receiving moxifloxacin in the post-intervention group had a clinically-justifiable reason for use of the drug instead of preferred alternatives compared to the baseline group (60% vs 31%, p<0.001). This result was not seen for patients treated with linezolid.
CONCLUSION: There was a non-significant trend toward the reduction of prescription of targeted antimicrobials following alert implementation. Benefits were seen in antimicrobial usage

and cost after implementation. Further studies to determine the optimal use of alternative alerts are warranted.

120. Evaluation of a screening process for the early detection of sepsis: a pilot program. *Jonathan D. Edwards, Pharm.D*, Nicholas Massie, Pharm.D., Jonathan Spry, Pharm.D.; Department of Pharmacy, Huntsville Hospital, Huntsville, AL

PURPOSE: Evidence indicates that prompt identification of sepsis and initiation of early goal-directed therapy significantly decreases mortality, improves patient outcomes, and provides potential cost-containment. The Stop Sepsis initiative at Huntsville Hospital is a multidisciplinary effort designed to promote sepsis identification and treatment. The primary objective of this initiative is to implement a systematic method for the early identification and treatment of septic inpatients in an effort to decrease our sepsis-related mortality rate. Secondary endpoints include measurement of sepsis bundle compliance, thirty-day readmissions, lengths of stay, and average hospital costs.

METHODS: A retrospective review of suspected septic adult inpatients was conducted for individuals admitted to three pilot units. Baseline data was compiled from July to December 2012 and compared to post-intervention data from July to December 2013. Sepsis bundle compliance was measured from January to March 2013 and January 2014 to March 2014. Patients <18 years of age and pregnant females were excluded. Data collection included laboratory, medication, and fiscal parameters.

RESULTS: A total of 9524 patients were screened on the pilot units in which 190 patients screened positive for suspected sepsis. In comparing baseline to post-intervention data, the primary endpoint of mortality decreased in two of the three pilot units. In addition, all secondary endpoints improved compared to baseline figures. Utilization of the institutional sepsis order set increased from 0% to an average of 38%. Thirty-day readmission rates decreased in two of the three pilot units. Average length of stay and average hospital cost decreased from 13.9 to 11.4 days and $23,776.10 to $16,656.52, respectively.

CONCLUSION: The implementation of early detection sepsis pilot program resulted in decreased mortality, thirty-day readmissions, average length of stay, and average hospital cost over a 6-month period. Through the formation of an interdisciplinary taskforce, our institution observed success in improving patient care, sepsis management strategies, and fiscal outcomes.

121. Missed opportunities for congenital syphilis prevention in Baltimore City. *Stephanie Atueyi, Pharm.D., MPH*[1], Glen Olthoff, MHA, M.A.[2], Evelyn Awah, Pharm.D., BCPS[3]; (1)College of Public Health and Health Profession, University of Florida; (2)STD/HIV Prevention Program, Baltimore City Health Department, Baltimore, MD; (3)Department of Pharmacy, Johns Hopkins Hospital, Baltimore, MD

PURPOSE: Maryland has one of the highest rates of congenital syphilis nationally. In 2012, the city of Baltimore accounted for approximately 50% of new congenital syphilis cases in Maryland. These high rates prompted the Baltimore City Health Department (BCHD) to investigate potential missed opportunities for prevention.

METHODS: A retrospective review of congenital syphilis cases reported to the BCHD from 2009 to 2012 was completed to evaluate any missed opportunities for prevention. Maternal and infant information were collected. In women who received prenatal care (PNC), a missed opportunity was considered if there was lack of syphilis screening during pregnancy; delayed or inappropriate treatment for syphilis during pregnancy; or no treatment for syphilis during pregnancy.

RESULTS: From January 1st, 2009 to December 31st, 2012, 31 newborns reported to the BCHD met the CDC surveillance case definition for congenital syphilis. The congenital syphilis case rate from 2009 to 2012 in Baltimore city was 85.1 per 100,000 live births. Mothers who did not receive PNC (n=3) were excluded. For mothers who received PNC, 96% (n=27) were screened for syphilis during their pregnancy. For mothers that received treatment, all received treatment with an appropriate penicillin regimen. However 17% (n=5) received delayed treatment, and 14% (n=4) did not receive treatment during pregnancy. For the mothers who received appropriate therapy, the most reported cause of mother-to-child transmission was reinfection or relapse.

CONCLUSIONS: Previous studies reported that a common cause for congenital syphilis was lack of prenatal screening of syphilis in pregnancy, however this study demonstrated that most women who received PNC, also received syphilis screening. Missed opportunities that were observed included late therapy and missed therapy, however a majority did receive appropriate therapy with a penicillin regimen. The most reported cause of transmission was relapse or reinfection; therefore, interventions should be targeted to reduce relapse and reinfections.

122E. Role of Rta3 in fluconazole resistance in *Candida albicans*. *Sarah G. Whaley, Pharm.D.*, Katherine S. Barker, Ph.D., P. David Rogers, Pharm.D., Ph.D.; University of Tennessee College of Pharmacy, Memphis, TN

Presented at the 24th European Congress of Clinical Microbiology and Infectious Diseases in Barcelona, Spain, May 10–13 2014.

123. Antibiotic treatment duration in male veterans with urinary tract infections. Michael Lorenz, Pharm.D.[1], *Patrick Finnegan, Pharm.D., BCPS*[2]; (1)Department of Pharmacy, Saint Louis VA Healthcare System, Saint Louis, MO; (2)John Cochran Division, VA St. Louis Health Care System, St. Louis, MO

PURPOSE: To determine the most appropriate antibiotic treatment duration in males with urinary tract infections (UTI).

METHODS: Retrospective review spanning 1 Jan 2012–30 June 2013 including 150 symptomatic male patients between 18 and 90 years of age with microbiologically documented bacteriuria greater than 104 cfu/mL, >5 white blood cells/mm3 on urinalysis, and known antibiotic treatment duration. Patients with an indwelling urinary catheter, those receiving moxifloxacin or nitrofurantoin with a creatinine clearance <60 mL/minutes, symptoms suggesting pyelonephritis, fungal UTI, past medical history of prostatitis, isolation of bacterial isolate resistant to initial antibiotic, immunocompromised, presence of another infection requiring antibiotics, or end-stage renal disease requiring hemodialysis were excluded. Patients were separated based on total antibiotic treatment course with durations of 4–7 days compared with 10–14 days. Treatment durations were compared through relapse and readmission/admission rates within 30 days after completion of therapy and treatment failure.

RESULTS: A statistically significant difference was not found between treatment groups with regards to relapse rates, treatment failure, or readmission rates. In addition, risk factors for UTIs such as benign prostate hyperplasia, diabetes mellitus, and previous UTIs did not have an effect on relapse or treatment failure rates.

CONCLUSIONS: An antibiotic treatment duration of 4–7 days did not increase the risk of relapse or treatment failure rates among male patients with a confirmed symptomatic UTI when compared to a treatment duration of 10–14 days.

124E. Regional and seasonal variations in *Clostridium difficile* infections in United States hospitals, 2001 to 2010. *Kelly Reveles, Pharm.D., Ph.D.*, Grace Lee, Pharm.D., Natalie Boyd, M.S., Pharm.D., Christopher Frei, Pharm.D., M.S.; College of Pharmacy, The University of Texas at Austin, San Antonio, TX

Presented at the International Society for Pharmacoeconomics and Outcomes Research Annual Meeting, Montreal, Canada, June 4, 2014.

125E. The rise of hospitalizations due to *Staphylococcus aureus* skin and soft tissue infections among United States Children From 2001 to 2010. Grace C. Lee, Pharm.D, BCPS, Kelly Reveles, Pharm.D., Ph.D., *Natalie Boyd, Pharm.D., M.S.*, Christopher

Frei, Pharm.D., M.S.; College of Pharmacy, The University of Texas at Austin, San Antonio, TX

Presented at the International Society for Pharmacoeconomics and Outcomes Research, Montreal, QC, Canada, June 4, 2014.

126. Critically-ill recipients of weight-based fluconazole meeting drug-induced liver injury network (DILIN) criteria. *Merlyn L. Joseph, Pharm.D.*, Russell T. Attridge, Pharm.D., M.Sc., BCPS, Jason M. Cota, Pharm.D., M.Sc., Cheryl K. Horlen, Pharm.D., BCPS, Kathleen A. Lusk, Pharm.D., Rebecca L. Brady, Pharm.D., Rebecca L. Attridge, Pharm.D., M.Sc, BCPS; University of the Incarnate Word Feik School of Pharmacy, San Antonio, TX

PURPOSE: Fluconazole-associated liver injury is estimated to occur in less than 10% of patients; however, the effect of weight-based fluconazole dosing on liver injury has not been assessed. We evaluated how often patients met Drug-Induced Liver Injury Network (DILIN) criteria when receiving fluconazole daily doses of <6 mg/kg versus ≥6 mg/kg.

METHODS: This multi-center, retrospective cohort study was performed in critically-ill fluconazole recipients hospitalized from January 2009 to December 2012. We included patients who received ≥3 fluconazole doses with ≥1 dose administered in the intensive care unit. Patients were excluded if pregnant, presented with acetaminophen toxicity, administered fluconazole within 1 week of liver transplantation, or missed >1 fluconazole dose during therapy. We compared liver function tests (LFTs) upon fluconazole initiation to peak LFTs within 2 weeks after fluconazole discontinuation using DILIN criteria. Fisher's exact test was used to detect differences in the primary outcome of patients meeting DILIN criteria by weight-based dosing (<6 mg/kg vs ≥6 mg/kg), as well as in subgroups of patients with kidney dysfunction, liver disease, septic shock, and receiving a loading dose.

RESULTS: Two-hundred and forty-eight of 767 patients met inclusion criteria; 90% had a documented fungal infection or received empiric therapy for suspected invasive candidiasis. Of 199 patients receiving <6 mg/kg of fluconazole, 55% met DILIN criteria versus 46.9% of the 49 patients in the ≥6 mg/kg cohort (p=0.20). Only 14.5% of patients who met DILIN criteria also met the definition for hepatocellular damage. In analysis of subgroups, 77.3% of patients with cirrhosis and 76.3% with septic shock met DILIN criteria ($p < 0.001$ for both compared to those without these conditions).

CONCLUSIONS: Weight-based dosing did not affect the number of critically-ill fluconazole recipients who met DILIN criteria. However, DILIN criteria may overestimate the incidence of fluconazole-associated liver injury in critically-ill patients.

127. Real-world outcomes of chronic hepatitis C virus (HCV) genotype 1-infected veterans treated with boceprevir- or telaprevir-based therapy. *Kruti Patel, Pharm.D.*[1], Helen Yee, Pharm.D.[2], Hui Shen, B.S.[3], Joshua Chua, Pharm.D.[1], Alexander Monto, M.D.[2]; (1)Department of Veterans Affairs Medical Center, San Francisco, CA; (2)Department of Veterans Affairs Hepatitis C Resource Center Program, Washington, DC; (3)University of California, San Francisco, CA

PURPOSE: In clinical trials of chronic HCV genotype 1-infected patients, 63–75% of treatment-naïve patients and 33–88% of peginterferon-ribavirin relapsers/non-responders were successfully cured with boceprevir- or telaprevir-based therapy. This study evaluated outcomes of boceprevir- or telaprevir- based therapy including efficacy, safety, tolerability, and discontinuation rates in Veterans with HCV genotype 1 infection at the San Francisco VA Medical Center (SFVAMC), and compared these results with published clinical trials.

METHODS: A retrospective chart review of 47 Veterans with chronic HCV genotype 1 infection who received boceprevir- or telaprevir- based therapy at SFVAMC between July 1, 2011 and September 30, 2013 was conducted. Patients lost to follow up were excluded. The patient's treatment response, incidence of adverse events and discontinuation rates were collected.

RESULTS: Sustained virologic response (SVR), defined as undetectable HCV RNA at least 24 weeks after treatment completion, was achieved in 33% of the overall cohort. SVR occurred in 24% with boceprevir-based therapy and 43% with telaprevir-based therapy (p=0.19). Treatment was discontinued based on futility rules in 29% and adverse effects in 14–19%. Anemia, neutropenia and thrombocytopenia occurred in 48–55% during treatment.

CONCLUSION: Chronic HCV genotype 1-infected patients who received boceprevir- or telaprevir-based treatment at SFVAMC achieved lower SVR rates along with higher hematologic adverse effects and discontinuation rates when compared to published clinical trials. The Veteran population at SFVAMC appears more difficult-to-treat, possibly due to older age, more severe liver disease, a higher incidence of psychiatric comorbidities and poorer tolerability to treatment.

128E. Evaluation of an extended-infusion piperacillin-tazobactam protocol at a University Hospital. *Robert Sbertoli, Pharm.D.*, Emily Welch, Pharm.D., BCPS; Department of Pharmacy, Saint Louis University Hospital, St Louis, MO

Presented at The St. Louis Area Resident Research Conference at St. Louis College of Pharmacy, St. Louis, MO, May 22, 2014.

Medication Safety

129. Evaluating the quality of medical mobile apps that target drug-related problems. John Loy, B.Sc. (Pharmacy), *Kevin Yap, Ph.D., SRPharmS*; Department of Pharmacy, Faculty of Science, National University of Singapore, Singapore

PURPOSE: Drug-related problems (DRPs) pose a significant burden to healthcare, but can potentially be prevented through the use of mobile apps in clinical practices. A quality assessment tool was developed in this study and used to evaluate medical apps that target DRPs on the Apple and Android platforms.

METHODS: The tool assessed the apps based on overall quality, which consisted of sections on content appropriateness, reliability, user-friendliness and privacy. The top 100 free and paid apps from both the Apple and Android platforms were screened (N=400) and classified according to 5 features (monitoring, medication interaction checker, dose calculator, medication information and medication record). Descriptive statistics and the Mann-Whitney U test were used for statistical analysis of the quality scores.

RESULTS: A total of 59 apps (14.8%) were identified to target DRPs. Generally, paid apps scored higher than free apps based on the percentage overall scores for both platforms (Apple median scores, 58.1% vs 55.8% respectively; Android median scores, 59.4% vs 59.1% respectively). Free and paid apps scored only a quarter of the total reliability score, reflecting poor reliability (median reliability scores, 25.0% each; interquartile range, 29.2% vs 18.8% respectively). Paid apps were more user-friendly than free apps, especially on the Android platform (median usability scores, 81.9% vs 63.6% respectively, p=0.012). Conversely, free apps considered privacy protection to a greater extent than paid apps for the Android platform (median privacy scores, 50.0% vs 25.0% respectively, p=0.012).

CONCLUSION: A quality assessment tool for evaluating medical apps that target DRPs was developed. In particular, the overall quality of apps with monitoring, medication interaction checker, dose calculator, medication information and medication record features were evaluated. The quality of other newly developed medical apps could potentially be evaluated using this tool in relation to their content appropriateness, reliability, user-friendliness and privacy.

130. Incidence of medication dispensing discrepancies associated with electronic medication prescribing in a university hospital internal medicine clinic. *Katharine McCarthy, Pharm.D.*; Outpatient Pharmacy Department, University of Rochester Medical Center, Rochester, NY

PURPOSE: Integrated electronic medical records have facilitated practices that minimize transcribing errors in the medication ordering process; however the problem of incomplete or inaccurate medication lists remains. These discrepancies can result in therapeutic misadventures when medications are omitted or continued contrary to the intent of the prescriber. The primary objective of this study is to determine the incidence of medication dispensing discrepancies of electronically prescribed medications compared to the pharmacy patient medication list at an academic medical center.
METHODS: This retrospective analysis included all medications electronically prescribed or discontinued via the electronic medical record (EMR) by a University of Rochester Medical Center (URMC) Strong Internal Medicine (SIM) provider and sent to select URMC outpatient pharmacies between 1/1/2013 and 5/31/2013. The pharmacy dispensing system's (ScriptPro®) daily prescription fill reports were reviewed from 1/1/2013 through 12/31/2013 to allow for a minimum 6 month refill period, and matched to the electronic prescription by patient last name, date of birth, and medication name. The frequency of medications dispensed after provider discontinuation in the EMR, as well as medications e-prescribed but never dispensed by the pharmacy was assessed. Medication class and discontinuation reason was used to further characterize discrepancies. Data was analyzed with descriptive statistics.
RESULTS: Overall, 6003 e-prescriptions were sent by 184 SIM providers to URMC outpatient pharmacies for 1656 internal medicine patients. Of the identified e-prescriptions sent to the Strong Outpatient Pharmacy and URMC Employee Pharmacy, 34.6% and 13.6%, respectively, were not dispensed. Of 10,477 prescription fills between 1/1/13–12/31/13, 32.2–49.7% were dispensed after provider discontinuation.
CONCLUSION: Significant medication discrepancies exist between EMRs and outpatient pharmacy dispensing records. More effective means of comprehensive communication will improve medication list accuracy, provider awareness of patient non-adherence, and ultimately reduce preventable medication errors through increased awareness of medication history.

131. Risky research: perceptions and practices to improve safety in an investigational drug service. Jennifer Cruz, Pharm.D., BCPS[1], *Jamie Brown, Pharm.D., BCPS*[2]; (1)Geriatric Research, Education, and Clinical Center, Durham VA Medical Center, Durham, NC; (2)Pharmacy Service, Durham VA Medical Center, Durham, NC
PURPOSE: Rigorous practices for the safe and efficient dispensing of investigational drugs are not standardized. The objective of this investigation was to identify error-prevention processes utilized in the provision of investigational drug services (IDS) within Veteran Affairs (VA) Medical Centers and to characterize pharmacists' perceptions about the safety risks posed by investigational drugs.
METHODS: An electronic questionnaire was distributed via email to a nationwide audience of IDS pharmacists. Multiple facets were examined including demographics, perceptions of medication safety, and standard processes used to support investigational drug protocols related to storage, security, ordering, dispensing, documentation, and error reporting.
RESULTS: Twenty-one respondents (32.8% response rate) from the Northeast, Midwest, South, West, and Non-contiguous United States participated. The mean number of pharmacist full-time equivalents (FTEs) dedicated to the IDS was 0.77 per site with 0.2 technician FTEs. The mean number of active protocols was 22, and the majority of sites supported both inpatient and outpatient studies. A total of 80.9% of respondents indicated some level of concern for safety risks. A variety of concerns related to the packaging of medications were expressed, most notably lack of product differentiation, expiration dating, barcodes, and choice of font size or color. Regarding medication safety practices, the majority of sites had specific procedures in place for storing and securing drug supply, temperature monitoring, and prescription labeling. Repackaging bulk items and use of proactive error-identification strategies were less common. Sixty-seven percent of respondents reported that an independent double check was not routinely performed.
CONCLUSION: This survey demonstrates that medication safety concerns exist among pharmacists in an investigational drug service; however, a variety of measures have been employed to improve medication safety practices. "Best Practices" for the safe dispensing of investigational medications should be developed in order to standardize these error-prevention strategies.

132. Acid suppression therapy in the hospital setting: an evaluation of the appropriateness of stress ulcer prophylaxis. *Lindsay Saum, Pharm.D., BCPS, CGP*[1], Karen Samaan, Pharm.D., BCNSP[2]; (1) Department of Pharmacy Practice, Butler University, Indianapolis, IN; (2)St. Vincent Hospital Indianapolis, Indianapolis, IN
PURPOSE: Prevention of stress ulcer prophylaxis (SUP) through gastric acid suppressive therapy (AST) is common practice in the hospital setting. Despite published guidelines and recommendations describing indications for SUP, AST with proton pump inhibitors (PPIs) and histamine 2 receptor antagonists (H2RAs) is often prescribed inappropriately and is inadvertently continued at discharge. AST has been associated with infectious complications and adverse effects which may complicate disease state management and require need for medical management. We evaluated the utilization of AST and appropriateness of SUP prescribing at a community teaching hospital.
METHODS: Utilizing our electronic medical records, we prospectively evaluated the use of AST in our intensive care units (ICUs) and on our internal medicine units for 3 months. Data collected included AST medication, SUP indication, home AST, and whether AST was continued at discharge.
RESULTS: 445 patients were included in our evaluation and 56% had AST listed as a home medication. SUP accounted for 88% (n=391) of AST prescriptions. PPIs were prescribed more often than H2RAs (61 vs 39%), and IV administration was slightly preferred over oral (56 vs 44%). SUP was inappropriate in 61% of the prescriptions (n=239) and was more likely to occur outside of the ICUs (88% vs 17%). When groups were adjusted for home AST therapy (n=176), inappropriate rates were similar (86 vs 20%). 26% of SUP prescriptions were inappropriately continued at discharge.
CONCLUSION: Inappropriate prescribing of AST for SUP, particularly outside of the ICUs, is common. Of concern is the continuation of AST and the infectious and metabolic risks associated with AST. Our findings suggest a process improvement plan is needed to help the clinician with appropriate SUP prescribing. In order to avoid inadvertent continuation of therapy at discharge, this plan will need to include facilitation of appropriate medication reconciliation at time of transfer and discharge.

133. Association between topiramate use and serum bicarbonate levels in a veteran population. Anna Sciegienka, Pharm.D., Tami Argo, M.S., B.A., Pharm.D., BCPP, *Matthew Cantrell, Pharm.D., BCPS*, Bruce Alexander, Pharm.D., B.S.; Iowa City Veterans Affairs Health Care System, Iowa City, IA
PURPOSE: Topiramate has been associated with metabolic acidosis secondary to decreased serum bicarbonate. Product labeling recommends serum bicarbonate monitoring at baseline and periodically thereafter. The objective of this study was to assess changes in serum bicarbonate within the first year of topiramate use in an outpatient veteran population.
METHODS: This was a single center retrospective cohort study conducted at the Iowa City Veterans Affairs Health Care System. Criteria for inclusion required a minimum of one outpatient topiramate prescription between October 1, 1999 and August 31, 2012 and at least one serum bicarbonate level within 12 months prior to topiramate initiation. Patients with topiramate nonadherence, concurrent use of sodium bicarbonate or oral carbonic anhydrase inhibitors, and serum bicarbonate values obtained during inpatient hospitalizations were excluded. Change in bicarbonate was evaluated using a paired t-test. Decreases in bicarbonate of

≥5 mEq/L, values <20 mEq/L, days to lowest value, and correlation between adverse drug reactions (ADR) and topiramate discontinuation were evaluated.
RESULTS: Of 546 patients reviewed, 350 met inclusion criteria. There was a statistically significant decrease of 2.7 mEq/L in bicarbonate post initiation. Only one patient had a bicarbonate value <17 mEq/L. There was no association between bicarbonate decrease ≥5 mEq/L and ADR.
CONCLUSION: A statistically significant reduction in bicarbonate levels occurred with topiramate. However, ADR did not correlate with bicarbonate levels <17 mEq/L or a decrease ≥5 mEq/L. Serum bicarbonate levels should only be monitored before initiation of topiramate and in patients presenting with symptoms suggestive of acidosis.

134. Determining if substances are properly disposed of safely and effectively (DISPOSE). *Jaclyn Cole, Pharm.D.*, Melissa Ruble, Pharm.D., Rachel Franks, Pharm.D., Angela Hill, Pharm.D.; Pharmacotherapeutics and Clinical Research Department, University of South Florida College of Pharmacy, Tampa, FL
PURPOSE: This study described the association between level of education and public perception regarding proper medication disposal techniques and resources. The association between age and number of prescriptions filled by study participants at the time of enrollment and public perception of proper medication disposal and resources was also assessed.
METHODS: Twenty-eight participants were surveyed during Florida's Legislative Health Fair in Tallahassee in March 2014. Participant demographics included level of education, age, ethnicity, gender, and number of current prescriptions. The majority of participants were males (61% vs 39%) with 29% between the ages of 45–54. Proper disposal was defined as correctly disposing of medication(s) in trash or dropping medication(s) off with a healthcare provider or at the local police station. Fisher's exact test was used to assess the association between correct perception/resources and level of education, age, and number of prescriptions.
RESULTS: Participant level of education was determined to be 14% Doctoral degree, 7% Master's Degree, 54% Bachelor's degree, 18% Associates degree, and 7% high school degree. Median number of prescriptions at the time of the survey was two. There did not appear to be an association between level of education and proper disposal (p=0.78). In addition to level of education, no association was found between participant age or number of prescriptions and proper disposal (p=0.79, p=0.18). A significant correlation was not found between level of education, age, or number of prescriptions and knowledge of pharmacist involvement (p=0.78, p=0.57, p=0.25).
CONCLUSION: Level of education does not appear to influence consumer perception of safe and effective medication disposal or pharmacist involvement in the disposal of medications. Further prospective studies are needed to assess the necessity for public education for all populations regardless of education level on proper disposal techniques and pharmacist involvement.

135. Use of an interactive role-play activity to educate teens about substance abuse. *Helen C. Pervanas, Pharm.D.*[1], Sing Chhay, Pharm.D.[2], Jennifer A. Kelleher, B.A.[3]; (1)Pharmacy Practice Department, MCPHS University, Manchester, NH; (2)MCPHS University, Norcross, GA; (3)MCPHS University, Manchester, NH
PURPOSE: Substance abuse among teens and adolescents is a major concern. Educating teens about the associated dangers is necessary to avoid the potential for misuse or abuse. Interactive activities may be an effective teaching approach in educating this population.
METHODS: Student pharmacists created an interactive activity to educate teens and adolescents about substance abuse at a local Boys and Girls Club. Student pharmacists' video recorded a role play skit depicting a scenario that involved prescription and alcohol abuse leading to an overdose. This video recording was played for the participants and was followed by a discussion and similar role play activities in which the participants were involved. Participants were asked to complete an 8 question pre and post survey. Qualitative coding and analysis was performed on the data. This project was approved by the MCPHS University Institutional Review Board.
RESULTS: A total of 24 students participated in the activity. A majority of the participants were female (54%) and between the ages of 11–12 (52%). Younger participants ages 11–13 reported that alcohol (56%) was most abused by teens versus the 14–17 years olds that reported prescription drug were most abused (66%). When asked about whether it was safe to take prescription drugs that were not prescribed, teens disagreed (18%) or strongly disagreed (73%) with the statement prior to the activity versus (96%) that strongly disagreed following the activity. When asked about the dangers associated with prescription drugs participants reported death (56%) and getting sick (42%).
CONCLUSION: The use of an interactive role play skit activity allowed for teens to recognize the dangers associated with prescription drug abuse. Teens were able to identify that non prescribed prescription drugs if taken can lead to serious consequences. Older teens had a greater knowledge of prescription drugs versus younger adolescents.

136. Medication discrepancies identified in home health patients. *Amy Myers, Pharm.D., BCPS*[1], Jennifer Hale, Pharm.D.[2], Erin Neal, Pharm.D., BCPS[2], Kelsii Gerber, M.S.[3], Kelly Wright, M.S.[3], Amanda Mixon, M.D., M.S., MSPH[4]; (1)Department of Pharmacy, Vanderbilt Medical Center, Nashville, TN; (2) Vanderbilt University Medical Center, Nashville, TN; (3) Vanderbilt University; (4)Division of General Internal Medicine and Public Health, Vanderbilt University
PURPOSE: To determine the frequency, type, and reason for medication discrepancies in patients receiving home healthcare following hospital discharge.
METHODS: We completed a retrospective, observational study of adults discharged from a quaternary academic medical center (AMC) who received home healthcare from one home health agency affiliated with the AMC within 7 days of hospital discharge. Medication discrepancies were identified by comparing the discharge medication list to what the patient was taking at the first home health visit. Patient demographics and a 3 item brief health literacy screen were collected from the electronic medical record. Outcomes were the number of medication discrepancies per patient (primary), as well as the type, reason, and status of the discrepancy at the first outpatient clinic visit. We utilized Poisson regression to determine the association of demographic and health literacy variables with the types medication discrepancies, reported as incidence rate ratio (IRR).
RESULTS: Of the seventy patients who met inclusion criteria the mean age was 64.9 years and 44 (63%) were female. Almost all (66, 94%) had at least one medication discrepancy, and nearly half were omissions (163, 46%). The most frequent reason was that a medication was on the hospital admission medication list but not addressed thereafter. Most discrepancies (85%) were not addressed in the first outpatient clinic visit. Increased age was significantly associated with decreases in the rate of medication discrepancies overall and for discrepancies of addition (IRR = 0.99 and 0.98, respectively).
CONCLUSIONS: Most patients receiving home health services after hospitalization had medication discrepancies.

137. A multicenter evaluation of a trigger alert tool to prevent adverse drug events in the intensive care unit and general medical ward populations. *John DiPoto, Pharm.D.*[1], Mitchell S. Buckley, Pharm.D., FASHP, FCCM, BCPS[1], Sandra L. Kane-Gill, Pharm.D., M.Sc., FCCM, FCCP[2]; (1)Department of Pharmacy, Banner Good Samaritan Medical Center, Phoenix, AZ; (2)University of Pittsburgh School of Pharmacy, Pittsburgh, PA
PURPOSE: Automated medication monitoring systems using alerts based on logic-based rules have been used to identify and prevent adverse drug events (ADE). The purpose of this study

was to evaluate the rates of pharmacist intervention in response to medication-related trigger tool alerts in intensive care unit (ICU) and non-ICU patients.
METHODS: A retrospective cohort study was conducted in adult ICU and non-ICU patients at an academic, community hospital, and a rural hospital. Computerized trigger alerts generated during two nonconsecutive months (May 2012 and December 2012) were obtained from a centralized pharmacy database. Duplicate alerts for the same medication during the patient's admission were excluded. Pharmacists were responsible for evaluating alerts in their respective patient care areas and contacting the physician in response to the alert, if needed. Triggers for abnormal laboratory values and suspected drug causes were assessed for causality. Drug related hazardous conditions (DRHCs), defined as drug-induced abnormal laboratory values that had the potential to progress to patient injury, were evaluated for severity of harm. How well the triggers predicted a DRHC was determined by calculating the positive predictive value (PPV).
RESULTS: A total of 810 alerts generated in 667 patients during the study period were included for analysis. Pharmacists intervened on 40.1% and 46.5% alerts generated in the ICU and non-ICU, respectively. The most common response by the pharmacist was to discontinue the medication in both groups. Physician acceptance rates were comparable in the ICU (90.9%) and non-ICU (84.7%). The PPV of alerts identifying a DRHC was 0.66 in the ICU and 0.76 in the non-ICU. DRHC severity in both groups was similar.
CONCLUSION: The rates of pharmacist intervention in response to automated trigger alerts were similar in ICU and non-ICU settings. Overall, triggered alerts perform well at identifying DRHCs.

Nephrology

138E. Implementation of a pharmacy managed erythropoeisis stimulating agent prescribing protocol in the inpatient setting. *Joanna Q. Hudson, Pharm.D., BCPS, FASN, FCCP, FNKF*[1], Christopher K. Finch, Pharm.D., BCPS, FCCM[2]; (1)The University of Tennessee, University of Tennessee, Memphis, TN; (2)Pharmacy Department, Methodist University Hospital, Memphis, TN

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139. Using the MedLit-D tool to assess medication label literacy in patients on hemodialysis. *Soo Min Jang, Pharm.D.*[1], Wendy Parker, Ph.D.[2], Amy Barton Pai, B.S., Pharm.D., BCPS, FASN, FCCP[1], Kristine Ferreira, Pharm.D. Candidate[3], Katie Cardone, Pharm.D., BCACP, FNKF[1]; (1)Department of Pharmacy Practice, Albany College of Pharmacy and Health Sciences, Albany, NY; (2)Department of Basic and Social Sciences, Albany College of Pharmacy and Health Sciences, 12208, NY; (3)Albany College of Pharmacy and Health Sciences
PURPOSE: The impact of health literacy on the ability of hemodialysis patients to interpret medication labels has not been evaluated. The study objectives were to: (i) determine utility of a tool assessing medication label understanding, and (ii) assess prevalence of low literacy relating to medication labels, in hemodialysis patients.
METHODS: English-speaking patients ≥18 years old, on chronic HD and reasonably able to self-manage medications were included. Those residing in long-term care or assisted-living facilities were excluded. Participants completed the Rapid Estimate of Adult Literacy in Medicine Short Form (REALM-SF) and a new literacy scale (MedLit-D). MedLit-D assesses document- and quantitative-type literacy skills from over-the-counter and prescription labels, including a phosphate-binder and a liquid antacid/anti-gas product. Tasks included: locating (find data from text), cycling (match and locate data), integrating (pull together data from text), generating (use background knowledge) and calculating (identify numbers and operations).
RESULTS: Participants included 110 patients (64 men, 46 women); the majority were ≥65 years old (61%), Caucasian (83%), on phosphate binders (PB; 69%), and had been on hemodialysis 1–5 years (49%). Participants' educational experiences were slightly lower than national norms; most had some college or less (64%), 11% had not completed high school. Most (77%) achieved the maximum REALM-SF score. The answers to the health literacy questions varied with 72% answering the locating questions correctly, calculating (66%), cycling (52%), and integrating (57%). Only 16% correctly answered a basic knowledge question about PB (generating question). Patients on PBs were more likely to correctly answer the generating question (p=0.005).
CONCLUSION: Few people were able to correctly answer a basic knowledge question about PB. Patients with less education scored lower overall on both literacy tools than those with more education. The MedLit-D tool could inform medication labeling and educational initiatives in dialysis facilities, and warrants further study.

Neurology

140E. Clinical outcomes in patients with Parkinson's disease treated with a monoamine oxidase type-B inhibitor (MAOB-I): a cross-sectional study. *Jack J. Chen, Pharm.D.*[1], Khashayar Dashtipour, M.D., Ph.D.[1], Khaled Bahjri, M.D., MPH[2]; (1)Loma Linda University, Loma Linda, CA; (2)School of Public Health, Loma Linda University, Loma Linda, CA

Presented at the Annual Meeting of the College of Psychiatric and Neurologic Pharmacists, Phoenix, AZ, April 27–28, 2014.

141. A mixed treatment comparison to compare the efficacy of botulinum toxin type A treatments for upper limb spasticity. *Jack J. Chen, Pharm.D.*[1], Heather Walker, M.D.[2], Yi Han, Ph.D.[3], Andrea Stevens, Ph.D.[3], Kathleen Lomax, M.D.[4], Michael Lee, M.D.[2]; (1)Loma Linda University, Loma Linda, CA; (2) University of North Carolina, NC; (3)WG Consulting, NY; (4) Ipsen Biopharmaceuticals Inc, Basking Ridge, NJ
PURPOSE: To provide a systematic pairwise comparison of the efficacy of all available type A botulinum toxins (in the US) for the treatment of upper limb spasticity.
METHODS: Multi-armed, randomized, controlled trials (RCT) for inclusion were identified using a systematic literature review. Due to the lack of direct head to head clinical trial evidence, we utilized a mixed treatment comparison (MTC) analysis using a Bayesian hierarchical model allowing indirect comparison of the efficacies of the interventions. The main outcome measure was change in Modified Ashworth Scale (MAS) score at week four following injection. Due to the variability of available RCT data, this study only investigated the main outcome measure without explicit adjustment for potential confounding factors such as gender and toxin formulation differences.
RESULTS: A network of nine RCTs with 42 arms met inclusion criteria and were investigated to compare all type A botulinum toxin treatments. 1184 subjects randomly assigned to abobotulinumtoxinA (n=202), incobotulinumtoxinA (n=9), onabotulinumtoxinA (n=426), or placebo (n=547). The network of RCTs and treatment arms formed a linear series of "steps" which facilitated the meaningful comparison of all botulinum toxin type A treatments of interest. The results for MAS change from baseline for all treatments were: Placebo (mean −0.45, SE 0.08), abobotulinumtoxinA (mean −2.14, SE 0.75), incobotulinumtoxinA (mean −1.3, SE 1.15), and onabotulinumtoxinA (mean −1.10, SE 0.08) where a negative number indicates symptom improvement. There was reasonable agreement between the number of unconstrained data points, residual deviance and pair-wise results, suggesting a coherent network.
CONCLUSION: AbobotulinumtoxinA and onabotulinumtoxinA were significantly more effective compared to placebo in treating upper limb spasticity. There was no significant efficacy difference between abobotulinumtoxinA and onabotulinumtoxinA. Due to the low number of patients for the incobotulinumtoxinA intervention, this analysis cannot assess the efficacy of incobotulinumtoxinA with reasonable certainty.

142. Correlation between Unified Parkinson's Disease Rating Scale and Global Impression of Change Scales. *Jack J. Chen, Pharm.D.*, Khashayar Dashtipour, M.D., Ph.D., Pejman Dalaie, M.D., Kayvan Kani, M.D., MPH, Camellia Kani, M.D., MAS; Loma Linda University, Loma Linda, CA

PURPOSE: Published data do not address the correlation between changes in Unified Parkinson's Disease Rating Scale (UPDRS) score (quantitative) and Patients' Global Impressions of Change (PGIC) ratings (qualitative). To determine the minimum quantitative change on UPDRS that is detectable by PGIC and Clinician Global Impression of Improvement (CGI-I).

METHODS: Double-blind, prospective study of non-demented patients with idiopathic PD. At baseline, UPDRS was recorded. Follow-up assessments (UPDRS, PGIC, CGI-I) were performed within 12 weeks. PGIC ratings were obtained with subject blinding to other assessments. UPDRS and CGI-I were assessed by two blinded physician raters. Scores and ratings were correlated using both anchor- and distribution-based methods.

RESULTS: Mean age (SD) of subjects (n=38; 66% male) was 70.2 ± 7.9 years. Mean follow-up interval was 12.4 ± 2.5 weeks. The Spearman correlation coefficients for correlation between PGIC and change in total UPDRS score was 0.665 and 0.668 for the motor subscale ($p<0.001$). PGIC and CGI-I demonstrated no correlation with UPDRS mentation or activities of daily living (ADL) subscales, ($p>0.05$). CGI-I demonstrated a weak correlation with changes in total UPDRS ($r = 0.310$, p=0.058). PGIC and CGI-I were correlated ($r = 0.421$, p=0.008). The PGIC "minimally improved" rating corresponded to a total UPDRS mean score change of −4.9 points and −3.7 points (sensitivity 0.6, specificity 0.86, AUC 0.743), based on receiver operating characteristics (ROC) curves. The PGIC "minimally worse" rating corresponded to a total UPDRS mean score change of 6.1 points and 2.5 points (sensitivity 0.69, specificity 0.79, AUC 0.731) based on ROC curves.

CONCLUSIONS: PGIC is able to capture UPDRS symptom change (improvement or worsening) to a stronger degree than that of CGI-I. Patients were able to report, with more precision, a worsening of clinical condition than an improvement. These preliminary results suggest that changes in UPDRS scores can be translated to PGIC ratings that are qualitatively meaningful.

143E. VPA retains suppressive PPR effect at steady-state with less variability than CBZ: retrospective analysis of 239 photosensitive clinic patients. *Ronald Reed, B.S., RPh, Pharm.D.*[1], Dorothee Kasteleijn- Nolst Trenite, M.D., Ph.D., MPH[2]; (1)Department of Pharmacy Practice, Husson University School of Pharmacy, Bangor, ME; (2)Faculty of Medicine & Psychology, University of Rome "Sapienza" II, Roma, Italy

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144. Predictive performance of the Winter-Tozer and its derivative equations for estimating free phenytoin concentrations in specific patient populations. *Wendy Cheng, B.Sc. (Pharm)*[1], Tony KL Kiang, B.Sc. (Pharm), Ph.D., ACPR[1], Penny Bring, B.Sc. (Pharm), ACPR, Pharm.D.[1], Mary HH Ensom, Pharm.D., FASHP, FCCP, FCSHP, FCAHS[2]; (1)Department of Pharmacy, Vancouver General Hospital, Vancouver, BC, Canada; (2)The University of British Columbia, Children's & Women's Health Centre of British Columbia, Vancouver, BC, Canada

PURPOSE: Studies have found bias and imprecision in the predictive performance of the Winter-Tozer equation in predicting free phenytoin concentration. Various investigators have developed alternative predictive equations but not all have been validated. This study aims to assess the bias and precision of the Winter-Tozer and select derivative equations in predicting free phenytoin concentrations in select patient populations and to derive new equations that better predict free phenytoin concentration.

METHODS: Following ethics approval, a retrospective chart review was conducted (data from September 2008–2013) in different subpopulations (critical care, general medicine, neurology). Subjects were included if greater than 18 years old, and had a free phenytoin concentration available. Subjects were excluded if their phenytoin was not at steady state, were on hemodialysis, or took carbamazepine, phenobarbital, and/or valproic acid. Mean prediction error (MPE) and root mean square error (RMSE) were calculated. Bland-Altman plots were created.

RESULTS: Altogether, 133 patients were included (53% male; age = 64 ± 19 years; serum creatinine = 1.0 ± 0.7 mg/dL; albumin = 2.7 ± 0.7 g/dL). In the combined population, the Winter-Tozer (MPE 0.43 mg/L [95% CI 0.38–0.48]) and Anderson (Ann Pharmacother. 1997;31(3):279–84) (MPE 0.13 mg/L [95% CI 0.08–0.18]) equations overpredicted, Kane equation#1 (Ann Pharmacother. 2013;47(5):628–36) tended to underpredict [MPE −0.05 mg/L (95% CI −0.10 to 0.00)], and Kane equation#2 underpredicted [MPE −0.08 mg/L (95% CI −0.13 to 0.03)] the actual free phenytoin concentration. In each subpopulation, the Winter-Tozer equation overpredicted the true concentration with more bias and imprecision compared to the other equations. Other equations had variable bias in the different subpopulations. The predictive bias of the equations correlated with the albumin coefficient in the equations, and an iterative process determined the optimal albumin coefficient with reduced bias for this patient population to be 0.275.

CONCLUSION: Relatively poor predictive performance of the Winter-Tozer and its derivative equations calls for more precise and less biased equations and testing of the new coefficient (0.275) for predicting free phenytoin concentrations.

Nutrition

145. Challenges of administering pancrelipase in adult pancreatitis patients. Jackie Tran, Pharm.D.[1], Stephen Lemon, Jr., Pharm.D.[2], Yan Zhang, Pharm.D.[1], *Abigail Antigua, Pharm.D.*[2]; (1)Department of Pharmacy, UF Health Shands Hospital; (2) Department of Pharmacy, UF Health Shands, Gainesville, FL

PURPOSE: Pancreatitis patients may have reduced endogenous pancreatic enzymes and therefore may need pancreatic enzyme supplementation (PES) to aid with digestion. However, PES administration via an enteral access device often results in inadequate drug delivery due to PES' enteric-coated formulation. To mitigate the problem with administering PES, some institutions use an elemental nutritional supplement for nutrition support for these patients. This study evaluated nutrition status to determine the impact of a novel approach using elemental nutrition in pancreatitis patients.

METHODS: This retrospective study included adult pancreatitis patients who were nil per os (NPO) and received elemental nutrition from August 2008 to 2010 (n=24) or PES with non-elemental nutrition from August 2011 to 2013 (n=41) at a large, academic medical center. The primary outcome is the percentage of diarrhea-free days. Secondary outcomes included time-to-goal enteral nutrition from the initiation enteral nutrition, and pre-albumin and albumin changes pre- and post-enteral nutrition.

RESULTS: There were no statistically significant differences between the elemental nutrition and PES with enteral nutrition groups in percent diarrhea-free days (46.80% + 29.03 vs 53.45% + 36.76, p=0.45). Additionally, there were no differences in secondary outcomes of time-to-goal enteral nutrition and pre-albumin and albumin changes pre- and post-enteral nutrition.

CONCLUSION: Utilizing elemental nutrition compared to PES with non-elemental nutrition in pancreatitis patients was not associated with a significant reduction in percentage of diarrhea-free days, time-to-goal enteral nutrition, and nutrition status. A multicenter, prospective, randomized, controlled trial is warranted to further evaluate the efficacy of elemental nutrition in pancreatitis patients.

146. Reassessment of the appropriateness of parenteral nutrition therapy in adult critically ill patients after implementation of a parenteral nutrition qualification checklist. *Stephen Lemon, Jr., Pharm.D.*[1], Jenny Liu, Pharm.D.[2], Bibin Varughese, Pharm.D.[2],

Abigail Antigua, Pharm.D.[1]; (1)Department of Pharmacy, UF Health Shands, Gainesville, FL; (2)School of Pharmacy, University of Florida College of Pharmacy, Gainesville, FL
PURPOSE: Nutrition support is a vital part of the management of critically ill patients. Parenteral nutrition (PN) therapy can provide benefit to some patients; however, it should be utilized appropriately to avoid iatrogenic complications. An internal study performed at University of Florida (UF) Health Shands from May 1, 2011 to May 28, 2012, identified 49% adherence to the ASPEN/SCCM nutrition support guidelines. The primary objective is this study was to identify and assess the indications for use of parenteral nutrition at UF Health Shands after implementation of criteria for use.
METHODS: Retrospective chart review was conducted at UF Health Shands between June 1, 2012 and May 31, 2013. Inclusion criteria were critically ill patients age 18 years and older who had an intensive care unit (ICU) stay of greater than 48 hours.
RESULTS: A total of 244 patients over the study period were evaluated. Of this cohort, 72% of patients had an appropriate indication for PN. Median time between admission and PN therapy initiation increased from 3 to 8 days when compared to the previous internal study. Median ICU and total length of stay, nutrition therapy prior to initiation of PN, and median nutrition markers prior to initiation of PN, were not different in this study compared to the previous investigation.
CONCLUSION: Adherence to the ASPEN/SCCM guidelines for use of PN in the critically ill improved by 46% compared to a previous internal investigation. Increased adherence to the appropriate criteria for use of PN should be considered to improve patient outcomes and decrease health care expenditures.

Oncology

147. The association of pro-inflammatory biomarkers and chemotherapy-induced cognitive impairment in Asian breast cancer patients: a multi-centered, prospective, cohort study. *Alexandre Chan, Pharm.D., MPH, BCPS, BCOP*[1], Yin Ting Cheung, Ph.D.[2], Terence Ng, B.Sc.Pharm (Hon)[2], Ng Raymond, M.D.[3]; (1) Department of Pharmacy, Faculty of Science, National University of Singapore, Singapore; (2)National University of Singapore; (3)National Cancer Centre Singapore
PURPOSE: Existing evidence suggests that cytokines play an intermediary role in post-chemotherapy cognitive impairment. This is the largest multi-centered, prospective, cohort study to evaluate the prevalence and pro-inflammatory biomarkers of post-chemotherapy cognitive impairment in Asian breast cancer patients.
METHODS: Chemotherapy-receiving breast cancer patients (Stages I to III) were recruited. Pro-inflammatory plasma cytokines levels (IL-1β, IL-2, IL-4, IL-6, IL-8, IL-10, GM-CSF, IFN-γ an d TNF-α) were evaluated using multiplex immunoassay prior to chemotherapy and 12 weeks later at the end of chemotherapy. Computerized neuropsychological assessment (Headminder") was administered to evaluate patients' memory, attention, response speed and processing speed. Cognitive impairment was defined as a 1.5 reduction of the *Z* score from baseline. Linear mixed-effects models were applied to test the relationships of clinical variables and cytokine levels on each objective cognitive domain.
RESULTS: Eighty-one patients were included (age 50.2 ± 8.4 years; 79.3% Chinese). Post-chemotherapy memory (28.1%), attention (34.1%) and response speed (21.9%) impairments were prevalent. The linear mixed-effects models showed that age, baseline BMI, education (years) and anxiety (Beck Anxiety Inventory scores) were significant predictors for all four cognitive domains. Higher level of IL-1β predicts poor response speed (Estimate −5.46; 95%CI: −7.9 to −0.4; p=*0.008*), while higher levels of TNF-α (Estimate −3.15; 95%CI: −5.2 to −1.1; p=*0.003*) are predictive of memory decline. IL-4 (Estimate −3.86; 95%CI: −5.5 to −0.2; p=*0.025*) and IL-8 (Estimate −4.12; 95%CI: −9.2 to −0.1; p=*0.021*) are associated with poorer attention performance.
CONCLUSION: Cognitive impairment is prevalent among chemotherapy-receiving Asian breast cancer patients. Patients suffering post-chemotherapy cognitive impairment may experience increased plasma levels of TNF-α, IL-1β, IL-4 and IL-8.

148E. Effects of body mass index on the efficacy and pharmacokinetics of granisetron transdermal system. *James Gilmore, Pharm.D.*[1], Christine Brown, RN, BSN, M.A.[2], Deborah Braccia, RN, MPA, Ph.D.[2]; (1)Georgia Cancer Specialists; (2) Prostrakan, Inc

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Other

149. Implementation of a cardiac patient medication transition pilot program: a prospective study of inpatient and outpatient clinical pharmacy services. *Julie A. Murphy, Pharm.D., BCPS, FASHP, FCCP*[1], Sean O. P. McKee, Pharm.D.[2], Rachel E. Rarus, Pharm.D.[2], Michelle N. Mangan, Pharm.D., BCACP, CDE[3], Steven J. Martin, Pharm.D., BCPS, FCCP, FCCM[4]; (1)University of Toledo College of Pharmacy, Toledo, OH; (2)University of Toledo Medical Center; (3)Department of Pharmacy Practice, College of Pharmacy and Pharmaceutical Sciences, The University of Toledo, Toledo, OH; (4)Ohio Northern University
PURPOSE: To determine the change in 30-day readmission rates for patients with Heart Failure (HF) and Acute Myocardial Infarction (AMI) after implementation of a "high-touch" pharmacist-driven transitional care program compared to historical data.
METHODS: This prospective pilot study was approved by the University of Toledo (UT) Institutional Review Board and funded through a grant from the Cardinal Health Foundation (2013 E3 Grant Program). Patients admitted to UT Medical Center (UTMC) from August 2013 through April 2014 with HF exacerbation or AMI (non-ST elevation or ST elevation) were eligible. Patients received the following services from a pharmacist: (i) disease state and medication education on the second day of admission, (ii) reinforcement of concepts during the hospitalization, as necessary, (iii) discharge medication reconciliation, (iv) a follow-up telephone call within 48–72 hours of discharge to ensure understanding and compliance with medications, and (v) an offer for an appointment with a Medication Therapy Management (MTM) pharmacist within 2 weeks of discharge.
RESULTS: Within the HF arm, 80 patients were educated while hospitalized and 15 participated in an MTM appointment. For these two groups, 30-day readmission rates were 18.8% and 13.3%, respectively. This difference was not significant when compared to UTMC's 2012 readmission rate of 26.4% (p=0.1975 and p=0.3714, respectively). Within the AMI arm, 64 patients were educated while hospitalized and four participated in an MTM appointment. For these two groups, 30-day readmission rates were 14% and 0%, respectively. The difference was not significant when compared to UTMC's 2012 readmission rate of 15.2% (p > 0.05 for both groups).
CONCLUSION: A "high-touch" pharmacist-driven transitional care program may contribute to a reduction in 30-day readmission rates for patients with HF exacerbation and AMI, although the difference in this pilot study was not statistically significant. Efforts to increase the number of MTM appointments need to be examined.

150. Physicians' experiences, attitudes and expectations regarding pharmacists' provision of pharmaceutical care in Algeria. *Iman Amrani, M.Sc.*[1], Ahmed Awaisu, Ph.D.[2], Dounia-Zed Menaceur, Pharm.D.[1], Manar Maalem, Pharm.D.[1]; (1)Department of Pharmacy, Faculty of Medicine, University of Batna, Batna, Algeria; (2)College of Pharmacy, Qatar University, Doha, Qatar

PURPOSE: The pharmacy profession is at its very early stage of development in terms of pharmaceutical care. The practice and implementation of this concept can only be achieved if both pharmacists and physicians recognize and appreciate each other's professional roles and boundaries. This study aimed to explore the physicians' current experiences, attitudes and expectations regarding pharmacists' involvement in pharmaceutical care provision in Algeria.
METHODS: A cross-sectional study was conducted between February and May 2014 in the city of Batna, Algeria. A validated self-administered questionnaire composed of four sections was distributed to 300 randomly selected physicians working in different areas of practice.
RESULTS: A total of 201 questionnaires were returned (67% response rate). Only 20% of the respondents had interacted with pharmacists at least once weekly. The main reason for the interaction was to check on availability of certain medicines. The majority of physicians (64%) had positive attitudes towards pharmacists providing pharmaceutical care. Respondents were most comfortable with pharmacists detecting and preventing prescription errors and providing patient education and counseling (90%). However, the majority were uncomfortable with pharmacits suggesting prescription medications to them (61%) and recommending nonprescription medications for patients (75%). Respondents expected pharmacist to be knowledgeable drug therapy expert, to advise them about more cost-effective drug alternatives (75%) and to provide patient education (90%). However, 60% to 85% of them were against pharmacists treating minor ailments, or conducting necessary dosage adjustment or therapy modification without referring to them.
CONCLUSION: The current findings indicate that the majority of physicians were in support of pharmacist providing different patient-centered services and extending their role as long as they do not make independent decisions about drug therapies. A more precise determination of the pharmacist's responsibilities would benefit the cooperation between physicians and pharmacists and promote the implementation of pharmaceutical care practice in Algeria.

151. Readability and comprehensibility of package inserts for antidiabetic medications in Middle East. *Emad Eldin Munsour, M.Pharm*[1], Mohamed Azmi Ahmad Hassali, Ph.D.[2], Ahmed Awaisu, Ph.D.[3], Sara Darwish, M.D[4], Einas Abdoun, B.Sc. Pharm[4]; (1)Social and Administrative Pharmacy, School of Pharmaceutical Sciences, Universiti Sains Malaysia, Doha, Qatar; (2)School of Pharmaceutical Science, Universiti Sains Malaysia, Bayan Lepas, Malaysia; (3)College of Pharmacy, Qatar University, Doha, Qatar; (4)Hamad Medical Corporation
PURPOSE: This study evaluated the readability and comprehensibility of package inserts (PIs) supplied with medications being used for the treatment of type 2 diabetes mellitus in Qatar.
METHODS: All package inserts (n=27) of oral hypoglycemic agents (OHAs) available in Qatar were evaluated using Flesch Reading Ease (FRE) score for readability while Flesch Kincaid Grade Level, SMOG grading and New Dale-Call Readability Formula were used to estimate the comprehensibility of these PIs corresponding to the school grade level. The number of words and languages available were also documented.
RESULTS: Fourteen (51.8%) PIs were for innovator products and 13 (48.2%) were for generic products. Five (18.5%) of package inserts were in English language, 7 (25.9%) were in English, Arabic and French languages and 15 (55.6%) were in English and Arabic languages. The mean FRE score was 33.07 (±12.5) and the most readable PI has FRE score of approximately 56. The comprehensibility score are shown in the table below.

Parameter	Flesch-Kincaid Grade Level	Gunning-Fog Score	SMOG Index
Mean ± SD	11.22 ± 2.4	15.5 ± 2.6	11.7 ± 1.6
Minimum	7.5	10.4	8.9
Maximum	15.1	20.2	14.7

The most commonly used OHA was Metformin (n=10); the mean number of PIs words was 1372.90 (±552.94).
CONCLUSION: None of the evaluated PIs achieved the acceptable readability score of FRE (60–70). All the evaluated PIs could be comprehended at least by 12th grade school student which exceed the recommended grade level for health-related materials. About 20% of these PIs were in English language and hence not readable by most of the patient especially those with limited literacy skills. The most commonly used OHA exhibited huge variation in the number of words which indicates the inconsistency of information contained.

152. Description and Validation of the Disease Interaction Scoring Tool (DIST) for an Electronic Health Record (EHR) integrated drug knowledgebase.. *Jeff Bubp, Pharm.D.*[1], Joan Kapusnik-Uner, Pharm.D.[2], Brian Hoberman, M.D., MBA[3], Harrison Wright, M.D.[4], Emanuel Kwahk, Pharm.D.[5], Karl A. Matuszewski, Pharm.D., M.S.[6]; (1)Clinical Editorial, Disease Decision Support Group, First Databank, Inc., South San Francisco, CA; (2) Clinical Editorial, First Databank, Inc., South San Francisco, CA; (3)Department of Medicine, Kaiser Permanente, San Francisco, CA; (4)Family Medicine Department, Kaiser Permanente, Rohnert Park, CA; (5)School of Pharmacy, Department of Clinical Pharmacy, University of California, San Francisco, San Francisco, CA; (6)First Databank, Inc., South San Francisco, CA
PURPOSE: Drug-disease interaction clinical care guidance is increasingly deployed in EHR systems, yet physician acceptance remains low due to alert fatigue and poor alert relevance. DIST was developed for assessing knowledgebase content to aid the creation of the most significant subset of contraindicated disease interaction alerts. We describe DIST and present results of a tool-derived, clinician-validated subset.
METHODS: DIST uses equally weighted negative and positive alert scoring criteria for evaluating each drug-disease interaction pair. Scores range between +5 down to −4. DIST was applied to a drug-disease contraindication (severity level = 1) knowledgebase, and a threshold DIST score greater than zero was used for inclusion in the subset. To validate the performance of DIST, physician and pharmacist volunteers from Kaiser Permanente, Northern California were surveyed. Randomized survey questions were generated from the drug-disease pairs in the subset. Questions presented example alerts and asked if the alert should be interruptive in the inpatient or outpatient care settings. A "yes" was considered an affirmative response. Survey question results were stratified across the DIST scores of the alert subset drug-disease pair represented by each question.
RESULTS: DIST identified 1211 out of 4111 contraindicated drug-disease pairs reviewed for inclusion in the subset. Survey questions represented all contraindicated conditions and 54% of the drugs in the subset. Survey response rate was 73/108 (68%). Survey question results stratified across the entire range of DIST scored alerts (+5 down to +1) had affirmative responses 96–100% of the time.
CONCLUSION: Survey results strongly support alert inclusion in a disease interaction subset when the alert has a positive DIST score. This suggests that the tool may be useful in creating disease interaction subsets that generate acceptable interruptive alerts while decreasing alert burden and increasing relevance of disease interaction care guidance.

Pain Management/Analgesia

153E. Liposomal bupivacaine versus elastomeric continuous infusion bupivacaine pump. *Michael Kenes, Pharm.D.*[1], Mandy Leonard, Pharm.D.[1], Seth Bauer, Pharm.D., BCPS[2], Marcia Wyman, Pharm.D.[1]; (1)Cleveland Clinic, Cleveland, OH; (2)Department of Pharmacy, Cleveland Clinic, Cleveland, OH

Presented at the American Society of Anesthesiologists Annual Meeting, New Orleans, LA, October 11–15, 2014.

154. Correlation of pain scores and opiate requirements: a comparison of two methods. *Zachariah Thomas, Pharm.D.*, Brian Faley, Pharm.D., Justin Kaplan, Pharm.D.; Department of Pharmacy, Hackensack University Medical Center, Hackensack, NJ

PURPOSE: Many institutions conduct retrospective medication use evaluations of new products to ensure safety and efficacy. The evaluation of new analgesics is difficult because little guidance exists to properly assess retrospective pain data. We compared two methods for evaluating pain scores retrospectively to determine which one correlated most closely with opiate requirements.

METHODS: Pain scores in 50-opiate naïve patients undergoing unilateral total knee arthroplasty were calculated using two methods. In method A, the mean pain score was calculated by dividing the sum of all pain scores documented by the total number of pain assessments. Since Method A incorporated pain reassessments as well, it was possible to have several pain scores within a given hour. In Method B, only the maximum pain score per hour was used to calculate the mean pain score.

RESULTS: The mean pain score was statistically lower using method A versus method B (2.65 vs 3.41, $p < 0.0001$). The overall mean opiate consumption (IV morphine equivalents) was 30.55 ±22.27 mg. Method A had an r^2 value of .259 and Method B had an r^2value of 0.244. Both methods were significantly correlated with opiate consumption ($p < 0.001$ for both).

CONCLUSION: Both methods of calculating pain scores yielded similar r^2 values. However, neither showed a robust correlation with opiate requirements. We conclude that either there is not a robust correlation between pain scores and opiate requirements or that this relationship may be confounded in retrospective data collection.

Pediatrics

155. Restricted use of repeat doses of surfactant after the prophylactic dose does not increase the risk of BPD or death in preterm infants. *Varsha Bhatt-Mehta, M.S., (CRDSA), Pharm.D., FCCP*[1], Subrata Sarkar, M.D.[2]; (1)University of Michigan, Ann Arbor, MI; (2)Neonatal Perinatal Medicine, University of Michigan, Ann Arbor, MI

PURPOSE: Repeat doses of surfactant after the prophylactic dose for treatment of RDS are currently recommended by the manufacturers to be administered at minimal levels of respiratory support. Reducing the number of unnecessary repeat doses will represent a significant cost-saving. We determined if restricting repeat doses of Survanta by using high-threshold criteria for respiratory support increased the risk of the composite primary outcome of BPD or death before hospital discharge.

METHODS: A total of 140 infants of ≤28 weeks gestation who received prophylactic berectant (Survanta®) soon after birth were reassessed 12 hours after the initial dose for retreatment if the infant remained intubated and required at least 40% inspired oxygen with a MAP >10 cm H2O, and compliance of <0.5 mL/cm H2O.Multivariate analysis identified which risk factors from a set of *a priori* predictors including the need for berectant re-treatment could predict the primary outcome.

RESULTS: Eighty-eight (59%) of the 140 infants reached the re-treatment criteria and received repeat doses of berectant. Sixty-eight (49%) infants developed BPD or died. Infants who developed BPD or died were younger and smaller, were more likely to have PDA, NEC or sepsis, longer (>28 days) stay on mechanical ventilation, and receive retreatment with berectant. On forward stepwise logistic regression analysis of *a priori* risk factors only the need for mechanical ventilation >28d ($p < 0.001$, OR 7.3, 95% CI 2.7–19.5) was independently associated with increased risk of primary outcome.

CONCLUSION: Restricting repeat doses of berectant did not increase the risk of development of BPD or death in preterm infants with RDS.

156. Effects of antithrombin during extracorporeal membrane oxygenation. *Marcia L. Buck, Pharm.D.*[1], Samuel Addison, RRT[1], Amanda Liszewski, Pharm.D.[2], Gary Fang, M.D.[3], David Kaufman, M.D.[3]; (1)University of Virginia Children's Hospital, Charlottesville, VA; (2)Department of Clinical Pharmacy Services, University of Virginia, Charlottesville, VA; (3) Department of Pediatrics, School of Medicine, University of Virginia, Charlottesville, VA

PURPOSE: To evaluate the effects of antithrombin supplementation on heparin requirements and anticoagulation in children on ECMO.

METHODS: A retrospective comparison of ECMO patients <18 years of age given antithrombin and an untreated cohort using similar circuitry was performed. Serum antithrombin and anti-Xa levels, fresh frozen plasma (FFP) use, heparin requirements, clot formation, bleeding, and survival were evaluated. Data were compared with *t*-tests.

RESULTS: Seventeen patients (median age 0.1 month) received antithrombin (median dose 255 units) for levels <70% or heparin > 60 units/kg/hour. Antithrombin levels increased from 59 ± 14% pre-dose to 83 ± 22% at 2–6 hours and 83 ± 24% at 20–24 hours. Anti-Xa increased from 0.49 ± 0.15 to 0.63 ± 0.21 at 2–6 hours and 0.64 ± 0.19 units/mL at 20–24 hours (all $p < 0.001$). Heparin requirements were no different pre-dose, 4 hours, or 24 hours post-dose (29 ± 12 units/kg/hour, 30 ± 12 units/kg/hour, and 28 ± 12 units/kg/hour). Antithrombin patients had higher anti-Xa levels than untreated patients (0.59 ± 0.22 units/mL vs 0.53 ± 0.29 units/mL; $p < 0.001$) and used less FFP (6.7 ± 8.5 vs 25.0 ± 22.0 mL/kg/day; p=0.007); but there was no difference in heparin dose (27 ± 5 units/kg/hour vs 30 ± 9 units/kg/hour). Clots developed in 8 antithrombin (47%) and 6 untreated (40%) patients, with one in each group requiring a circuit change. Minor bleeding occurred in 6 antithrombin (35%) and 3 untreated (20%) patients; 3 additional untreated patients had major bleeding. Seventy-one percent of the antithrombin patients and 67% of the untreated patients survived to discharge.

CONCLUSIONS: Antithrombin supplementation was beneficial in raising anti-Xa levels and minimizing FFP use during ECMO, but had little impact on heparin requirements, clot formation, circuit changes, or survival. Additional studies are needed to confirm the new finding of reduced FFP use.

157. Pediatric hypertension: who is keeping watch?. *Flora Estes, Pharm.D.*; Pharmacy Practice, Texas Southern University, College of Pharmacy and Health Sciences, Houston, TX

PURPOSE: In 2006 there were 24,602 pediatric hypertension related hospitalizations, with 2–5% of children in the United States meeting the criteria for diagnosis of hypertension. This study was conducted to determine if the general public was aware that high blood pressure can occur among children.

METHODS: A 16-question survey was randomly administered to agreeable participants 18 years and older between June 10 and July 19, 2013. Underrepresented minority areas were targeted in the greater Houston and surrounding communities. Responses were obtained from 138 persons. The survey was analyzed using a descriptive analysis.

RESULTS: The data indicated that 51.4% did not know that children could have hypertension; 47.1% were aware, and 1.4% did not answer. The survey further indicated that 92% were familiar with hypertension; 83% had a family history, including 7% children with hypertension. Risk factors for hypertension were known including obesity (31.3%), family history (30.1%), diabetes (17.4%), and high cholesterol/triglycerides (20%). The most surprising finding was that 30% of participants reported that their healthcare professional did not routinely check their child's blood pressure. The survey population; 47.5% African American, 23.0 Hispanic/Latino, 16.5 Caucasian, 3.6 Asian, 1.4% other, and 8% non-responders.

CONCLUSION: This survey indicated that the population disproportionately affected by childhood hypertension is marginally aware that hypertension exists in children. Those who were aware had a family member or knew of a child with hypertension. A disadvantage of the study was the short data collection period and incomplete survey responses. The study does support the

need to increase awareness of pediatric hypertension in the general public. This should include education and screenings, compliance, and routine physical assessments for early detection and prevention.

158. Initial dosing of methadone and morphine for treatment of neonatal abstinence syndrome. *Bethany Ibach, Pharm.D.*[1], Peter Johnson, Pharm.D., BCPS[2], Roshni Patel, Pharm.D.[3], Diana Mendez, Pharm.D. Candidate[3], Donald Harrison, Ph.D., FAPhA[2], Kimberly Ernst, M.D.[4], Jamie Miller, Pharm.D., BCPS[2]; (1) Department of Pharmacy Practice, Texas Tech University Health Sciences Center School of Pharmacy, Abilene, TX; (2) Department of Pharmacy: Clinical and Administrative Sciences, University of Oklahoma College of Pharmacy, Oklahoma City, OK; (3)University of Oklahoma College of Pharmacy, Oklahoma City, OK; (4)Department of Pediatrics, University of Oklahoma College of Medicine, Oklahoma City, OK
PURPOSE: There is limited data describing and evaluating appropriate initial dosing of methadone and morphine in neonates with neonatal abstinence syndrome (NAS). The purpose of this study was to (i) describe the initial dose and frequency of morphine and methadone, and (ii) compare the number of dose adjustments, time to symptom relief, and taper complexity between methadone and morphine regimens.
METHODS: This retrospective study included neonates who received enteral morphine or methadone for NAS treatment from January 1, 2009 to December 31, 2013. Data collection included NAS treatment regimen, Finnegan Neonatal Abstinence Scores in the first 72 hours of treatment, and opioid-related adverse events. Planned home taper complexity was assessed using the Medication Taper Complexity Score (MTCS). Data were analyzed using the Mann-Whitney Rank-Sum test and chi-square analyses.
RESULTS: During the study period, 37 neonates were initiated on methadone and 14 on morphine for NAS. The median initial opioid dose was 0.09 mg/kg (range, 0.03–0.2) and 0.04 mg/kg (0.03–0.41) for methadone and morphine, respectively. The most common initial dosing interval was q8 h for methadone versus q3 h for morphine. Number of dose adjustments and time to symptom relief were similar between groups. The median MTCS scores were 20 (9–29; n=27) for methadone and 17.5 (15–25; n=4) for morphine (p=0.906). NICU length of stay was significantly shorter in methadone-treated neonates (8 vs 11.5 days; p=0.034). Additionally, 4 neonates (28.6%) in the morphine group were changed to methadone, but no methadone-treated patients were changed to morphine (p=0.001). There was no difference in adverse events between groups.
CONCLUSION: There was a high degree of variability in initial doses of methadone and morphine for treatment of NAS at this institution. Methadone required less frequent dosing with similar efficacy to morphine. In addition, methadone-treated neonates had shorter NICU admissions.

Pharmacoeconomics/Outcomes

159. Pharmacogenetic-guided selection of oral anticoagulants: a cost-effectiveness analysis. *Joyce You, Pharm.D., BCPS*; School of Pharmacy, The Chinese University of Hong Kong, Hong Kong
PURPOSE: Oral anticoagulants available for stroke prevention in patients with atrial fibrillation (AF) include vitamin K antagonists (warfarin) and novel oral anticoagulants (NOACs) (dabigatran, rivaroxaban and apixaban). Individual warfarin sensitivity is subjected to genetic variation in the P450 enzyme (*CYP*2C9) and vitamin K epoxide reductase complex 1. This study aimed to examine cost-effectiveness of usual anticoagulation care (usual AC), NOAC, and pharmacogenetic-guided selection (PG-AC) of anticoagulant in AF patients from perspective of healthcare payers.
METHODS: A Markov model was used to simulate life-long outcomes in 65-year-old AF patients: (i) All patients received warfarin therapy with usual AC; (ii) all patients received a NOAC; and (iii) all patients were genotyped (PG-AC). Patients with normal warfarin sensitivity genotypes would receive warfarin with focused care, and those with high or low warfarin sensitivity genotypes would receive a NOAC. Model inputs were derived from literature. Outcome measure was incremental cost per quality-adjusted life-year (QALY) gained (ICER). Robustness of model was examined by sensitivity analysis.
RESULTS: In base-case analysis, expected cost was lowest in PG-AC (USD95,834), followed by usual AC (USD96,573) and NOAC (USD98,991). Expected QALYs in NOAC and PG-AC (9.957 and 9.936 QALYs, respectively) were higher than usual AC (9.721 QALYs). ICER of NOAC versus PG-AC was USD147,903. Using USD50,000 as threshold of willingness-to-pay per QALY, PG-AC was the preferred strategy. Base-case results were sensitive to three factors, including patient time-in-therapeutic range in PG-AC, utility value of warfarin therapy and utility value of NOAC therapy. In 10,000 Monte Carlo simulations, PG-AC was cost-effective in 85.2% of time. NOAC and usual AC were cost-effective in 13.6% and 1.2% of time, respectively.
CONCLUSION: Using individual genotype data to select warfarin or NOAC appears to be a cost-effective strategy.

160. Relationship between delays in filling prescriptions and 30-day readmission rate among patients discharged for heart failure: a retrospective study. *Yang Fan, Pharm.D.*, Eric Balmir, M.S., Pharm.D., Helen Eldabie, Pharm.D., CDE, Eileen Tang, Pharm.D., BCPS; Pharmacy Department, New York Methodist Hospital, Brooklyn, NY
PURPOSE: Hospital readmission of recently discharged patients with congestive heart failure (CHF) represents an expensive and often preventable adverse outcome. Nationally, approximately 25% of CHF patients are readmitted within 30 days. Readmission rates are influenced by many factors, such as clinical care, medication management, and continuity of care. The purpose of this study was to determine whether disruption in continuity of medication therapy post hospital discharge increases the rate of readmission in patients with CHF.
METHODS: Medical records and prescription insurance claims of 200 patients admitted for heart failure from June 2010 to June 2013 were reviewed. Primary outcome was the rate of all-cause readmission ≤30 days of discharge. Secondary outcomes included: rate of unfilled prescriptions (unclaimed ≤ 30 days), average time to first CHF prescription filled after discharge, rate of 30 day readmission for prescriptions filled within 0, 1, 2, 3, 7, 14, 30, and 120 days of discharge, quality of medication reconciliation and follow up planning.
RESULTS: All-cause 30-day readmission rates for patients who filled their prescription or not was 33% vs 51% (RR = 0.65; CI 0.44, 0.95; p=0.02). Rates of unfilled prescriptions for those readmitted ≤30 days or not were 26% (average delay of 26 days to fill) vs 14% (17 days). Readmission rates for those who filled their prescription within 0, 1, 2, 3, 7, 14, 30, and 120 days were 26%, 31%, 29%, 34%, 34%, 35%, 33%, and 37%, respectively. Medication reconciliation was completed >95% of the time within 24 hours for all patients.
CONCLUSION: There was an association between delays in filling prescriptions and rates of 30-day readmission in patients with CHF. Patients who filled their prescriptions had lower readmission rates. Patients who were not readmitted within 30 days filled their prescriptions sooner. The clinical significance of these findings must be determined in larger studies.

161E. Differences in infection rates between outpatient hospital, clinic and home infusion settings for patients with primary immunodeficiency disorder (PIDD). Diane Ito, M.A.[1], Yan Xiong, M.S.[1], *Xiaolan Ye, Ph.D.*[2], Josephine Li-McLeod, Ph.D.[1]; (1) Baxter HealthCare, Westlake Village, CA; (2)Baxter HealthCare, Deerfield, IL

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162. Completeness of medication part D Claims in the Atherosclerosis Risk in Communities (ARIC) Study: influence of Generic Drug Discount Programs and Veterans Affairs Drug Benefit. *Emily M. Thudium, Pharm.D.*[1], Lei Zhou, MSPH[2], Khalid A. Alburikan, Pharm.D., BCPS[3], Sally C. Stearns, Ph.D.[4], Eliza S. Daubert, Pharm.D.[3], Jo E. Rodgers, Pharm.D., FCCP, BCPS (AQ Cardiology)[5]; (1)Department of Pharmacotherapy and Experimental Therapeutics, University of North Carolina at Chapel Hill Eshelman School of Pharmacy, Chapel Hill, NC; (2) Gillings School of Pulic Health, University of North Carolina at Chapel Hill; (3)Eshelman School of Pharmacy, University of North Carolina at Chapel Hill; (4)Health Policy and Management, UNC Gillings School of Public Health, Chapel Hill, NC; (5)Division of Pharmacotherapy and Experimental Therapeutics, Eshelman Scool of Pharmacy, University of North Carolina, Chapel HIll, NC

PURPOSE: Medicare Part D claims continue to gain popularity for comparative effectiveness analysis of various treatment options. Given a lack of incentive to co-file alternative coverage claims with Medicare, increasing use of alternative prescription coverage plans such as Generic Drug Discount Programs (GDDPs) and the Veterans Affairs Drug Benefit (VADB) may reduce the completeness of Medicare claims.

METHODS: Prevalent medications reported by ARIC study participants during a 2009 telephone survey were evaluated for inclusion on 2009 GDDP plans. Six medications were identified; three medications commonly included on GDDPs and three medications not included on GDDPs. A total of 4468 merged medication records (self-report or Part D) were available for 2905 ARIC participants enrolled in Medicare Part D. Veteran status was an indirect measure of presence of VADB. Multinomial logit regression provided estimates of the association of concordance (in both self-report & Medicare, self-report only, or Medicare only) with GDDP and VADB status while controlling for participant socio-demographics.

RESULTS: Participants were a mean age of 74 ± 5 years, 68% white, 63% female, and 18% were veterans. GDDP medications were 4% (95% CI: 1%–7%, p=0.003) more likely to exist in both self-report and Medicare and 3% (95% CI: 1%–5%, p=0.002) less likely to exist in Medicare only, with no statistical difference in the likelihood of existing in self-report only. Male veterans were 11% (95% CI: 7%–16%, p=0.001) less likely to have matched medications in both self-report & Medicare than females or non-veteran males, but 11% (95% CI: 7%–16%, p=0.001) more likely to occur in self-report only.

CONCLUSIONS: Claims for medications available through GDDP are more likely to match with self-report than claims for non-GDDP drugs. Veterans are more likely to have missing Medicare claims. GDDP status was not associated with missing claims in 2009, but researchers should remain aware of gaps in claim databases.

Pharmacoepidemiology

163. What are the predictors of proton pump inhibitor co-prescription among acute coronary syndrome patients receiving dual antiplatelet therapy in Qatar?. *Ahmed Awaisu, Ph.D.*[1], Fatma Hamo, Pharm.D.[1], Lylia Mekideche, B.Sc. (Pharm)[2], Nisrine El Muabby, Pharm.D.[2], Ahmed M Mahfouz, M.Sc.[2], Shaban Mohammed, M.Sc.[2], Ahmad Saad, Pharm.D.[2]; (1)College of Pharmacy, Qatar University, Doha, Qatar; (2)Heart Hospital, Pharmacy Department, Hamad Medical Corporation, Doha, Qatar

PURPOSE: Studies have documented widespread co-prescription of proton pump inhibitors (PPIs) with antiplatelet agents in patients with acute coronary syndrome (ACS). However, published evidence on prevalence and predictors of use is lacking. This study aimed to estimate the prevalence of PPI use among ACS patients receiving dual antiplatelet therapy (DAPT) and to examine the predictors of co-prescribing the PPIs with DAPT.

METHODS: We conducted a retrospective observational analysis of a prescription database at Heart Hospital in Qatar. Patients included were adult ACS patients on DAPT, admitted from January to December 2012 and discharged with or without PPIs. Descriptive statistics (frequencies with Pearson chi-square) were used to compare subjects as PPI users versus nonusers. Univariate and multivariate binary logistic regression models were conducted to determine the predictors of concomitant PPI use. Both crude OR and adjusted OR were presented. P-value ≤0.05 was considered statistically significant.

RESULTS: A total of 626 patients were analyzed for PPI use prevalence, with 200 patients (32%) being prescribed PPI upon discharge. Female gender (OR = 3.7; 95% CI = 1.54–8.91, p=0.004), age ≥65 years (OR = 3.3; 95% CI = 1.74–6.11, p < 0.001), and nationality (OR for Qatari = 3.7; 95% CI = 1.88–7.28, p < 0.001), were significantly associated with PPI co-prescribing. Furthermore, patients with non-ST-segment ACS were twice more likely to be prescribed PPIs compared to their counterparts with ST-segment ACS (OR = 1.97; 95% CI = 1.24–3.12, p=0.004). After controlling for confounders using multi-logistic regression analysis, only ACS type, having diabetes, dyslipidemia, and having Qatari nationality significantly influenced PPI co-prescription (p-values 0.082, 0.014, 0.001, and 0.037, respectively).

CONCLUSIONS: PPI prescribing in the population studied was predicted by nationality, ACS type, and having diabetes or dyslipidemia. More extensive analysis is needed to determine the rational prescribing of PPI among ACS patients and to better predict such usage.

164. Dosing decision of ACE inhibitors and angiotensin II receptor blockers among the elderly after acute myocardial infarction: the role of patient age and risk factors. *Sandra Hanna, Pharm.D. Candidate*, Izabela Annis, M.S., Gang Fang, Pharm.D., M.S., Ph.D.; Division of Pharmaceutical Outcomes and Policy, UNC Eshelman School of Pharmacy, Chapel Hill, NC

PURPOSE: Numerous randomized controlled trials (RCTs) have secured the role of angiotensin converting enzyme (ACE) inhibitors and angiotensin II receptor blockers (ARBs) for secondary prevention of acute myocardial infarction (AMI) at target doses. However, with relatively few elderly patients being represented in these RCTs, it is unclear at what dose clinicians choose in the elderly after AMI. The objectives of this study are to (i) determine the prevalence of using RCT target dose vs lower doses in the elderly and (ii) examine how risk factors (hypertension, diabetes, hyperlipidemia, chronic kidney disease) for cardiovascular outcomes and severe adverse effects may influence choices of these doses in clinical practice.

METHODS: This is a retrospective cohort study using Medicare research files from 2007 to 2009. We extracted a national cohort of 45,737 AMI survivors 65 years and older treated with ACE inhibitor or ARB and assessed the prevalence of using RCT target doses across age groups 65–74, 75–84, and 85 + within 30 days post-discharge. Multivariable modified Poisson regression models were applied to assess the association between risk factors and dose choice. C-statistics were used to assess the extent of variation in dose choices explained by these risk factors.

RESULTS: The rates of using RCT target doses were 48.9%, 46.6%, and 44.3%, respectively, among patients aged 65–74, 75–84, and 85+. The adjusted relative risk (RR) for receiving RCT target dose for age groups 75–84 and 85+ were 0.94 and 0.88, respectively, vs 65–74 (p < 0.0001). RR for diabetes and hypertension were 1.11 and 1.29, respectively (both p < 0.0001). Hypertension, hyperlipidemia, diabetes, and chronic kidney disease increased the C-statistic from 0.596 to 0.609 (p < 0.0001).

CONCLUSION: Less than half of elderly AMI survivors received RCT target doses, the prevalence of which decreased with age. Dose choice is not largely driven by the investigated risk factors.

Pharmacogenomics/Pharmacogenetics

165. Genome-wide association study of fluoroquinolone-induced tendonitis. *Jason Karnes, Pharm.D., Ph.D.*, Jonathan Mosley, M.D., Ph.D., Christian Shaffer, BS, Erica Bowton, Ph.D., Jessica

Delaney, M.D., Sara Van Driest, M.D., Ph.D., Peter Weeke, M.D., Quinn Wells, Pharm.D., M.D., Joshua Denny, M.D., Dan Roden, M.D.; Department of Medicine, Vanderbilt University, Nashville, TN

PURPOSE: This study identified cases of fluoroquinolone-induced tendonitis (FQT) in BioVU, a biobank coupling over 180,000 DNA samples to an electronic medical record in order to identify genetic influences on FQT using a genome-wide association study.

METHODS: We identified FQT cases and FQ-exposed controls in BioVU using ICD9 codes and natural language processing to analyze narrative text. Cases developed tendinitis or tendon rupture within 30 days of FQ treatment, which was confirmed by chart review. FQ-exposed controls were matched to cases in a 10:1 ratio based on age, ancestry, and gender. Samples were genotyped using Illumina® HumanOmni1-QUAD and HumanOmni5-QUAD BeadChip platforms and analyzed using single nucleotide polymorphisms (SNPs) on both platforms (n=730,803 SNPs). Quality control included SNP call rate >0.98, sample call rate >0.98, duplicate and HapMap concordance, identity by descent, and testing for Hardy-Weinberg equilibrium. Logistic regressions were performed with adjustment for age, gender, and first two principal components in an additive genetic model. Analysis was restricted to Caucasians and significance was considered at Bonferroni-corrected alpha = 6.84×10^{-8}.

RESULTS: We identified 85 FQT cases and 850 matched controls with genome-wide data. No SNPs reached the Bonferroni-corrected significance level. The strongest association was observed for the SNP rs8050801 (odds ratio 3.01, p=4.13×10^{-7}, minor allele frequency = 0.12). This SNP and two other strongly associated SNPs in linkage with rs8050801 were located in the intron of the membrane-bound transcription factor peptidase, site 1 gene (MBTPS1), which encodes a peptidase important for cholesterol regulation, lipid homeostasis, and lysosomal dysfunction.

CONCLUSIONS: We implicate SNPs from MBTPS1 as potential risk factors for FQT. Our results also suggest a role of lipid homeostasis and lysosomal dysfunction in FQT pathogenesis. However, no SNPs reached genome-wide significance levels and the identified associations require replication. Further study is warranted to confirm the role of MBTPS1, lipid homeostasis, and lysosomal dysfunction in FQT pathogenesis.

166. Knowledge and attitudes survey among healthcare professionals on the implications of pharmacogenetics. Dania Alkhiyami, B.Pharm[1], Dima Alsahan, B.Pharm[1], *Hazem Elewa, Ph.D., RPh, BCPS*[2], Ahmed AbdElbari, B.Pharm[3]; (1)College of Pharmacy, Qatar University, Doha, Qatar; (2)Qatar University, Doha, Qatar; (3)HMC Pharmacy, HMC, Doha, QatarPharmacists are expected to play an important role in applying pharmacogenetic discoveries to patient care. Despite the increased attention to genetic research in Qatar, clinicians' attitude towards pharmacogenetics' applications are not yet explored.

PURPOSE: To determine the level of awareness, and perceived clinical implications of pharmacogenetics among health care professionals (physicians and pharmacists) in Qatar.

METHODS: A cross-sectional survey instrument was developed based on literature review. Eligible participants were pharmacists and physicians currently practicing in Hamad Medical Corporation (HMC) hospitals in Qatar. The survey comprised questions on demographic and professional characteristics. It also evaluated the awareness, attitudes and challenges towards pharmacogenetics and its application.

RESULTS: Our preliminary results included 179 participants, 104 (58%) of which are pharmacists and the remaining 75(42%) are physicians. The overall participants' mean total awareness score was low (45%± 25). However, pharmacists tended to have higher awareness score compared to physicians but didn't reach statistical significance (48 ± 25% vs 41 ± 25%, p = 0.06). Pharmacists had significantly more positive attitude than physicians, towards taking the responsibility of applying pharmacogenetics to drug therapy selection, dosing and monitoring ("Agree" 63% vs 37%; "disagree" 5% vs 28%, $p < 0.001$), as well as counseling the patients on their pharmacogenetic testing results("Agree"67% vs 56%; "disagree" 10% vs 24%, p=0.05) and educating the patients about available pharmacogenetic testing for their medications ("Agree" 74% vs 52%; "disagree" 4% vs 18%, p=0.002). Both pharmacists and physicians perceived lack of knowledge (81%) as well as lack of guidelines (53%) among the major challenges towards the application of pharmacogenetics in Qatar.

CONCLUSION: Despite physicians' and pharmacists' low level of awareness towards pharmacogenetics, they both have positive attitude towards the clinical implications of pharmacogenetics. Pharmacists are more motivated to learn about pharmacogenetics and are more willing to take initiatives in its clinical application and patient education.

167E. Increasing the tamoxifen dose in CYP2D6 intermediate metabolizers increases toxicity. *Daniel Hertz, Pharm.D., Ph.D.*[1], Anna Snavely, Ph.D.[2], James Evans, M.D., Ph.D.[2], Joseph Ibrahim, Ph.D.[2], Christine Walko, Pharm.D.[3], Steven Anderson, M.D.[4], Karen Weck, M.D.[5], Peter Rubin, M.D.[6], Oludamilola Olajide, M.D.[7], Susan Moore, M.D.[7], Rachel Raab, M.D.[8], Daniel Carrizosa, M.D.[9], Steven Corso, M.D.[10], Garry Schwartz, M.D.[9], Jeffrey Peppercorn, M.D.[11], Mark Graham, M.D.[12], Sean Canale, M.D.[13], Howard McLeod, Pharm.D.[3], Lisa Carey, M.D.[2], William Irvin, Jr., M.D.[14]; (1)Department of Clinical Social and Administrative Sciences, University of Michigan College of Pharmacy, Ann Arbor, MI; (2)University of North Carolina at Chapel Hill; (3)Moffitt Cancer Center; (4)Laboratory Corporation of America; (5)School of Medicine, University of North Carolina, Chapel Hill, NC; (6)Moses Cone Regional Cancer Center; (7)Rex Hematology Oncology Associates; (8) Brody School of Medicine at East Carolina University; (9) Carolinas Medical Center Hematology-Oncology Associates; (10) Palmetto Hematology Oncology; (11)Duke Cancer Institute; (12) Waverly Hematology Oncology; (13)Carolina Breast Care Specialists; (14)Bon Secours Cancer Institute

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168. Addition of CYP2C9*5, *6, *8, *11 and rs12777823 genotypes into an existing warfarin dosing algorithm improves algorithm performance for African Americans. *Katarzyna Drozda, Pharm.D., M.S.*[1], Shitalben R. Patel, M.S.[1], Edith A. Nutescu, Pharm.D., M.S.[1], Larisa Cavallari, Pharm.D.[2]; (1)University of Illinois at Chicago College of Pharmacy, Chicago, IL; (2) Department of Pharmacotherapy and Translational Research, University of Florida, FL

PURPOSE: Recent clinical trial results cast doubt on the utility of genotype-guided warfarin dosing, specifically showing that a pharmacogenetic algorithm performs worse than a clinical algorithm in African Americans. However, many genotypes important in African Americans were not accounted for in clinical trials. We aimed to determine if adding the *CYP2C9*5, *6, *8, *11* and rs12777823G>A genotypes to an existing, recommended algorithm improves the performance of the algorithm in African Americans.

METHODS: A total of 274 African Americans on a stable dose of warfarin were enrolled and genotyped for *CYP2C9*2, *3, *5, *6, *8, *11; VKORC1* -1639G>A; and rs12777823G>A. Predicted dose requirements were calculated using the freely accessible www.warfarindosing.org algorithm, which is recommended by the Clinical Pharmacogenetics Implementation Consortium and includes the *CYP2C9*2, *3* and *VKORC1* -1639G>A genotypes plus clinical factors. The predicted dose was further reduced by adding the *CYP2C9*5* and *6* variants into the algorithm, and reducing doses by 20% for carriers of a *CYP2C9*8* or *11* allele and by 7 mg/wk or 9 mg/week in rs12777823 A allele heterozygotes or homozygotes, respectively. Doses predicted with the original (ORIG) and modified (MOD) algorithms were compared to observed (actual) doses in the study cohort overall and in carriers of a *CYP2C9*5, *6, *8, *11* or rs12777823 allele (variant carriers).

RESULTS: The mean ± SD dose predicted by the ORIG algorithm was significantly higher than the mean observed dose for the whole population (7.2 ± 1.8 vs 6.6 ± 2.5 mg/day; p<0.0001) and for variant carriers (7.4 ± 1.8 vs 6.0 ± 2.2 mg/day; p<0.0001). The dose predicted by the MOD algorithm was similar to the observed dose for the whole cohort (6.6 ± 1.8 mg/day, p=0.97) and for variant carriers (6.1 ± 1.6 mg/day; p=0.53).
CONCLUSIONS: These data suggest that accounting for variants important for African Americans will improve performance of warfarin pharmacogenetic dosing algorithms in this population.

170. Escitalopram pharmacogenetics: association between CYP2C19 and tolerance to a forced dose titration schedule in the treatment of Autism Spectrum Disorders (ASD). *Jeffrey Bishop, Pharm.D., M.S., BCPP*[1], Fedra Najjar, M.D.[2], Leah Rubin, Ph.D.[2], Thomas Owley, M.D.[3], Stephen Guter, M.S.[4], Edwin Cook, Jr., M.D.[2]; (1)Department of Pharmacy Practice, University of Illinois at Chicago, Chicago, IL; (2)Department of Psychiatry, University of Illinois at Chicago; (3)Department of Psychiatry, Rush University Medical Center; (4)Department of Psychiatry
PURPOSE: ASD are characterized by persistent deficits in social communication and restricted repetitive patterns of behaviors. Escitalopram (ESC) is commonly used to treat ASD, but there are individual differences in treatment response and tolerability. CYP2C19 encodes the primary enzyme responsible for the metabolism of ESC. We investigated whether genetic polymorphisms in CYP2C19 were related to symptoms and dosing in ASD.
METHODS: Study samples from two open-label, forced-titration, ESC treatment protocols using similar enrollment, assessment, and treatment strategies were combined for analysis. Participants (n=97, 5–50 yo, 80% male) with a confirmed DSM-IV ASD diagnosis completed the Aberrant Behavior Checklist-Community Version (ABC-CV) weekly for 6 weeks. Participants were initiated on 2.5 mg qd of ESC with weekly dose increases of 5 mg qd unless intolerable side-effects occurred. Genotypes associated with ultrarapid/increased (UM), extensive/normal (EM), and reduced/poor (PM) metabolizer groups were examined. Mixed effects regressions were used to examine group differences in the rates of change of symptoms and tolerated dose.
RESULTS: Overall, ABC-CV Irritability scores improved over the course of treatment (p<0.0001). Compared to both PM and EM groups, UMs had a slower dose escalation rate from week 2 to 6 (UMvsPM p=0.0033; UMvsEM p=0.024). Changes from baseline to endpoint on the ABC-CV and subscales did not differ across metabolizer groups.
CONCLUSION: To our knowledge, this is the first study to examine associations between genotypes and tolerance to a forced titration schedule in ASD. Unexpectedly, CYP2C19 UMs were associated with reduced tolerance to the titration schedule. Possible explanations may involve the more rapid conversion of ESC to metabolites. While known to exhibit lower serotonin transporter binding, other biological effects and receptor binding profiles of S-Desmethylcitalopram and S-Didesmethylcitalopram are unknown. Findings support the need for study on the biological effects of ESC metabolites as well as dosing implications of drug metabolizing genotypes early in treatment.

171. Implementation and evaluation of a *CYP2C19* genotype-guided antiplatelet therapy algorithm in high-risk coronary artery disease patients. *John Andrew Lee, Pharm.D.*[1], Brent N. Reed, Pharm.D., BCPS[2], David C. Plitt, M.D.[3], Jonathan D. Cicci, Pharm.D., BCPS[4], Kristen E. Tasca, Pharm.D.[4], Karen E. Weck, M.D.[5], Craig R. Lee, Pharm.D., Ph.D., FCCP[6], George A. Stouffer, M.D.[7]; (1)UNC Eshelman School of Pharmacy, Chapel Hill, NC; (2)University of Maryland School of Pharmacy, Baltimore, MD; (3)School of Medicine; University of North Carolina Hospitals and Clinics, Chapel Hill, NC; (4)University of North Carolina Hospitals and Clinics, Chapel Hill, NC; (5)School of Medicine, University of North Carolina, Chapel Hill, NC; (6)Division of Pharmacotherapy and Experimental Therapeutics, UNC Eshelman School of Pharmacy, Chapel Hill, NC; (7)Division of Cardiology, UNC School of Medicine, Chapel Hill, NC
PURPOSE: CYP2C19 intermediate/poor metabolizers (IMs/PMs) treated with clopidogrel following percutaneous coronary intervention (PCI) are predisposed to inadequate platelet inhibition and higher risk of poor outcomes. An algorithm that uses clinical factors and *CYP2C19* genotype to guide $P2Y_{12}$ inhibitor selection (clopidogrel, prasugrel, or ticagrelor) in high-risk patients undergoing PCI with stent placement was recently implemented at our institution. We sought to evaluate use of this algorithm and identify which factors influenced $P2Y_{12}$ inhibitor selection.
METHODS: This retrospective cohort study included 264 patients receiving PCI from July–December 2012. Associations between clinical factors, *CYP2C19* genotype (turnaround time: 24–48 hours), initial and final $P2Y_{12}$ inhibitor selection, and changes in therapy were evaluated by regression.
RESULTS: Selection of prasugrel or ticagrelor was common (initial: 32%; final: 36%). *CYP2C19* genotype was obtained in 229 patients (87%); of these, 68 (30%) were IMs or PMs. Multiple factors, including younger age, current myocardial infarction, absence of elevated bleeding risk, and prasugrel/ticagrelor use upon admission, were associated with initial prasugrel/ticagrelor selection ($p < 0.01$ for each). The strongest predictors for final prasugrel/ticagrelor selection versus clopidogrel were CYP2C19 IM/PM phenotype (59% vs 7.1%; OR 19, 95% CI 9.5–40, $p < 0.01$) and initial prasugrel/ticagrelor selection (70% vs 11%; OR 18, 95% CI 9.6–35, $p < 0.01$). Similar associations were observed in adjusted models. Therapy was changed in 49 patients (19%) and IM/PM phenotype was the primary predictor (59% vs 18%; OR 6.5, 95% CI 3.4–13, $P < 0.01$). Changes from clopidogrel to prasugrel/ticagrelor occurred almost exclusively in IMs/PMs (93%), whereas 84% of changes from prasugrel/ticagrelor to clopidogrel occurred in rapid/extensive metabolizers.
CONCLUSION: Selection of a $P2Y_{12}$ inhibitor in high-risk PCI patients was associated with both clinical factors and *CYP2C19* genotype. Changes in therapy, however, were driven primarily by genotype results, illustrating that obtaining and using *CYP2C19* genotype to guide $P2Y_{12}$ inhibitor selection in a clinical setting is feasible.

Pharmacokinetics/Pharmacodynamics/Drug Metabolism/Drug Delivery

172. Pharmacokinetics, safety, and tolerability of single and multiple-doses of pinocembrin injection administered intravenously in healthy subjects. *Guoying Cao, M.D.*; Beijing Hospital, China
PURPOSE: To investigate the safety, tolerability and pharmacokinetics of a new neuroprotective agent, pinocembrin.
METHODS: A double-blind, placebo-controlled, randomized study was carried out in 58 healthy subjects. Single ascending doses of pinocembrin (20–150 mg) were evaluated in 5 cohorts. Multi-dose was studied at pinocembrin 60 mg.
RESULTS: Pinocembrin was well tolerated.No serious adverse events occurred. No subjects was discontinued because of a treatment emergent AE. Treatment related adverse event was acute urticaria. Two subjects in 150 mg cohort developed grade II urticaria during the study. One subject discontinued after 3 days at 60 mg bid because of diarrhea. In the single-dose study, the mean peak plasma pinocembrin concentration was obtained at the end of the 30-min infusion. The C_{max} ranged from 0.28 μg/mL to 2.46 μg/mL. $AUC_{(0,\infty)}$ ranged from 10.34 min × μg/mL to 89.34 min × μg/mL. The $t_{1/2}$ was similar across 5 dose groups, ranging from 40 to 55 min. Both urinary and feces excretion levels of pinocembrin were extremely low and similar among each dose groups, with mean values ranging from 0.07% to 0.17% and 0.94% to 1.94% of the administered dose, respectively. Linear increases in C max and $AUC_{(0,\infty)}$ were observed. The pharmacokinetics of pinocembrin in multiple-dose was similar to those observed in the single-dose study, with no evidence of accumulation. Both urinary and feces excretion levels of pinocembrin were extremely low.

CONCLUSION: Pinocembrin displayed linear plasma pharmacokinetics over the dose range, 20–150 mg and was well tolerated up to 120 mg/day when administered intravenously to healthy adults. No major safety concerns were identified that would preclude further clinical development of pinocembrin injection.

173. Impact of high flux dialyzers on vancomycin serum concentrations. *Joan Mege, Pharm.D.*[1], Robert Jones, D.O.[2], Oluwakemi Fagbami, M.D., Amal Kebede, D.O., Beth Bechdel, MSN, R.N.; (1)Department of Pharmacy, Reading Hospital, Reading, PA; (2)Section of Infectious Diseases, Reading Health System, Reading, PA

PURPOSE: This study evaluated extracorporeal removal of vancomycin when high-flux dialyzers (Polyflux Revaclear and/or Polyflux Revaclear MAX by Gambro) are utilized during hemodialysis (HD) to assess the appropriateness of current vancomycin dosing strategies in HD patients and ensure maintenance of recommended serum concentrations.

METHODS: Thirty series of vancomycin serum levels obtained prior to HD, immediately post-dialysis and 3 hours after the end of HD were collected from 16 inpatients at a community hospital. Patient and HD session related variables, including height, age, gender, HD efficiency as expressed by Kt/v (K = clearance of urea; t = duration of HD; v = distribution volume of urea), pre- and post-dialysis weight, duration of HD session, volume removed and specific dialyzer used, were also recorded.

RESULTS: Significant differences were noted between pre-dialysis (24.44 + 4.72, mean + Standard Deviation) and immediate post-dialysis (14.13 + 2.89) serum levels as well as between pre-dialysis and 3 hour post-dialysis (17.35 + 2.87) serum levels (both $p<0.001$). Redistribution occurring between the immediate post-dialysis and 3 hour post-dialysis serum levels also reached statistical significance ($p<0.001$). The patient HD session variable with the greatest correlation to the change in serum vancomycin levels was the efficiency of HD as expressed by Kt/v.

CONCLUSIONS: This study indicates the most accurate time to measure serum vancomycin levels in patients using high flux dialyzers may be following the post-dialysis redistribution phase. Obtaining vancomycin levels at that time introduces significant timing challenges, making it impractical in many settings. Further evaluation may be required to determine the most appropriate pre-dialysis threshold at which to re-dose vancomycin to ensure adequate serum concentrations between HD sessions to minimize treatment failures and prevent the emergence of resistance.

174E. Effect of alcohol on clopidogrel metabolism: identification of a new alcohol-dependent pathway. *S. Casey Laizure, Pharm.D.*, Robert B. Parker, Pharm.D., Zheyi Hu, Ph.D., Vanessa Herring, B.S.; Department of Clinical Pharmacy, University of Tennessee College of Pharmacy, Memphis, TN

Published in Hu ZY, Laizure SC, Herring VL, Parker RB. Effect of alcohol on clopidogrel metabolism: Identification of a new alcohol-dependent pathway. FASEB J 2014; 28(Supplement 1):1141.14.

175. Lack of correlation between PK and changes in pulmonary artery systolic pressure in healthy volunteers following administration of the HIF-prolyl hydroxylase inhibitor, GSK1278863. Laura Demopoulos, M.D., K. Mahar, xxx, T.F. Haws, xxx, L.A. Morgan, xxx, Z. Fang, xxx, Eric J. Olson, Ph.D., J.J. Lepore, xxx; Heart Failure DPU, GlaxoSmithKline, King of Prussia, PA

PURPOSE: Hypoxia-inducible factor (HIF) may raise pulmonary artery systolic pressure (PASP). HIF-prolyl hydroxylase inhibitors (PHDi) stabilize HIF and are in development for anemia. Increased PASP represents a theoretical safety concern. We evaluated PK exposure of the PHDi GSK1278863 and its correlation with PASP during normoxia (N) and hypoxia (H) in healthy volunteers (HV) (NCT01673555).

METHODS: HVs underwent parallel, blinded randomization to GSK1278863 5 mg/d (n=16), 100 mg/d (n=16), or placebo (PBO, n=17) for 5 days. The dose difference enabled robust PK/PD analyses, and included potential chronic (5 mg) and supratherapeutic (100 mg) doses, based on increased GSK1278863 exposure from CYP2C8 drug interactions. PASP was estimated by echocardiography under N (room air) and H (13% O_2), at baseline and on Days 1 and 5. PK was measured on Days 1 and 5, and parameters calculated. PK/PD relationships were explored graphically to determine the ability to model.

RESULTS: We previously reported that neither dose resulted in a clinically significant increase in PASP on N, nor meaningfully augmented the PBO-adjusted difference between changes from baseline in PASP on H and N (delta-delta). Analysis revealed: (i) the range of AUC and Cmax between the doses differed by two orders of magnitude; (ii) no relationship existed between PK and either change from baseline in PASP on N, or delta-delta of change in PASP on H and N. Interventions were generally well-tolerated.

CONCLUSIONS: Short-term PHD inhibition with GSK1278863 does not increase basal PASP or hypoxic pulmonary vasoconstriction in HVs. PK/PD analyses demonstrate no correlation between PK and PASP across a large exposure range; therefore, the possibility of missing a drug effect on PASP at clinically relevant exposures is unlikely.

176E. Crushing ticagrelor tablets accelerates exposure compared with intact tablets. Renli Teng, Ph.D., *Glenn Carlson, M.D.*, Judith Hsia, M.D.; AstraZenecaLP, Wilmington, DE

Presented at the American College of Cardiology 63rd Annual Scientific Session, Washington, DC, March 29–31, 2014.

177. Assessing real world dose adjustment in patients switching from intravenous immunoglobulin (IGIV) therapy to subcutaneous immunoglobulin (IGSC) 20%. *Xiaolan Ye, Ph.D.*[1], Yan Xiong, M.S.[2], Josephine Li-McLeod, Ph.D.[2]; (1)Baxter HealthCare, Deerfield, IL; (2)Baxter HealthCare, Westlake Village, CA

PURPOSE: The US package insert for IGSC 20% (Hizentra, CSL) recommends dose adjustment to achieve systemic serum IgG exposure (area under the concentration time curve [AUC]) not inferior to that of the previous IGIV treatment. The objective of this study was to examine if dose adjustment occurred in Primary Immunodeficiency (PI) patients in real world settings.

METHODS: Claims for IG products dispensed for PI patients were extracted from five US specialty pharmacies between January 2009 and October 2013. Route of administration was identified by prescribed brand and dosing frequency. Patients with ≥2 claims for any IGIV who subsequently switched to IGSC 20% were included in the analysis. Dosing adjustment was calculated for each patient as the ratio of gm/30 days of [(IGSC 20%)/(IGIV)]. Wilcoxon signed rank test was used to examine the research hypothesis that the dose adjustment ratio was different from 1.

RESULTS: This study identified 247 patients who met the inclusion and exclusion criteria. These patients all switched from any IGIV to IGSC 20% and 42 were pediatric patients (age 0–16 years), and 205 were adult patients (>16 years). Among all the patients, 75% had an increase in their dose. The mean dose adjustment for the entire study was 1.42 (median 1.30) and was statistically significant ($p<0.0001$). This dose adjustment was seen in both age groups and the mean for the pediatric group was 1.34 (median 1.35) and for the adult group it was 1.44 (median 1.30). The median number of days on IGIV and IGSC 20% therapy in this study was 351 and 345 days, respectively.

CONCLUSION: Using real world pharmacy dispensing data, this study suggests that a dose increase occurred when PI patients switched from IGIV therapy to IGSC 20%.

178. Comparing estimated glomerular filtration rates based on serum creatinine versus serum cystatin C and effect on renal dosing of medications. *Marissa Trester, Pharm.D.*, Lorraine Wang, Pharm.D., Shirley Chao, Pharm.D., Daniel Maddix, Pharm.D.;

Pharmacy Services, San Francisco Veterans Affairs Medical Center, San Francisco, CA
PURPOSE: This study assessed whether serum cystatin C predicted the same estimated glomerular filtration rate (eGFR) and recommended renal dosing of medications as serum creatinine.
METHODS: This study was a retrospective chart review of San Francisco Veterans Affairs Medical Center (SFVAMC) patients who had serum creatinine and serum cystatin C documented on the same day over 1 year. Patient eGFR with Modified Diet in Renal Disease equation ($eGFR_{MDRD}$) and eGFR with Cockcroft and Gault equation ($eGFR_{CG}$) were each compared to eGFR with SFVAMC cystatin C equation ($eGFR_{cys}$). Recommended doses of a pre-determined list of renally adjusted medications (ertapenem, alendronate, nitrofurantoin, and metformin) using $eGFR_{cys}$ and either $eGFR_{MDRD}$ or $eGFR_{CG}$ were compared.
RESULTS: Of 233 patients included, most were outpatient (77%) and male (96%), with average age of 72 years. Average weight and BMI were 88 kg and 29 kg/m^2, respectively. Average $eGFR_{cys}$ was 61 mL/minutes, average $eGFR_{CG}$ was 62 mL/minutes, and average $eGFR_{MDRD}$ was 68 mL/min. The difference between $eGFR_{CG}$ and eGFRcys (calculated as $eGFR_{CG}$–$eGFR_{cys}$) was negligible overall, but was significant in patients with $eGFR_{CG}$ 15–59 mL/min (n=123), with average difference of −8 mL/minutes ($p < 0.01$). The average difference between $eGFR_{MDRD}$ and $eGFR_{cys}$ (calculated as $eGFR_{MDRD}$–$eGFR_{cys}$) was +8 mL/minutes ($p < 0.01$). Recommended renal dosing of ertapenem, alendronate, nitrofurantoin, and metformin would have been different with $eGFR_{cys}$ versus standard serum creatinine-based dosing in 7%, 14%, 30%, and 24% of patients, respectively.
CONCLUSIONS: Differences in $eGFR_{cys}$ versus $eGFR_{MDRD}$ and $eGFR_{CG}$ sometimes resulted in different recommended renal dosing of medications. If accurate renal function assessment is crucial for dosing of medications, $eGFR_{cys}$ could be considered.

Psychiatry

179. Prescribing trends in Veterans with posttraumatic stress disorder following updated 2010 VA/DoD guidelines. *Abbey N. Loy, Pharm.D.*, Autumn D. Bagwell, Pharm.D., Jennifer R. Bean, Pharm.D., BCPP, BCPS, Jennifer W. Baker, Pharm.D., BCACP, BCPS, Theron N. Fourakre, Pharm.D., BCPS, Jennifer L. Easterling, Pharm.D.; Veterans Affairs Tennessee Valley Healthcare System, Murfreesboro, TN
PURPOSE: PTSD continues to be a rising problem in the veteran population. The updated 2010 VHA/DoD Clinical Practice Guideline for Management of Post-Traumatic Stress Disorder (PTSD) provides guidance and evaluation of optimal treatment modalities. Given emerging evidence on the recommended treatment of PTSD and the 2010 VHA/DoD guideline update, it is important to assess both adherence to and effectiveness of these guidelines in the veteran population.
METHODS: Patients were included if they received medical care within the Tennessee Valley Healthcare System (TVHS) from January 1, 2008 to December 31, 2008 and/or January 1, 2012 to December 31, 2012, had an ICD-9 diagnosis code for PTSD, and received at least one prescription for medications within the following classes: selective serotonin reuptake inhibitors (SSRIs), serotonin-norepinephrine reuptake inhibitors (SNRIs), antipsychotics, tricyclic antidepressants (TCAs), monoamine oxidase inhibitors (MAOIs), mirtazapine, prazosin, buspirone, benzodiazapeines, and nefazodone.
RESULTS: A total of 7,691 and 11,135 unique Veterans were identified as meeting inclusion/exclusion criteria for 2008, 2012 respectively. 407 charts were randomly evaluated for each time period. The average age was 57.2 ± 13.6 and 52.7 ± 14.9 years for 2008/2012 respectively and a majority of Veterans were male (87%, 86%). There was no statistically significant change in the prescribing trends of SSRIs nor SNRIs between 2008 and 2012. Of the secondary endpoints, prazosin and mirtazapine prescribing revealed a statistically significant increase from 2.2% to 15.0% ($p<0.001$) and 8.6% to 13.5% ($p=0.0453$) respectively. Benzodiazepine prescribing trended down, however was not found to be statistically significant.
CONCLUSION: Prescribing trends of SSRI/SNRIs continued to emulate the 2010 VA/DoD PTSD Practice Guidelines with over three-fourths of patients diagnosed with PTSD receiving a prescription for one of these first-line therapies. While there was a downward trend in benzodiazepine prescribing, it was not statistically significant revealing the continued need to decrease their utilization.

Pulmonary

180. Effect of a pharmacist provided education program on the prescribing of maintenance medications for asthma. *Rebecca L. Bragg, Pharm.D., BCPS*, Amie D. Brooks, Pharm.D., FCCP, BCPS, BCACP, Suzanne G. Bollmeier, Pharm.D., BCPS, AE-C; St. Louis College of Pharmacy, St. Louis, MO
PURPOSE: The objective was to determine whether an education program focused on pharmacologic asthma management impacted the prescribing patterns for maintenance medications for patients with asthma.
METHODS: Patients with an asthma diagnosis scheduled for a primary care appointment between February 1 and April 30, 2014 were included. Pharmacy claims information was gathered to determine if patients had more than one fill of rescue inhaler within a 30 day period. Patients that were determined to overuse rescue inhalers had electronic messages sent to their provider prior to the appointment to recommend consideration of asthma therapy modification. The intervention also included an evidence based asthma management educational presentation for providers. The percentage of patients prescribed maintenance medications for asthma was evaluated pre- and post-intervention.
RESULTS: The study included 100 patients- 80% African American, 77% female with age 44.8 ± 11.56 years. Maintenance medications were prescribed for 61% of patients at baseline and 62% post intervention (p=1.0). Of the patients determined to be over users of their rescue medication (n=11), 25% of patients that had an individual message sent to their provider (n=4) had their regimen modified (n=1). Non-statistically significant results were found for change in pulmonary function tests, urgent care visits, tobacco use, and non-selective beta blocker prescribing.
CONCLUSION: This study did not find a significant improvement in prescribing patterns of maintenance asthma medications, however this could be due to limited sample size and pharmacy claims reporting delays. Further studies may assess patient education, use of asthma action plans, medication compliance, and symptom severity.

181. A proof of concept study to evaluate use of aerosolized 13C-urea to detect urease-producing bacteria in lungs of cystic fibrosis patients. Hengameh Raissy, Pharm.D.[1], Theresa Heynekamp, M.D.[2], Lea Davies, M.D.[1], Michelle Harkins, M.D.[2]; (1) Depratemtn of Pedicatrics, University of New Mexico, Albuquerque, NM; (2)Department of Internal Medicine, University of New Mexico, Albuquerque, NM
PURPOSE: Urease is an enzyme produced by many bacteria. Pseudomonas aeruginosa (PA) expresses urease and rapidly metabolizes 13C urea to 13CO2. This is a "proof of concept" study to determine whether inhalation of 13C-urea can be used to detect the presence of PA in the airways of patients with cystic fibrosis (CF) by detecting 13CO2 in breath.
METHODS: Three adult CF subjects colonized with PA received 20 and 50 mg doses of aerosolized 13C-urea. Patients performed baseline spirometry before administration of 13C-urea and then received 2 puffs of albuterol before inhalation of 13C-urea via a jet nebulizer. Dose administration was followed by serial spirometry (10 minute and 30 minute post inhalation) and collection of exhaled breath at 5, 10 and 15 minutes post inhalation. The

13CO2/12CO2 was measured by POConeTM Infrared Spectrophotometer.
RESULTS: Mean of 13CO2/12CO2 delta over baseline values in CF patients at 5, 10 and 15 minutes post inhalation were as follow: 20 mg dose 4‰, 1‰ and 1‰; 50 mg dose: 10‰, 3‰ and 1.5‰. There was no clinical significant change in any of the spirometry values compared to baseline.
CONCLUSION: Inhaled 13C-urea for detection of PA was safe and preliminary data suggest that 13CO2/12CO2 delta over baseline values may be higher in CF patients with PA at 5–10 minutes after inhalation of 13C-urea. Preliminary data of t1/2 of 13CO2/12CO2 delta over baseline values suggests that the first measurement in 5 minutes may be a decline from the peak. Future research will evaluate13CO2/12CO2 at earlier time points. Inhaled 13C-urea may offer an advantage for detecting PA infection in young children who have difficulty producing sputum for culturing.

182. A dose-escalating study to evaluate safety of aerolized 13C-urea to detect urease-producing bacteria in lungs of cystic fibrosis patients. Hengameh Raissy, Pharm.D.[1], Theresa Heynekamp, M.D.[2], Lea Davies, M.D.[1], Michelle Harkins, M.D.[2]; (1) Depratement of Pedicatrics, University of New Mexico, Albuquerque, NM; (2)Department of Internal Medicine, University of New Mexico, Albuquerque, NM
PURPOSE: Urease is an enzyme unique to many bacteria. In Pseudomonas aeruginosa (PA) it expresses urease and rapidly metabolizes 13C urea to 13CO2. This is a "proof of concept" study to determine whether inhalation of 13C-urea can be used to detect the presence of PA in the airways of patients with cystic fibrosis (CF) by detecting 13CO2 in breath. Our hypothesis is that a relatively low dose of aerosolized 13C-urea can be safely administered to detect PA in the lungs of patients with CF.
METHODS: In this open, uncontrolled study, the safety of inhaled 13C-urea was established in a dose escalating manner in healthy adult volunteers. First, the safety of 20 mg inhaled 13C-urea was evaluated in three healthy adult volunteers followed by 50 mg. When the safety of both doses was established, 2 adult CF subjects colonized with PA were enrolled in the study and administered 20 and 50 mg doses of inhaled 13C-urea. For all visits, participants performed baseline spirometry before administration of 13C-urea. 13C-urea was administered via a jet nebulizer, followed by serial spirometry (10 minute and 30 minute post inhalation) and collection of exhaled breath at 5, 10 and 15 minutes post inhalation. The 13CO2/12CO2 was measured by POConeTM Infrared Spectrophotometer.
RESULTS: There was no clinical significant change in any of the spirometry values compared to baseline in healthy participants and CF patients. Mean of 13CO2/12CO2 delta over baseline values in healthy participants at 5, 10 and 15 minutes post inhalation were as follow: 20 mg dose: 0.8‰, 0.4‰ and 0.1‰; 50 mg dose: 2.1‰, 0.8‰ and 0.1‰.
CONCLUSION: Inhaled 13C-urea for detection of PA was safe. Inhaled 13C-urea may offer an advantage for young children who have difficulty producing sputum for culturing.

Rheumatology

183. Meta-analysis of serious infections with tofacitinib and biological treatment in rheumatoid arthritis clinical trials. *Vibeke Strand, M.D.*[1], Sima Ahadieh, M.S.[2], Jonathan French, ScD[3], Jamie Geier, Ph.D.[4], Sriram Krishnaswami, Ph.D.[5], Sujatha Menon, Ph.D.[5], Tina Checchio, Ph.D.[2], Mary Boy, VMD[6], Richard Riese, M.D., Ph.D.[5], Juan Gomez-Reino, M.D., Ph.D.[7]; (1)Biopharmaceutical Consultant, Portola Valler, CA; (2)Pharmacometrics, Pfizer Inc, Groton, CT; (3)Metrum Research Group, Tariffville, CT; (4) Epidemiology, Pfizer Inc, New York, NY; (5)Pfizer Inc, Groton, CT; (6)Clinical R&D, Pfizer Inc, Groton, CT; (7)Universitario de Santiago, Hospital Clinico, Santiago, Spain
PURPOSE: Limited head-to-head comparator data are available within the tofacitinib rheumatoid arthritis (RA) program to compare rates of serious infection events (SIEs) relative to approved biologic therapies. Here we aim to conduct a meta-analysis of randomized controlled trials (RCTs) and long-term extension (LTE) studies to contextualize SIEs for tofacitinib relative to approved biologics.
METHODS: A systematic literature search was conducted. Incidence rates (events/100 patient-years) of SIEs for each therapy were estimated based on RCT and LTE data using a random effects model. Relative and absolute risk comparisons to placebo (RCT data only) were made using Mantel-Haenszel methods. A total of 66 RCTs and 22 LTEs were used.
RESULTS: Estimated incidence rates (events/100 patient-years [95% CI]) were 3.04 (2.49, 3.72) for abatacept, 3.72 (2.99, 4.62) for rituximab, 5.45 (4.26, 6.96) for tocilizumab, and 4.90 (4.41, 5.44) across TNF inhibitor (TNFi) therapies. The tofacitinib rates from the Phase 3 trials were 3.02 (2.25, 4.05) and 3.00 (2.24, 4.02) for 5 and 10 mg twice daily (BID), respectively. LTE incidence rates were 2.50 (2.05, 3.04) for 5 mg BID and 3.19 (2.74, 3.72) for 10 mg BID. The risk ratio (RR; [95% CI]) for TNFi relative to placebo in methotrexate inadequate responder trials (n=24) was 1.50 (1.0, 2.25). The tofacitinib RRs, relative to placebo, were 2.21 (0.60, 8.14) for 5 mg BID and 2.02 (0.56, 7.28) for 10 mg BID. Risk differences (RDs; [95% CI]) relative to placebo were 0.94% (0.25%, 1.63%) for TNFi therapies, 0.38% (−0.24%, 0.99%) for tofacitinib 5 mg BID, and 0.40% (−0.22%, 1.02%) for tofacitinib 10 mg BID.
CONCLUSION: Comparisons of incidence rates, RRs and RDs suggest that the risk of SIEs with tofacitinib is comparable to published rates for biologic therapies in the treatment of moderate to severely active RA.

184. Assessment of lipid changes and infection risk in diabetic and nondiabetic patients with rheumatoid arthritis treated with tofacitinib. W. Rigby, M.D.[1], *L. Takiya, Pharm.D., BCPS*[2], S. Wood, RN MA[3], H. Fan, M.S.[4], T. Jones, M.D., MPh[2]; (1)Geisel School of Medicine at Dartmouth, Dartmouth Hitchcock Medical Center, Lebanon, NH; (2)Pfizer Inc, Collegeville, PA; (3) Pfizer Inc, Groton, CT; (4)Pfizer Inc, Collegeville, CT
PURPOSE: Tofacitinib is an oral JAK inhibitor for the treatment of rheumatoid arthritis (RA). This analysis evaluated selected safety endpoints in patients with and without diabetes mellitus (DM) receiving tofacitinib for RA.
METHODS: Safety endpoints, including changes in fasting blood glucose (FBG), lipids, and frequency of all infections, were evaluated in a *post-hoc* pooled analysis of five tofacitinib Phase 3 studies in patients who were inadequate responders to DMARDs. Baseline clinical characteristics, laboratory measures and follow-up lipid and FBG (four studies) data at Month 3 were analysed descriptively. Categorical (American Diabetes Association [ADA]) changes in FBG vs baseline were compared using shift analyses.
RESULTS: At baseline, 8.9% (108/1216), 8.5% (103/1214), and 7.0% (48/681) of patients had DM in the tofacitinib 5 mg BID, 10 mg BID, and placebo groups, respectively; mean FBG levels in these patients were similar at baseline (138.0, 129.8, and 138.9 mg/dL) and at Month 3 (126.1, 124.0, and 129.5 mg/dL). FBG shift analysis revealed that, with tofacitinib 5 mg BID, 10 mg BID and placebo, 10, 19 and 9 patients moved to a higher ADA category; 19, 13, and 9 moved to a lower category; 53, 46, and 25 had no change. Increases in mean low-density lipoprotein cholesterol (LDL-C) and triglyceride (TG) were observed at Month 3 with tofacitinib, and were similar in patients with and without DM. By Month 3, 23.1%, 21.4%, and 25.0% of patients with DM had ≥1 infection with tofacitinib 5 mg BID, 10 mg BID, and placebo vs 21.0%, 21.8%, and 18.6% without DM, respectively.
CONCLUSIONS: Most patients with RA and DM showed no change in mean FBG after 3 months' tofacitinib; FBG increases were similar with placebo. Increases in LDL-C and TG in tofacitinib-treated patients, and numbers of patients who experienced infection, were similar in patients with and without DM.

185. Efficacy and safety of tofacitinib in patients with rheumatoid arthritis that had inadequate response to non-biologic DMARDs or one or more biologic DMARDs including tumor necrosis inhibitors: pooled analysis from Phase 2 and 3 studies. C. Charles-Schoeman, M.D.[1], G.R. Burmester, M.D.[2], A. Koenig, DO[3], J. Maurey, Pharm.D.[3], S. Naik, Ph.D.[3], *J. Bourret, Pharm.D.*[4], K. Kwok, M.Sc.[5], E. Bananis, Ph.D.[3], R. Fleischmann, M.D.[6]; (1)University of California, Los Angeles, Los Angeles, CA; (2)Charité – University Medicine Berlin, Berlin, Germany; (3)Pfizer Inc, Collegeville, PA; (4)Pfizer Inc, Collegeville, CT; (5)Pfizer Inc, New York, NY; (6)Metroplex Clinical Research Center, University of Texas Southwestern Medical Center, Department of Medicine, Dallas, TX

PURPOSE: To compare tofacitinib 5 mg BID (an oral Janus kinase inhibitor for the treatment of rheumatoid arthritis [RA]) vs placebo (PBO) in patients (pts) with an inadequate response (IR) to a non-biologic conventional synthetic disease modifying antirheumatic drug (csDMARD) or an IR to ≥1 tumor necrosis factor inhibitors (TNFi; efficacy) or biologic-IR (safety).

METHODS: The comparison was performed on pooled data from 4 Phase (Ph) 2 and 5 Ph 3 randomized, controlled tofacitinib studies in RA pts. Pts received tofacitinib 5 mg BID or PBO as monotherapy, or with background methotrexate or other csDMARDs. Efficacy was assessed in csDMARD-IR and TNFi-IR populations. Safety analyses included Ph 3 csDMARD-IR or biologic-IR.

RESULTS: Baseline demographics and disease characteristics were similar with tofacitinib and PBO within csDMARD-IR (n=1071/651), one TNFi-IR (n=146/115), multiple-TNFi–IR (n=77/58) and biologic-IR (n=247/181); TNFi-IR and biologic-IR were heavier and had longer disease duration than csDMARD-IR. With csDMARD-IR, ACR20 rates were 60.3% vs 26.6% with tofacitinib vs PBO (p<0.0001). With one TNFi-IR, ACR20 rates were 46.2% vs 27.4% with tofacitinib vs PBO (p=0.002); with multiple TNFi-IR, ACR20 rates were 39.0% vs 17.2% with tofacitinib vs PBO (p=0.004). ACR50 and 70 rates and HAQ improvement followed similar patterns. In Ph 3 studies, incidence rates (per 100 pt-years [95% CI]) of serious adverse events with tofacitinib vs PBO: 11.6 (9.3, 14.4) vs 15.0 (9.9, 22.8) for csDMARD-IR and 11.7 (7.2, 19.1) vs 19.0 (9.5, 38.0) for biologic-IR. CIs were wide and overlapping for all events and treatment groups due to the limited sample size in PBO and biologic-IR.

CONCLUSIONS: Regardless of prior DMARD or biologic therapy, tofacitinib reduced signs and symptoms of RA. Tofacitinib had a numerically greater clinical response after failure of csDMARDs than after failure of one or more TNF inhibitors. The safety profile appeared similar between csDMARD-IR and biologic-IR.

186. Efficacy and safety of tofacitinib in older and younger patients with rheumatoid arthritis. J.R. Curtis, M.D., M.S., MPh[1], H. Schulze-Koops, M.D.[2], *L. Takiya, Pharm.D., BCPS*[3], C. Mebus, Ph.D.[4], K. Terri, Ph.D.[5], P. Biswas, Ph.D.[4], T. Jones, M.D., MPh[3]; (1)University of Alabama at Birmingham, Birmingham, AL; (2)University of Munich, Germany; (3)Pfizer Inc, Collegeville, PA; (4)Pfizer Inc, Groton, CT; (5)Pfizer Inc, New York, NY

PURPOSE: Tofacitinib is an oral Janus kinase inhibitor for the treatment of rheumatoid arthritis (RA). This post hoc analysis evaluated tofacitinib efficacy (pooled Phase (P) 2/P3 studies) and safety (P3/long-term extension [LTE] studies) in older (≥65 years) and younger (<65 years) patients.

METHODS: Efficacy was assessed by American College of Rheumatology (ACR) 20/50/70 response rates and Health Assessment Questionnaire–Disability Index (HAQ-DI) improvement of ≥0.22 from baseline; probability ratio (PR): proportion of patients with tofacitinib divided by placebo (Month 3). Incidence rates evaluated for serious adverse events (SAE), serious infection events (SIE), herpes zoster (HZ), and discontinuations due to AE (dAE).

RESULTS: Patients received tofacitinib 5 mg or placebo BID; 2117 were evaluated for efficacy. PRs (95% CI) of ACR20/50/70 and HAQ-DI improvement rates in older patients receiving tofacitinib (n=196) versus placebo (n=122) were 1.86 (1.42–2.42), 2.84 (1.72–4.70), 3.32 (1.49–7.42), and 1.23 (1.02–1.50), respectively, which were similar to, or slightly lower than, PRs for younger patients. In P3, SAE and dAE were higher in older versus younger patients, irrespective of treatment; HZ rates appeared higher with tofacitinib (Table). SIE occurred more frequently in older patients with tofacitinib versus placebo. LTE findings were similar.

CONCLUSIONS: Tofacitinib had similar efficacy in older (≥65 years) and younger patients, consistent with RA patient databases of biologic DMARDs (Listing et al. 2013). Older patients had greater risk of SAE, SIE, and dAE than younger patients. The tofacitinib benefit-risk profile must be evaluated when considering treatment of older RA patients.

Table. Incidence rate/100 patient-years (95% CI), safety endpoints (P3).

Younger		Older	
Placebo (n=580)	Tofacitinib 5 mg BID (n=1026)	Placebo (n=101)	Tofacitinib 5 mg BID (n=190)
SAE			
13.4 (8.9–20.2)	10.1 (8.1–12.7)	24.7 (11.8–51.9)	22.5 (15.5–32.5)
dAE			
12.2 (7.9–18.6)	9.9 (7.9–12.4)	13.9 (5.2–37.0)	14.5 (9.3–22.8)
SIE			
1.7 (0.6–5.4)	2.5 (1.6–3.9)	0	7.6 (4.1–14.2)
HZ			
1.7 (0.6–5.4)	4.6 (3.3–6.4)	0	3.1 (1.2–8.2)

187. Reversibility of pharmacodynamic effects after short and long-term treatment with tofacitinib in patients with rheumatoid arthritis. *Mark C. Genovese, M.D.*[1], Thomas T. Kawabata, Ph.D.[2], Koshika Soma, M.D.[2], Sujatha Menon, Ph.D.[2], James D. Clark, Ph.D.[3], Jennifer A. Hodge, Ph.D.[4], Lisa Takiya, Pharm.D., BCPS[5], Richard Riese, M.D., Ph.D.[2], Sriram Krishnaswami, Ph.D.[2]; (1)Stanford University Medical Center, Stanford, CA; (2) Pfizer Inc, Groton, CT; (3)Pfizer Inc, Cambridge, MA; (4)Pfizer Inc, New York, NY; (5)Pfizer Inc, Collegeville, PA

PURPOSE: Tofacitinib is a targeted, oral Janus kinase (JAK) inhibitor for the treatment of rheumatoid arthritis which has a short half-life (3 hours). This analysis investigated the reversibility of the pharmacodynamics effects of tofacitinib after discontinuation.

METHODS: Blood samples were collected following discontinuation of tofacitinib from 2 randomized Phase 2 studies of 4 and 6 weeks in duration, and after a 2-week temporary withdrawal from 1 long-term extension (LTE) study. Phosphorylation of signal transducer and activator of transcription (STAT)5 was measured as a proxy of JAK1/3 dependent signaling. In addition, changes in interferon-inducible protein-10 (IP-10), lymphocyte subsets (natural killer (NK) and B cells), neutrophils, C-reactive protein (CRP) were measured. Clinical efficacy was evaluated via DAS28-4(ESR) and HAQ-DI.

RESULTS: After short-term tofacitinib treatment (4–6 weeks), mean pSTAT5 levels fully reversed to baseline within 24 hours after discontinuation, while serum IP-10 levels and NK and B cell counts completely reversed to baseline levels 1–2 weeks after discontinuation; mean CRP and neutrophil counts partially reversed over 2–4 weeks after discontinuation. After a 2-week withdrawal from longer term tofacitinib treatment (median:~ 22 months), B cell counts, CRP, DAS28-4(ESR) and HAQ-DI values reversed after 1–2 weeks (Table).

CONCLUSION: The pharmacodynamic effects of short- or long-term tofacitinib treatment are reversible, after approximately 2 weeks of discontinuation. These data provide a scientific basis for the reversal of many of pharmacologic effects of tofacitinib after

2 weeks of discontinuation.**Table: Reversibility of pharmacodynamic endpoints after discontinuation of tofacitinib treatment.**

Biomarker	Change during treatment	Mean time to reversal (weeks)
Phase 2 study (treatment duration: 4 weeks)		
pSTAT5	↓	<1
IP-10	↓	1
Phase 2 study (treatment duration: 6 weeks)		
CRP	↓	2
B Cells	↑	2
NK Cells	↓	2
Neutrophils	↓	4
LTE study (median ~22 months)		
B cells	↑	1
CRP	↓	1
DAS28-4(ESR)	↓	1
HAQ-DI	↓	2

188. Integrated safety analysis of tofacitinib in rheumatoid arthritis clinical trials with a cumulative exposure of 12,664 patient-years. S. Cohen, M.D.[1], Y. Tanaka, M.D.[2], X. Marriette, M.D.[3], J.R. Curtis, M.D., M.S., MPh[4], K. Kwok, M.Sc.[5], E.B. Lee, M.D.[6], P. Nash, M.D.[7], K. Winthrop, M.D.[8], C. Charles-Schoeman, M.D.[9], K. Thirunavukkarasu, M.D.[10], *A. Anisfeld, Ph.D.*[5], L. Wang, M.D.[11], Richard Riese, M.D., Ph.D.[11], J. Wollenhaupt, M.D.[12]; (1) Clinical Research Center, Dallas, TX; (2)University of Occupational and Environmental Health, Kitakyushu, Japan; (3) Paris-Sud University, Paris, France; (4)University of Alabama at Birmingham, Birmingham, AL; (5)Pfizer Inc, New York, NY; (6) Seoul National University, Seoul, South Korea; (7)University of Queensland, Queensland, Australia; (8)Oregon Health and Science University, Portland, OR; (9)University of California, Los Angeles, Los Angeles, CA; (10)Pfizer Australia, Sydney, Australia; (11)Pfizer Inc, Groton, CT; (12)Schoen Klinik Hamburg Eilbek, Hamburg, Germany

PURPOSE: Tofacitinib is an oral Janus kinase inhibitor for the treatment of rheumatoid arthritis (RA). This analysis describes safety data for tofacitinib in patients from the integrated RA clinical trial database based on cumulative exposure in Phase (P)2, P3, and long-term extension (LTE) studies.

METHODS: The analysis was performed on patients who received ≥1 dose of tofacitinib (doses pooled), as monotherapy or with background disease-modifying antirheumatic drugs, integrated across 6 P2 trials, 6 P3 trials, and 2 LTE studies up to April 10, 2013 (ongoing; database not locked). Patients switching from placebo, adalimumab or methotrexate to tofacitinib contributed data following their first dose of tofacitinib. Incidence rates (IR; per 100 patient-years and 95% confidence intervals [CI]) are presented.

RESULTS: The analysis includes 5,671 patients, representing 12,664 patient-years of tofacitinib exposure, with median exposure of 2.4 years. Overall, 926 (16.3%) patients discontinued due to adverse events (AEs) (IR 7.39 [6.93, 7.89]). The IR for mortality (within 30 days of last dose) was 0.28 (0.20, 0.39). IRs for serious AEs (SAEs; 10.28 [9.72, 10.87]) and AEs of special interest were stable across time intervals to >42 months.[1] Serious infections (IR 2.93 [2.65, 3.25]) were the most common SAEs. IRs for AEs of special interest were as follows: opportunistic infections (including disseminated/multidermatomal herpes zoster; excluding tuberculosis), 0.25 (0.18, 0.36); tuberculosis, 0.21 (0.14, 0.30); malignancies excluding non-melanoma skin cancer (NMSC), 0.85 (0.70, 1.02); lymphoma, 0.06 (0.03, 0.13); all herpes zoster AEs, 4.22 (3.87, 4.61; 93.6% were non-serious); including rare serious herpes zoster AEs, 0.28 (0.20, 0.39).

CONCLUSIONS: The pattern and rate of SAEs and AEs of special interest observed following >12,000 patient-years of tofacitinib exposure was stable across >42 months. No new risks were identified compared to previous reports. [1]Cohen S, et al. EULAR 2014; DOI:10.1136/annrheumdis-2014-eular.5656.

Transplant/Immunology

189. Risk prediction model for late posttransplant anemia in renal allograft recipients. *Jae Wook Yang, Pharm.D., Ph.D., BCPS*[1], Tariq Shah, M.D.[2], Robert Naraghi, M.D.[2], David I. Min, M.S., Pharm.D.[3]; (1)Department of Pharmacy Practice, School of Pharmacy, West Coast University, Los Angeles, CA; (2)Mendez National Institute of Transplantation, Los Angeles, CA; (3) School of Pharmacy, Western University of Health Sciences, Pomona, CA

PURPOSE: Production of erythropoietin is expected to be recovered within 30 days after renal transplantation. However, large number of renal allograft recipients suffers from anemia even after 6 months, which is defined as the late posttransplant anemia (LPTA). The objective of this study is to develop and validate the risk scoring system in identifying renal transplant patients at high risk of LPTA.

METHODS: Retrospective cohort of 416 renal transplant recipients who received renal transplant at the St. Vincent Medical Center was included in this study. Among these, 216 patients were used to identify predictive parameters for LPTA and 200 patients for its validation. These patients were divided into LPTA and the control group and a total of 27 clinical factors were compared for each group. An equation calculating individual risk of LPTA was developed by using odds ratio(OR) of each risk factor generated by the binary logistic regression. The possible risk-score was from 0 to 10 and the risk score >5 was regarded as higher risk.

RESULTS: Among 216 renal transplant recipients, 102 patients (47.2%) showed LPTA. In logistic regression, early PTA (OR = 4.18, 95%CI 2.19–7.97, $p < 0.001$), female gender (OR = 2.30, 95%CI 1.19–4.45, p=0.013), ACE inhibitor use (OR = 2.27, 95%CI 1.08–4.76, p=0.030), tacrolimus(FK)(OR 2.38, 95%CI 1.20–4.72, p=0.013), sirolimus(OR = 5.85, 95%CI 2.68–12.78, $p < 0.001$) were independently associated with LPTA. The final equation from regression model is as follows: Risk score for LPTA = [{4.183xEPTA(1 or 0)+2.304 × Female(1 or 0) +2.271xACE I(1 or 0)+2.379xFK(1 or 0)+5.853xSRL(1 or 0)}/ 16.985] × 10. In the validation of developed risk-scoring system with separate 200 cohort patients, sensitivity was 69.6%, and specificity was 80.0%. The positive predictive value was 75.3%, the negative predictive value was 73.4%, and area under ROC curve was 80.0%.

CONCLUSION: This risk scoring system permits moderately sensitive and specific prediction of risk of LPTA. However, further validation with a large cohort may be warranted.

190E. Efficacy, safety and tolerability of recombinant human hyaluronidase-facilitated subcutaneous infusion of immunoglobulin in adult subjects with primary immunodeficiency enrolled in a Phase 3 Study. Mark Stein, M.D.[1], Richard Wasserman, M.D., Ph.D[2], Isaac Melamed, M.D.[3], Arye Rubinstein, M.D., Ph.D[4], Jennifer Puck, M.D.[5], Sudhir Gupta, M.D., Ph.D., MACP[6], Werner Engl, M.D.[7], Heinz Leibl, Ph.D.[7], Barbara McCoy, M.D.[7], Leman Yel, M.D.[8], *Richard Schiff, M.D., Ph.D.*[8]; (1)Allergy Associates of the Palm Beaches, North Palm Beach, FL; (2) DallasAllergyImmunology, Dallas, TX; (3)IMMUNOe Health Centers, Centennial, CO; (4)Albert Einstein College of Medicine and Montefiore Hospital, Bronx, NY; (5)University of California, San Francisco, San Francisco, CA; (6)University of California, Irvine, Irvine, CA; (7)Baxter Healthcare, Vienna, Austria; (8) Baxter Healthcare, Westlake Village, CA

Presented at the Clinical Immunology Society Meeting, Baltimore, MD, April 10–13, 2014 and at the 100th J Project Meeting, Antalya, Turkey, Mar 12–15.

191. Multiple regression analysis of factors associated with neutropenia in steroid-free adult renal transplant recipients taking tacrolimus and mycophenolate in three different study periods during the first year post-transplant. *Tony KL Kiang, BSc (Pharm), Ph.D., ACPR*[1], Nilufar Partovi, Pharm.D.[1], Trana

Hussaini, Pharm.D.[1], Rebecca Jean Shapiro, M.D.[2], Mary HH Ensom, Pharm.D., FASHP, FCCP, FCSHP, FCAHS[3]; (1) Department of Pharmacy, Vancouver General Hospital, Vancouver, BC, Canada; (2)Department of Nephrology, Vancouver General Hospital, Vancouver, BC, Canada; (3)The University of British Columbia, Children's & Women's Health Centre of British Columbia, Vancouver, BC, Canada

PURPOSE: Frequent occurrence of neutropenia during the first year after engraftment is evident in renal transplant recipients while on mycophenolate (MPA) and tacrolimus (TAC). The purpose of this clinical study was to test the hypothesis that overexposure of MPA/TAC and/or inadequate renal function recovery may be potential causes of neutropenia in steroid-free kidney transplant patients.

METHODS: Age, absolute neutrophil count (ANC), glomerular filtration rate (GFR), MPA daily dose (g), TAC daily dose (mg), C_1-C_2-C_4 MPA levels (mg/L), and C_0-C_2TAC levels (μg/L) were collected prospectively within 20–40 days (period 1), 4–7 months (period 2), and 11–13 months (period 3) post transplant (n=6–17). Validated limited sampling strategies (Ther Drug Monit; 33:50–55, 2011) were used to estimate MPA and TAC exposure. Simple and multiple linear regression analyses between dose-normalized MPA/TAC exposure, GFR, and ANC were conducted (SigmaStat, v3.5).

RESULTS: Mean characteristics (baseline age 56 years) across 3 study periods: ANC (3–5 × 10^3 cells/μL), MPA dose (1–2 g/D), TAC dose (5–9 mg/D), limited sampling strategy-predicted dose-normalized MPA exposures (22–36 mg × hour/L/g), and limited sampling strategy-predicted dose-normalized TAC exposures (22–29 μg × hour/L/mg). Multiple regression analysis incorporating MPA/TAC exposure, GFR, and ANC indicated that only MPA exposure predicted ANC ($p<0.05$) in period 1 (n=17), whereas trends toward significance were observed for periods 2 and 3 (n=6–12). Linear regression revealed inverse associations ($p<0.05$) between MPA exposure and ANC within all 3 periods (R^2=0.35, 0.36, and 0.47) and across the 3 visits, but no such associations were observed for TAC exposure and GFR.

CONCLUSION: To our knowledge, this is the first study to examine associations between MPA/TAC exposure, renal function, and neutropenia in steroid-free kidney transplant recipients. Our novel findings suggest a significant association between MPA, but not TAC exposure or GFR, with ANC throughout all 3 study periods. Patient enrollment is currently ongoing.

192. The effect of mycophenolate mofetil dose and trough levels on clinical outcomes in pediatric heart transplant recipients. *Carly Mason, Pharm.D.*; Department of Pharmacy, Children's Hospital at Montefiore, Bronx, NY

PURPOSE: Limited pharmacokinetic and safety data is available on mycophenolate mofetil (MMF) therapy in pediatric heart transplant patients. In pediatric heart transplant patients, suggested target mycophenolic acid trough levels (MPA TL) are 1.5–3.0 mg/mL. We have adopted an immunosuppression protocol targeting a MPA TL at 0.8–2.0 mg/mL and sought to determine the outcomes of targeting a lower therapeutic MPA TL range to limit adverse events while maintaining efficacy.

METHODS: MPA TL were retrospectively collected between 2–12 months post-heart transplant from January 2009–November 2013. The proportion of MPA TL in therapeutic range (THER) was calculated for each patient. Adverse events including acute rejection, infection, leukopenia, and gastrointestinal complaints were correlated with MPA TL. All patients received antithymocyte-globulin induction therapy, steroids, tacrolimus, and prophylaxis with sulfamethoxazole/trimethoprim and valganciclovir.

RESULTS: 355 MPA TL from 22 pediatric heart transplant patients were included in this study. Median age at transplant was 2.5 years. The primary indication for transplant was dilated cardiomyopathy (64%). Mean MPA TL was 1.7 ± 0.9 mg/mL; in 16/22 patients, greater than 50% of MPA TL were THER, 4/22 were subtherapeutic (SUB) and 2/22 were supratherapeutic (SUP). Mean MMF per dose was 596 ± 99 mg/m^2; African American patients required significantly higher doses (702 ± 235 mg/m^2). Leukopenia occurred in all groups; however an increased frequency was noted in the SUP (25%). Gastrointestinal complaints occurred in 3% of patients. MMF was discontinued in one patient for gastrointestinal complaints and two patients for leukopenia. One SUB patient had acute rejection, and one SUP patient had infection. One-year patient and graft survival was 100%.

CONCLUSION: Targeting a lower range for MPA TL was not associated with a significant risk of rejection or infection. Leukopenia occurred in 19% of patients. Despite lower target trough levels than previously described, MMF was discontinued in 14% of patients because of adverse effects.

193E. Long term safety, efficacy, tolerability, and pharmacokinetics of recombinant human hyaluronidase-facilitated subcutaneous infusion of immunoglobulin G: a phase 3 extension study in patients with primary immunodeficiencies. Isaac Melamed, M.D.[1], Richard Wasserman, M.D., Ph.D[2], Mark Stein, M.D.[3], Arye Rubinstein, M.D., Ph.D.[4], Jennifer Puck, M.D.[5], Sudhir Gupta, M.D., Ph.D, MACP[6], Werner Engl, M.D.[7], Heinz Leibl, Ph.D[7], Leman Yel, M.D.[8], *Richard Schiff, M.D., Ph.D.*[8]; (1) IMMUNOe Health Centers, Centennial, CO; (2) DallasAllergyImmunology, Dallas, TX; (3)Allergy Associates of the Palm Beaches, North Palm Beach, FL; (4)Albert Einstein College of Medicine and Montefiore Hospital, Bronx, NY; (5) University of California San Francisco, San Francisco, CA; (6) University of California Irvine, Irvine, CA; (7)Baxter Healthcare, Vienna, Austria; (8)Baxter Healthcare, Westlake Village, CA

Presented at the Clinical Immunology Society Meeting, Baltimore, MD, April 10–13, 2014 and at the 100th J Project Meeting, Antalya, Turkey, Mar 12–15.

194. Impact of basiliximab administration time on patient outcomes in cardiopulmonary bypass dependent lung transplant. Angela T. Logan, Pharm.D., BCPS[1], *Esther Liu, Pharm.D.*[1], Tarik Haddad, M.D., FCCP[2]; (1)Department of Pharmacy, Tampa General Hospital, Tampa, FL; (2)New Lung Associates, Tampa, FL

PURPOSE: Cardiopulmonary bypass (CPB) is commonly used in lung transplantation, but there is no guidance on the optimal time to administer induction agents. The aim of this study was to compare outcomes of lung transplant patients administered basiliximab (BSX) induction at different times relative to initiation of CPB.

METHODS: This was a single-centered retrospective study with 58 patients who received lung transplants between January 2012 and August 2013. Patients were stratified according to 3 groups: those who received BSX before CPB (B), during CPB (D), and no-CPB (N) which served as the baseline control group. Primary outcomes include primary graft dysfunction (PGD) defined by $PaO_2/FiO_2 > 200$, hospital and intensive care unit (ICU) length of stay (LOS), and days on mechanical ventilation (MV). Secondary outcomes included incidence of biopsy proven acute rejection (BPAR), mortality, and extracorpeal membrane oxygenation (ECMO) use.

RESULTS: Baseline demographics between each group were similar. PGD was not found to be significantly different although there was a higher incidence of patients in group D. Among all 3 groups (B vs D vs N), group B and N had similar outcomes while group D had significantly longer hospital LOS (24.1 vs 46.6 vs 22.6; p=0.0029), ICU LOS (11 vs 32.8 vs 9.7; p=0.002) and MV days (3 vs 13.8 vs 3.6; p=0.049). Primary outcomes between group B and D alone were found to be significantly different. Compared to groups B and N, group D also had a higher incidence of ECMO post-transplant (p=0.005).

CONCLUSION: This study demonstrated significant differences in outcomes of patients who received BSX induction during CPB. These results have led to changes in institutional surgical practice and standardization of BSX induction administration to be given prior to CPB.

195E. Patient preferences for recombinant human hyaluronidase (rHuPH20)-facilitated subcutaneous (SC) infusion of immunoglobulin G (IGHy) in adult patients with primary immunodeficiencies (PI): phase 3 study results. Diane Ito, MA[1], *Xiaolan Ye, Ph.D.*[2], Yan Xiong, MS[1], Josephine Li-McLeod, Ph.D.[1], Richard Schiff, M.D., Ph.D.[3]; (1)Baxter HealthCare, Westlake Village, CA; (2)Baxter HealthCare, Deerfield, IL; (3) Baxter Healthcare, Westlake Village, CA

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196. A retrospective study of the correlation between tacrolimus exposure and long term outcome in Chinese kidney transplant recipients. *Chenyu Guo,* , Yongxu Sun,, Lu Congxiao, Ph.D., Wenwen Zheng,; Department of Pharmacy, Yuhuangding Hospital, Yantai, China

PURPOSE: The present study aimed to investigate the effects of tacrolimus trough concentrations (TTC) on long-term outcome in Chinese kidney transplant recipients. The correlations of daily doses of tacrolimus, TTC, and clinical parameters were also examined.

METHODS: Ninety six kidney transplant recipients receiving operation between December 2011 and April 2013 were enrolled in this study. According to TTC range, four groups (Group I: <6 ng/mL, Group II: 6–10 ng/mL, Group III: 10–15 ng/mL, and Group IV: >15 ng/mL) were subdivided, and the corresponding clinical parameters were recorded and analyzed. Additionally, univariate factor analysis was performed to assess the effects of clinical parameters on daily doses of tacrolimus and TTC.

RESULTS: For Chinese kidney transplant recipients, 6–15 ng/mL might be an appropriate range for tacrolimus. Allograft function, evaluated by estimated glomerular filtration rate (eGFR), in the range of 6–15 ng/mL was significantly better than that in the ranges of <6 ng/mL (70.2 mL/minute vs 58.2 mL/minute, P<0.001) and >15 ng/mL (70.2 mL/minute vs 66.2 mL/minute, P<0.001). Meanwhile, patients had low risks of moderate/severe anemia and infection when TTC was maintained in the range of 6–15 ng/mL. Additionally, daily doses of tacrolimus were significantly influenced by gender, body weight, white blood cell (WBC), blood urine nitrogen, serum creatinine concentration, cystatin c and eGFR of the patients. TTC was significantly associated with age, gender, body weight, post-operative days, WBC, total bilirubin and alkaline phosphatase of the patients.

CONCLUSION: This investigation provided the target range of tacrolimus fitting for Chinese kidney transplant recipients, and the clinical parameters affecting tacrolimus doses and TTC. The results might be useful to the clinical treatment of patients.

197. Oral ribavirin for the treatment of paramyxovirus respiratory infections in lung transplant patients. *Alicia Lichvar, Pharm.D.*[1], John McDyer, M.D.[2], Eun Jeong Kwak, M.D.[3], Joseph Pilewski, M.D.[2], Kerry Empey, Pharm.D., Ph.D.[4], Christopher R. Ensor, Pharm.D., BCPS, AQ-CV[5]; (1)Department of Pharmacy and Therapeutics, University of Pittsburgh Medical Center, Pittsburgh, PA; (2)Division of Pulmonary, Allergy, and Critical Care Medicine, University of Pittsburgh Medical Center, Pittsburgh, PA; (3)Division of Infectious Diseases, University of Pittsburgh Medical Center, Pittsburgh, PA; [4]Department of Pharmacy and Therapeutics, University of Pittsburgh, Pittsburgh, PA; (5)Department of Pharmacy & Therapeutics, University of Pittsburgh Medical Center, Pittsburgh, PA

PURPOSE: Evaluate the efficacy and safety of oral ribavirin (ORBV) for the treatment of paramyxovirus infection (PMVI) in lung transplant recipients (LTRs).

METHODS: LTRs with PMVI from 01/2012 to 07/2013 at a single center were reviewed. History, pulmonary function tests, viral PCR, and laboratory values were obtained. Differences in FEV1, FEF25/75, bronchiolitis obliterans syndrome (BOS) status, renal function, and hematologic toxicities were assessed from baseline (day 0) to days 30, 90, and 120 using Friedman's ANOVA. Freedom from BOS progression, FEV1 and FEF25/75 decline were assessed by Kaplan Meier method with log rank conversion. Time to BOS progression and relevant decline in FEV1 and FEF25/75 by baseline BOS stage and infecting virus were analyzed by log rank or Breslow's test. Univariate logistic regression was used to evaluate the relationship between viral clearance and BOS progression.

RESULTS: 38 PMVI (RSV = 13, PIV = 17, hMPV = 8) in 37 patients were included. Of 18 patients re-cultured within 30 days of ORBV completion, 12 had persistently-positive PCR (66.7%). FEV1 declined at infection (−9%) but recovered at 120 days (+1.4%). There were no differences in FEV1 (p=0.4), FEF25/75 (p=0.21), or BOS stage (p=0.31) from baseline to day 120. BOS progression was significantly different when assessed by infecting virus (p=0.05) and trended towards significance by baseline BOS stage (p=0.081). Patients who had persistent infection were more likely to experience BOS progression, though this did not reach significance (OR = 8, 95%CI = 0.6–106.9, p=0.12). Creatinine clearance and hemoglobin declined significantly at day 30 (−6.90 ml/min, p<0.001; −1.90 mg/dL, p<0.001, respectively) but recovered by day 90. 32 (84.2%) patients developed anemia during therapy (p=0.01).

CONCLUSION: ORBV was associated with a 66.7% viral PCR clearance failure rate. Lung function declined at the time of infection but recovered. Persistent viral infection may be associated with BOS progression. ORBV use was associated with significant toxicity which recovered.

198. Tacrolimus trough concentrations increase in intestinal transplant recipients during episodes of acute cellular rejection. *Alicia Lichvar, Pharm.D.*[1], Heather J. Johnson, Pharm.D., BCPS[2], David Deen, Pharm.D., BCPS, BCNSP[3], Jennifer Bonner, Pharm.D., Ph.D.[4], Geoffrey Bond, M.D.[5], Guilherme Costa, M.D., FACS[5], Kareem Abu-Elmagd, M.D., Ph.D., FACS[6], Raman Venkataramanan, Ph.D.[7]; (1)Department of Pharmacy and Therapeutics, University of Pittsburgh Medical Center, Pittsburgh, PA; (2)University of Pittsburgh School of Pharmacy, Pittsburgh, PA; (3)Department of Pharmacy, Memorial University Medical Center, Savannah, GA; (4)Northern Institute for Cancer Research at Newcastle University; (5)Thomas E. Starzl Transplantation Institute, University of Pittsburgh Medical Center, Pittsburgh, PA; (6)Center for Gut Rehabilitation and Transplantation, Cleveland Clinic, Clevland, OH; (7)Department of Pharmaceutical Sciences, University of Pittsburgh, Pittsburgh, PA

PURPOSE: Acute cellular rejection (ACR) in small bowel transplant recipients increases intestinal permeability and reduces intestinal CYP3A and p-glycoprotein activity. These changes may increase blood tacrolimus concentrations and lead to toxicities. The purpose of this study is to evaluate the impact of ACR episodes on dose-normalized tacrolimus blood concentrations in intestinal transplant recipients.

METHODS: A retrospective, single-center, cohort study of adult intestinal transplant recipients experiencing ACR from February 1998 to July 2013 was conducted. Patient information was collected 30 days before, during, and up to 30 days after biopsy-proven ACR. Primary outcome was the difference in dose-normalized tacrolimus concentrations at three time points. Secondary outcomes included differences in median percent change in dose-normalized tacrolimus compared across ACR grade, treatment agent, time post-transplantation, and initial or recurrent episode. Median serum creatinine levels were compared before, during, and after ACR episodes. Continuous values were compared before, during, and after ACR with the Friedman two-way analysis of variance. Differences in percent changes were compared with either the Mann-Whitney U test or the Kruskal-Wallis one-way test of variance.

RESULTS: A total of 113 intestinal transplant recipients experienced 285 episodes of ACR. Median dose-normalized concentrations were different before, during, and after ACR (1.74 ng/mL/mg vs 4.03 ng/mL/mg vs 2.15 ng/mL/mg, p=0.014). Median percent change in dose-normalized tacrolimus was significantly different across ACR severity (p=0.014), time post-transplant

(p=0.007), and initial versus recurrent ACR (p=0.013). There was no difference in median percent change across treatment agent (p=0.081). SCr was higher during ACR (1.30 mg/dL vs 1.50 mg/dL vs 1.2 mg/dL, p<0.001).
CONCLUSION: Median dose-normalized tacrolimus concentrations were elevated during ACR, and this was associated with an increase in SCr. These observations suggest the potential for increased systemic concentrations and toxicity of other orally administered drugs in small bowel transplant patients during acute rejection episodes.

199. Efficacy of once weekly dapsone dosing for PCP prophylaxis post-transplantation. *Rickey Evans, Pharm.D.*, Timothy Clifford, Pharm.D., BCPS, Ann Fugit, Pharm.D., BCPS; Department of Pharmacy Services, University of Kentucky Healthcare, Lexington, KY
PURPOSE: This study evaluated the use of a novel once weekly dapsone dosing regimen for prevention of *Pneumocystis jiroveci* pneumonia (PCP), as compared to trimethoprim-sulfamethoxazole (TMP-SMZ). The primary outcome measured was the incidence of PCP at 6 and 12 months post-transplant. Secondary outcomes included the incidence of breakthrough infections, hospitalizations within 6 and 12 months post-transplant, and indication for switching from TMP-SMZ to dapsone.
METHODS: This is a retrospective, single-center, cohort study where medical records of 158 adult kidney or liver transplant recipients from January 2005–December 2012 were reviewed. Study participants identified as dapsone cases were matched in a 1:1 ratio to TMP-SMZ controls based on transplant type, transplant indication, age, and gender. Categorical data was analyzed using the Chi-square or Fisher's exact test, while a student's t or Mann–Whitney *U* test was used to analyze continuous variables with an alpha significance level of 5%.
RESULTS: There were no documented cases of PCP in either study group at 6 or 12 months post-transplant (p=1.0). There were 35 (44%) cases of breakthrough infection in the dapsone group compared to 24 (30%) in the TMP-SMZ group (p=0.07). Fifty two (65%) patients in the dapsone group were hospitalized within 6 months post-transplant compared to 36 (46%) patients in the TMP-SMZ group (p=0.01), with similar results also seen within 12 months post-transplant (68% vs 48%, p=0.01). Forty-nine percent of patients were switched from TMP-SMZ to dapsone for PCP prophylaxis due to acute kidney injury.
CONCLUSIONS: There were no documented cases of PCP in either the dapsone or TMP-SMZ group, but this study was conducted with a limited sample size. There was a trend toward increased breakthrough infections and hospitalizations in the dapsone group. Future studies are warranted to show the efficacy of weekly dapsone dosing compared to other PCP prophylaxis regimens.

200. Incidence and risk factors for venous thromboembolism in solid organ transplant recipients. *Chelsea Sammons, Pharm.D., BCPS*, Angela T. Logan, Pharm.D., BCPS, Christina T. Doligalski, Pharm.D., BCPS; Department of Pharmacy, Tampa General Hospital, Tampa, FL
PURPOSE: Venous thromboembolism (VTE) increases post-surgical morbidity and mortality; VTE immediately following solid organ transplantation (SOT) is less well-described. This study sought to identify risk factors and incidence for early post-transplant VTE.
METHODS: An IRB-approved retrospective review of all adult SOT recipients from 1/1/2012–12/31/2012 at a single center was conducted; VTE was defined as objectively-confirmed VTE during the hospital admission for transplant surgery. Hypercoaguable patients and early deaths (<7 days) were excluded. Patients were followed for 6 months post-transplant to assess effect of VTE on index length of stay (LOS), readmissions and mortality. Data was analyzed using JMP.
RESULTS: Of the 365 adult SOT performed during the study period, 358 were included in analysis and 34 (9.5%) developed VTE. Most (25/34, 73.5%) were upper-extremity or neck VTEs. Incidence by organ was 4.3%, 10.8%, 17.1%, and 23.9% for kidney, liver, lung, and heart recipients, respectively. Time to post-operative VTE was 8.8 ± 6.6 days. Outcomes in SOT with VTE were worse, with increased LOS (26 day vs 9.9 day, p<0.05), ICU LOS (13.2 day vs 2.7 day, p<0.05), and 6-month mortality (14.7% vs 1.5%, p <0.05). Cardiopulmonary bypass (CPB) was more common among those with VTE (55.9% vs 23.8%, p<0.05), as was the presence of ≥2 co-morbidities prior to transplant (diabetes, malignancy, prior VTE) (11.8% vs 2.5%, p<0.05). Age, gender, race, BMI, and immunosuppression did not appear to affect VTE risk. VTE chemoprophylaxis rates were low among all patients and did not appear to reduce the incidence of VTE (29.4% vs 29.1%, p=0.9).
CONCLUSION: VTE during the transplant admission is a significant cause of morbidity and mortality. Risk factors include CPB and the pre-transplant presence of ≥2 VTE-related co-morbidities. Lack of chemoprophylaxis efficacy may be due to the high rate of UE/neck VTE that is often line-related.

Urology

201. Clinical trial of alfuzosin stone expulsion therapy for distal uretral calcui: efficacy and patient outcome evaluation. *Nouran El Said, B. Pharm.*[1], Lamia El Wakeel, Ph.D.[2], Khaled Kamal, M.D.[3]; (1)Department of Pharmacy Practice & Clinical Pharmacy, Faculty of Pharmaceutical Sciences& Pharmaceutical Industries, Fututre University in Egypt, Cairo, Egypt; (2)Faculty of Pharmacy, Ain Shams University, Cairo, Egypt; (3)Faculty of Medicine, Ain Shams University, Cairo, Egypt
BACKGROUND: Ureteral stones play an important role in urological practice. Alpha- blockers induce ureteral smooth muscle relaxation thus aid stone passage.
PURPOSE: To evaluate the efficacy and safety of the α- blocker, alfuzosin, on patients with uncomplicated distal ureteral calculi.
METHODS: This was a prospective, randomized, controlled study. Patients older than 18 years presenting to the outpatient clinic with radio-opaque stones located in the distal third of the ureter and of size ≤10 mm were included. Exclusion criteria included urinary tract infection, ureteral strictures, renal impairment, solitary functioning kidney, pregnancy, lactation and sensitivity to alpha blockers. A total of 54 patients with the above criteria, were randomly divided into 2 groups: Group 1 (n=26) received diclofenac 75 mg IM on demand while group 2 (n= 28) received the same therapy in addition to alfuzosin SR 5 mg twice daily. Follow up was on weekly basis for 4 weeks or until stone expulsion. Patients were assessed for stone passage and were monitored for occurrence of adverse drug events, complications, number of pain episodes, pain level, analgesic consumption and number of hospital revisits.
RESULTS: Stone expulsion rate was higher in the alfuzosin arm compared to the control arm (53.6% vs 26.9%, p=0.04). Median stone passage time was significantly reduced from 19 days to 9 days in the control and alfuzosin arms, respectively (p=0.006). Ureteral sepsis, uncontrollable pain and hospitalization readmissions were reported in the control group only. No difference was observed between both groups in terms of number of pain episodes, pain scores and analgesic consumption. Alfuzosin therapy was tolerable with only minor adverse effects.
CONCLUSION: Results suggest that alfuzosin is safe and effective in increasing stone expulsion rates and shortening stone passage times for distal ureteral stones with no effect on pain control.

Women's Health

202. Pharmacokinetics of hydralazine in pregnancy. *Michael Cusumano, Pharm.D.*[1], Rachel Ryu, Pharm.D[2], Thomas Easterling, M.D.[3], Danny Shen, Ph.D.[2], Ken Thummel, Ph.D.[4], Mary Hebert, Pharm.D, FCCP[2]; (1)St. John's Hospital, Springfield, IL; (2)Department of Pharmacy, University of Washington, Seattle, WA; (3)Department of Obstetrics &

Gynecology, University of Washington, Seattle, WA; (4) Department of Pharmaceutics, University of Washington, Seattle, WA

PURPOSE: To estimate steady state oral hydralazine pharmacokinetic (PK) parameters in hypertensive, pregnant women as compared to those previously reported in non-pregnant subjects.

METHODS: Four pregnant women taking hydralazine (20–100 mg/day) for therapeutic reasons provided serial blood samples over one dosing interval. Hydralazine (as its *p*-nitrobenzaldehyde derivative) and methyltriazolophthalazine (MTP, primary acetylated plasma metabolite) concentrations were determined utilizing a validated LC/MS/MS assay. AUC and Cmax were normalized to a 25 mg dose. All subjects were NAT2 genotyped.

RESULTS: Hydralazine PK parameters in two slow and two intermediate acetylators were: time to maximum concentration (Tmax) = 0.5 ± 0.0 hour vs 0.5 ± 0.0 hour, maximum concentration (Cmax) = 10.1 ± 6.0 vs 1.3 ± 0.1 ng/mL, area under the concentration-time curve (AUC) = 12.3 ± 5.0 vs 3.0 ± 0.0 ng•h/mL, half-life = 4.7 ± 1.1 vs 1.6 ± 0.1 h, apparent oral clearance (CL/F) = 37 ± 15 vs 139 ± 2 L/minute, and apparent oral volume of distribution β = 147 ± 16 vs 189 ± 25 L/kg, respectively. For MTP, PK parameters were: Tmax = 0.5 ± 0.0 vs 1.0 ± 0.7 hour, Cmax = 30.9 ± 22.8 vs 101.9 ± 40.1 ng/mL, AUC = 106 ± 90 vs 433 ± 266 ng• hour/mL, and half-life = 3.0 ± 0.4 vs 3.7 ± 2.0 hour for slow and intermediate acetylators respectively. Previously reported mean hydralazine PK parameters in non-pregnant fast and slow acetylators respectively included: dosed normalized AUC (16 vs 19 ng•hour/mL) and half-life (0.4 vs 3.1 hour).

CONCLUSION: This is the first report of hydralazine PK during pregnancy. Half-life in slow acetylators were similar to previously reported values in non-pregnant subjects. Mean half-life during pregnancy in the intermediate acetylators was 3.6-fold longer than previously reported in fast acetylator phenotype non-pregnant subjects.

CLINICAL PHARMACY FORUM

ADR/Drug Interactions

203E. Comparison of new-onset gout incidence in adults prescribed chlorthalidone versus hydrochlorothiazide. *Liza Wilson, Pharm.D.*[1], Vahram Ghushchyan, Ph.D.[2], Richard Allen, M.S.[3], Kavita V. Nair, Ph.D.[4], Joseph Saseen, Pharm.D.[4]; (1)School of Medicine, University of Missouri - Kansas City, Kansas City, MO; (2) American University of Armenia, Armenia; (3)Peak Statistical Services, Evergreen, CO; (4)University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO

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Adult Medicine

204. Expansion of clinical pharmacy services through a team-based approach to improve patient transitions across different levels of care. *Ravi Nehra, Pharm.D.*, Megan Jensen, Pharm.D., Vi Gilmore, Pharm.D., Emily Pherson, Pharm.D., Amanda Sowell, Pharm.D., Jennifer Gillespie, Pharm.D., MBA, Virna Almuete, Pharm.D., Leigh Efird, Pharm.D.; Adult Inpatient Pharmacy, The Johns Hopkins Hospital, Balitmore, MD

PURPOSE: In 2009, in accordance with its mission of advancing patient care, and to address forthcoming Centers for Medicare and Medicaid regulations, The Johns Hopkins Hospital (JHH) convened a multidisciplinary task force to identify and address causes of preventable readmissions. A pharmacy bundle of care transition services was created; this included pharmacist attendance at multi-disciplinary rounds, medication reconciliation, patient education, and post-discharge phone calls. The addition of these services prompted the need to redesign the pharmacy practice model.

METHODS: The pharmacy division where this model change occurred covers 478 patient beds at JHH. Prior to the change, pharmacists were in either operational or clinical roles with little overlap in service functions. Order verification responsibilities were condensed to allow pharmacists with residency training to participate in clinical patient care activities in areas that were previously not covered. Two additional pharmacist positions were gained via grant funding. New opportunities and responsibilities were created for pharmacists, pharmacy residents, pharmacy students, and pharmacy technicians in this team-based model.

RESULTS: In November 2013, this new model allowed expansion of acute care and transitional care services from 120 beds to 336 beds. In the previous model, nine pharmacists covered operational activities during the day and four pharmacists covered clinical activities. With the new model, five pharmacists were responsible for order verification for the entire division while ten pharmacists were in clinical roles attending to acute patient care needs and transitional services. At least 3 pharmacy students are incorporated into the model each block and one pharmacy technician to assist with care coordination activities.

CONCLUSION: The team-based pharmacy practice model positioned more pharmacists in direct patient care roles and increased the number of patients receiving pharmacy services. This model change was achieved with a minimal increase in the number of pharmacist positions.

205. Impact of standardized pharmacist involvement in a multidisciplinary delirium intervention team on a general medicine service. *Anthony Ishak, Pharm.D.*[1], May Adra, Pharm.D.[2], Andrea Branchaud, MPH[1], Melissa Mattison, M.D.[3]; (1)Department of Healthcare Quality, Beth Israel Deaconess Medical Center, Boston, MA; (2)Department of Pharmacy, Beth Israel Deaconess Medical Center, Boston, MA; (3)Department of Medicine, Beth Israel Deaconess Medical Center, Boston, MA

PURPOSE: To better define the effects of a standardized pharmacist intervention for individual patients identified as suffering from delirium or at high risk for the condition. Primary outcomes include: frequency of recommendations to reduce dosage, stop medication, start medication, or pain regimen optimization. Secondary outcomes include: patient discharge disposition rate, fall rate, use of restraints, and use of benzodiazepines or antipsychotics.

METHODS: In a retrospective, observational assessment of a quality improvement program, all patients admitted to a 36-bed general medicine unit at an academic medical center from March 2014–May 2014 who were identified by the primary medical team, nursing team, or other clinicians to be symptomatic of delirium or deemed at high risk for the condition received the intervention. In addition to a standard pharmacist-led review of medication history, indication, dosing, and response to medication; the intervention included an inter-professional bundle of care with physician review of the care plan, nursing-led environmental modifications, a mobility protocol, and cognitive training exercises from social work and occupational therapy.

RESULTS: Fifty-nine patients were included in the pilot program in the first 8 weeks. Preliminary analysis shows the pharmacist recommended starting a new medication in 24.6% of patients, stopping a medication in 22%, a dose change in 35.6% of patients, and analgesia recommendations in 52.5%. The pharmacist suggested 202 interventions (including general counseling, medication reconciliation, and lab recommendations) involving these patients.

CONCLUSION: The pharmacist made frequent interventions for patients and the full impact on secondary outcomes is currently being assessed. General provider satisfaction was high.

206. Impact of a transitions-of-care (TOC) pharmacist on readmission rates and medication compliance in "high-risk" patients. *Winnie Thi, Pharm.D.*, Bayan Yaktieen, Pharm.D., Harminder Sikand, Pharm.D.; Department of Pharmacy, Scripps Mercy Hospital, San Diego, CA

PURPOSE: With nearly two thirds of hospitals facing a total of $280 million in penalties for excessive readmissions, there is increasing attention on hospitals to reduce readmission rates. The addition of a TOC pharmacist has shown to be a crucial part of safe patient discharge and may contribute to decreased readmissions.
METHODS: Two TOC pharmacists with advanced training in medication therapy management (MTM) identified high-risk patients and provided the following services: assessment and removal of barriers to medication compliance; review of medication therapy for effectiveness, safety and compliance; providing patient medication education; validation of medication reconciliation list upon admission; discharge planning and follow up 30 days post discharge. High risk patients were identified by admission due to non-compliance or adverse drug event, new or unstable high risk disease states, polypharmacy, multiple medication changes to previous home medication regimen, and potential financial barriers. Readmitted patients were reviewed using root cause analysis methodology.
RESULTS: TOC pharmacists enrolled 1328 patients from April 2013 to March 2014. Of 629 MTM encounters, there were 89 readmissions (21.4%). Of those readmissions, 3 were medication related readmissions as compared to the 20 medication related readmissions in the non-MTM group (4.9%). Medication compliance was also assessed with 90% of the patients were able to fill each of the discharged medications and 100% claimed adherence to therapy.
CONCLUSION: TOC pharmacists reduced readmission rates, improved ability to obtain medications and improved patient adherence to therapy.

207. UPMC St. Margaret COPD Free Medication Program: impact on 30-day readmission rate and pharmacoeconomic utility. *Jennie Broders, Pharm.D., BCPS*[1], Priscilla Ko, Pharm.D.[2], Frank D'Amico, Ph.D.[2]; (1)UPMC St. Margaret Family Medicine Residency Program, UPMC St. Margaret, Pittsburgh, PA; (2) UPMC St. Margaret, Pittsburgh, PA
PURPOSE: To evaluate the effect of a COPD Free Medication Program, that supplies a 1 month supply of maintenance inhalers at hospital discharge for patients admitted for COPD exacerbations who also have financial difficulties, on 30-day hospital readmission rates.
METHODS: A single center, retrospective chart review was performed on patients who were identified by case management as a patient with COPD complications from July 22, 2013 to April 17, 2014. Of the patients identified, those admitted for a COPD exacerbation were evaluated by a pharmacist utilizing the Medication Adherence and Access Tool (MAAT) to stratify patients with financial and personal difficulties for obtaining their maintenance inhalers post-hospitalization. Patients that scored 2 or more points on the MAAT were offered a voucher for a 1 month supply of maintenance inhalers. Baseline patient characteristics, MAAT scores, hospital readmission, time to inhaler access and inhalers obtained was collected.
RESULTS: Case managers identified 400 patients with suspected COPD during the evaluation period, of which 104 patients were evaluated by a pharmacist utilizing the MAAT. There were 48 patients who scored <2 points on the MAAT (Group 1) and did not receive vouchers for free inhalers, 21 patients who scored ≥2 points on the MAAT, but did not pick up their inhalers (Group 2), and 35 patients who scored ≥2 points on the MAAT and received the free 1 month supply of inhalers after discharge (Group 3). Thirty-day readmission rates for Group 1, 2 and 3 were 38%, 38%, and 14% (p=0.037) respectively. This program saved our hospital over $47,000.
CONCLUSION: Providing free COPD maintenance inhalers at discharge to patients admitted with COPD exacerbations and found to have financial difficulties significantly reduced 30-day readmission rates at our hospital. The COPD Free Medication program is a cost effective way to improve patient care.

Ambulatory Care

208. Pharmacist recommendations for novel oral anticoagulant transition in patients with a low time in therapeutic range on warfarin. *Peggy Tilbury, Pharm.D.*, Emily Hays, Pharm.D., Melissa Duke, Pharm.D.; Intermountain Healthcare
PURPOSE: This retrospective study evaluated a novel oral anticoagulation (NOAC) transition recommendation service provided by pharmacists in order to (i) identify the proportion of patients pharmacists recommended to switch from warfarin to a NOAC as well as the proportion of these recommendations that were executed by the primary care provider (PCP) and (ii) identify patient characteristics associated with pharmacist recommendations to continue warfarin therapy instead of starting a NOAC.
METHODS: All patients identified using an anticoagulation watch list report who received a pharmacist evaluation between 9/1/2013 and 4/15/2014 were included. The report includes all patients >18 years who are prescribed warfarin and enrolled in the health system chronic anticoagulation program with a low time in therapeutic range (TTR).
RESULTS: NOAC therapy was recommended by a pharmacist in 54% of 72 patients on warfarin for whom a review was conducted. Of the patients identified as a NOAC candidate, 36% of recommendations were executed by the PCP. A greater proportion of patients for whom continuation of warfarin therapy was recommended had the following: older age (70.1 vs 60.4, p=0.007), CAD (33% vs 13%, p=0.048), atrial fibrillation (46% vs 15%, p=0.005), and prosthetic heart valve (15% vs 0%, p=0.017). Additionally, 19 (58%) of these patients had contraindications to NOAC therapy, defined as valvular disease (63%), drug interactions (47%), and renal dysfunction (11%).
CONCLUSION: The pharmacist service provided a reduction in the use of warfarin in those patients identified as candidates to switch to a NOAC. Patient characteristics associated with recommendations to continue warfarin therapy aligned with current contraindications and precautions for NOAC use.

209. Innovations in interdisciplinary diabetes management. *Kelsey Buckley, Pharm.D., BCACP*; Department of Pharmacy Practice, Midwestern University College of Pharmacy-Glendale, Glendale, AZ
PURPOSE: In 2009, the Phoenix VA Health Care System initiated a High Intensity Diabetes Management (HIDM) clinic utilizing a multidisciplinary approach. Although HIDM was effective in achieving targeted clinical outcomes, success came at a considerable cost given the number of one-on-one appointments with multiple clinicians. Therefore, the purpose of this study was to investigate the clinical differences observed between patients previously enrolled in the HIDM clinic to those enrolled in a less resource-intensive approach to multidisciplinary diabetes care, the Shared Medical Appointment (SMA), clinic model.
METHODS: Patients were included if they met SMA clinic enrollment criteria, were 18–75 years old, and completed three of four SMA clinic visits. The following clinical measures were evaluated: hemoglobin A1C (A1C), low density lipoprotein (LDL), systolic blood pressure (SBP), diastolic blood pressure (DBP), weight, and body mass index (BMI).
RESULTS: Ninety six patients completed at least three of four SMA clinic visits. Completion of SMA and HIDM clinics significantly reduced A1C, (10.82%–8.30%, p<0.001) and (10.62%–9.31%, p<0.001), respectfully. A significant reduction in LDL was also found with completion of SMA clinic (104.12 mg/dL–85.71 mg/dL, p<0.01) and HIDM clinic (90.88 mg/dL–79.75 mg/dL, p<0.05). SMA clinic significantly reduced DBP (81.91 mmHg–78.31 mmHg, p<0.05) in comparison to a non-significant decrease observed within HIDM clinic (77.53 mmHg – 77.05 mmHg, p>0.05). Non-significant changes in SBP, weight, and BMI were observed with completion of SMA and HIDM clinics. There was a 40% reduction in the amount of full time equivalent employee (FTEE) resources required within SMA clinic to obtain the observed changes.
CONCLUSION: Compared to the previous HIDM clinic, the diabetes SMA clinic has proved to be a model with reduced structural and human resources, with equivalent clinical outcomes.

210. Does bringing bottles to clinic improve medication reconciliation accuracy. *Gina J. Ryan, Pharm.D., CDE*[1], Jayne Caudle, MLn[2], Catherine Barnes, Ph.D.[3], Heuy Chen, Ph.D.[4], Nanette Turner, Ph.D.[4], David Ziemer, M.D.[2]; (1)Department of Pharmacy Practice, Mercer University College of Pharmacy, Atlanta, GA; (2)Department of Medicine, Division of Endocrinology and Metabolism, Emory University School of Medicine, Atlanta, GA; (3)Department of Medicine, Division of Endocrinology and Metabolism, Emory University School of Medicine, Atlanta; (4)Department of Public Health, Mercer University College of Health Professions, Atlanta, GA

PURPOSE: Medication reconciliation is a very difficult process and inaccuracies lead to incorrect medication lists and errors. The first step in medication reconciliation is to obtain a medication history; which is typically obtained verbally from the patient. Providers frequently recommend that patients bring their medication bottles (BBC) to clinic to improve medication reconciliation. The objective of this project is to determine the effect of BBC on the accuracy of charted medication list.

METHODS: In a diabetes clinic of an urban safety net health system, charted medication list (CHART) was compared to a reference medication list (REF) generated after an in-depth interview with a clinical pharmacist, who reviewed the chart and health system pharmacy profile and/or contacted community pharmacies. There were several types of errors: wrong or missing name, inclusion of discontinued medication, and missing or incorrect dose or frequency. Accuracy of CHART was defined as complete and correct name, dose, route, and frequency relative to REF. The CHART accuracy of the patients who BBC was compared to those who do not BBC.

RESULTS: Out of 192 subjects, 48 (25%) subjects brought their medication bottles. Only 49 (26%) of subjects had an accurate CHART. Significantly more subjects (40%) who BBC had an accurate CHART compared to those who did not (21%, p=0.01). Subjects had an average of 8 meds, and BBC subjects had fewer errors in CHART (1.8 vs 2.6, p=0.05). The most commonly reported error was a missing medication - 42% of errors in the BBC group and 45% of errors in nonBBC group (p=0.60).

CONCLUSION: Patients who BBC had significantly fewer errors in their charted medication list. Additional studies are needed to determine how to increase frequency of BBC and whether it improves chronic disease state management.

211. Development and implementation of a multi-disciplinary clinic for transition of care (TOC) following hospital discharge in Medicare Advantage Plan members. *Grace Ancheta, Pharm.D.*[1], Jinwen Li, Pharm.D., BCACP[2], Tracy Lin, Pharm.D., CACP, BCACP[3], Alexis Ryon, Pharm.D., BCACP[4], Michelle Cavner, Pharm.D.[2], Heather Jaeger, Pharm.D., CACP[2]; (1)Cigna Medical Group, Sun City, AZ; (2)Cigna Medical Group, Phoenix, AZ; (3) Cigna Medical Group, Mesa, AZ; (4)Cigna Medical Group, Glendale, AZ

PURPOSE: To evaluate interventions made by clinical pharmacists in a primary care setting for Medicare patients seen in a newly-established After the Hospital (ATH) clinic.

METHODS: A specialized ATH clinic was developed and implemented to improve TOC at Cigna Medical Group (CMG) between January 1, 2013 and December 31, 2013. The clinic consisted of one pharmacist, two nurses, and one provider (physician or mid-level practitioner), who saw patients following hospital discharge. The pharmacist was responsible for evaluating patients' complete medical and pharmacy records for gaps in care or medication-related problems and discussing interventions with the provider prior to the appointment. Additionally, the pharmacist met with patients to provide education and discuss pre- and post-hospitalization medications. After the appointment, the pharmacist documented recommendations in CMG's electronic health record using pre-identified intervention categories (e.g., medication reconciliation, review, and counseling; high-risk medications [HRMs] as defined by the Centers of Medicare and Medicaid Services; drug-drug interactions; drug-disease interactions; cost savings; appropriate lab monitoring; and guideline-related therapy). The number of interventions was tallied and used to determine the percentage of patients receiving each type of intervention. The average number of interventions per patient was also calculated.

RESULTS: A total of 9550 interventions were identified in 1805 patients seen in the ATH clinic, averaging 5.3 interventions per patient. The most commonly recommended intervention received by 97.1% of patients was medication reconciliation, review, and counseling. In addition, 18.1% of patients had HRMs; 18.5% had drug-drug interactions; and 11.4% had drug-disease interactions. Cost-saving opportunities for patients were identified in 15.0% of members. Appropriate lab monitoring was recommended in 42.4% of patients. Established guideline-related therapy recommendations included: angiotensin-converting enzyme inhibitors (12.6%) and aspirin (6.9%).

CONCLUSION: Clinical pharmacists identified multiple opportunities for interventions and can serve an important role in TOC clinics following hospital discharge.

212. Justification for implementation of a pharmacist-managed Medicare annual wellness visit clinic. *Karen Sando, Pharm.D., BCACP, CDE*[1], Jonathan Grant Harrell, M.D.[2]; (1)Department of Pharmacotherapy and Translational Research, University of Florida College of Pharmacy, Gainesville, FL; (2)Department of Community Health and Family Medicine/Family Medicine at Old Town, University of Florida College of Medicine, Old Town, FL

PURPOSE: Beginning January 1, 2011, Medicare provides coverage for an Annual Wellness Visit (AWV). The AWV is reimbursed at $170 for an initial AWV and $110 for subsequent AWVs. Nationally, only 6.5% of Medicare beneficiaries have received this service, likely due to the time (60–70 minutes) needed to conduct these visits. The AWV may be furnished by a medical professional (e.g. health educator, registered dietitian, or other licensed practitioner) or a team of such medical professionals, working under direct supervision of a physician. This project provides justification for implementation of a pharmacist-managed AWV clinic in a rural family medicine practice.

METHODS: A retrospective analysis of financial claims submitted for initial and subsequent AWVs was conducted from 12/1/2012 to 11/30/12. A business plan was completed describing financial projections, potential benefits to clinic physicians, impact on PQRS (physician quality reporting system) measures, and resource requirements for the service.

RESULTS: Of 1529 eligible beneficiaries, few had received an initial (0.85%, n=13) or subsequent (0.06%, n=1) AWV. With 13 AWV billed weekly, this service can provide 0.3 FTE (full-time equivalent) support for a pharmacist and 0.25–0.5 FTE support for a PGY-2 Ambulatory Care resident. Clinic physicians will benefit through increased productivity measures (1025–1516 relative value units generated per year). Key 2014 PQRS measures addressed by this service include: (i) reducing percentage of patients on at least one high-risk medication, (ii) increased immunization rates, and (iii) increased documentation of fall risk assessment and prevention plans. Resource requirements include staff support for visit scheduling, pre-visit phone calls, and advertisement of the service.

CONCLUSIONS: A pharmacist-managed AWV clinic is a potentially sustainable business model for delivery of clinical pharmacy services in the ambulatory setting. Use of a pharmacist to furnish the AWV can increase physician productivity and may improve quality of care for Medicare beneficiaries.

213. Development and implementation of clinical pharmacy services within an outpatient pulmonary clinic.. *Amber Lanae Smith, Pharm.D., MSc, BCPS*[1], Nancy MacDonald, Pharm.D., BCPS[2], Krishna Thavarajah, M.D., MSc[3], Bruno DiGiovine, M.D., MPH[4], James S. Kalus, Pharm.D., BCPS, (AQ-Cardiology)[2]; (1) Department of Pharmacy Practice, Wayne State University, Detroit, MI; (2)Henry Ford Hospital, Detroit, MI; (3) Department of Pulmonology, Henry Ford Hospital, Detroit, MI;

(4)Division of Pulmonary, Critical Care, and Sleep Medicine, Henry Ford Hospital, Detroit, MI

PURPOSE: The 2014 American Society of Health System Pharmacist (ASHP) Foundation's Pharmacy Forecast Report encouraged pharmacy practice leaders to develop and establish roles for pharmacists in ambulatory care settings. Additional publications address the need for pharmacist's collaboration in managing chronic obstructive pulmonary disease (COPD) to improve health outcomes and reduce readmissions. Historically, pharmacists have practiced in ambulatory care clinics at Henry Ford Hospital (HFH). In order to advance the practice model at HFH and improve care coordination, a collaborative care model was developed within an outpatient pulmonary clinic to complement and reinforce existing health care team provider roles.

METHODS: Clinical pharmacists and providers in the pulmonary department at HFH developed a new COPD patient care model with the purpose of improving care, reducing exacerbations, and achieving optimal outcomes through adherence assessment, medication optimization, and patient education. A collaborative practice agreement was developed and submitted to hospital leadership for approval. The supervising physicians and the clinical pharmacist approved the clinic structure and presented the model at the Pulmonary Department Meeting in May 2014.

RESULTS: Clinical pharmacy services are currently offered three half-days a week. Providers either request therapy recommendations or refer patients to the clinical pharmacist for face-to-face visits. Referral criteria includes, but is not limited to: patients with newly diagnosed COPD, two or more COPD exacerbations in the last 6 months, active tobacco dependence, and identified adherence barriers (i.e., low health literacy, complicated medication regimens, documented non-adherence, or need for inhaler education). Visits with the clinical pharmacist can include adherence assessment, medication reconciliation, patient education, and medication therapy co-management. Therapy recommendations are communicated to the provider and all encounters are documented in the electronic medical record.

CONCLUSIONS: Prospective data collection is ongoing to evaluate clinical pharmacist interventions and identify quality measures that demonstrate improved care and optimal outcomes.

214. Impact of a pharmacist-managed smoking cessation program. *Kelly Wright, Pharm.D., BCACP, TTS*; School of Pharmacy, Cedarville University, Cedarville, OH

PURPOSE: Estimated abstinence rates (EARs) in tobacco users are approximately 22% after using medications and receiving counseling. The goals of this project were to (i) determine the percent of participants who successfully quit smoking in a pharmacist-managed smoking cessation service at a federally qualified health center (FQHC) and (ii) identify what the participants found helpful about the service.

METHODS: A pharmacist-managed smoking cessation service, including medication recommendations and counseling, was implemented at a FQHC that serves an indigent population. A four-item survey was developed to address the study objectives. Past participants of the program were contacted via telephone and asked to participate. For non-responders, smoking status at their last pharmacist appointment was obtained through the electronic health record (EHR). Descriptive statistics were performed.

RESULTS: Of 58 past participants, 19 completed the survey (32.8% response rate). Nearly 90% (N=17), reported that the program was helpful in their quit attempt. Programmatic areas that were the most helpful were: education, counseling, and medication. After assessing survey and EHR data, the EAR (quit rate) of the service was 20.7% (N=12).

CONCLUSION: A pharmacist-managed smoking cessation service resulted in a similar quit rate to the literature, despite being offered at an FQHC serving an indigent population. Patients at the clinic often have significant barriers to achieving their health goals and do not continue to follow-up to complete the program, creating challenges to determine the true EAR of participants. Efforts have been made to expand the program and to continue to determine what factors impact the success of the service in order to improve it.

215. Virtual pharmacy senior care population management in ambulatory care setting. *Candace Minter, Pharm.D.*[1], Jessie Lish, Pharm.D., BCPS[2], Brad Myers, Pharm.D., MBA, BCPS[3], Mary Morin, RN, MSN, BSN, NEA-BC, RN-BC[4], Daniel Dickinson, M.D., MPH[5]; (1)Pharmacy Administration, Sentara Medical Group, Norfolk, VA; (2)Ambulatory Clinical Pharmacy, Sentara Healthcare System-Sentara Medical Group, Norfolk, VA; (3) Department of Pharmacy, Sentara Healthcare System, Norfolk, VA; (4)Sentara Healthcare System-Sentara Medical Group, Norfolk, VA; (5)Sentara Medical Group, Norfolk, VA

PURPOSE: To develop a virtual pharmacy program in the ambulatory care setting that would improve patient safety, decrease adverse events, and facilitate compliance with Center for Medicaid and Medicare (CMS) Star Measure patient outcomes in senior care population management.

METHODS: Clinical pharmacy specialists within a medical group ambulatory care setting identified the senior care patient population of one associated insurance payor providing a Medicare Advantage plan. The clinical pharmacy specialists completed virtual pharmacy chart reviews (VPRx) and real-time prescription review for each identified patient. The VPRx was completed for each patient prior to the scheduled medicare enrollment appointment, each provider office visit, and each hospital discharge encounter. Clinical pharmacy specialists provided prospective drug therapy recommendations including dose adjustments and generic interchange. In addition, the clinical pharmacy specialists received an electronic alert when a prescription was ordered electronically for each patient identified. These prescriptions were reviewed to verify that they were clinically appropriate and cost-effective. All recommendations were communicated to providers through a documented progress note and the in-basket messaging feature within the electronic medical record.

RESULTS: Two clinical pharmacy specialists delivered the virtual pharmacy senior care program to 396 patients beginning January 1, 2014. In first quarter 2014, the clinical pharmacy specialists provided 3052 interventions including 813 clinical interventions such as generic interchange. There was a 70% provider acceptance rate of these clinical interventions. The remaining 2239 interventions included patient touch points such as VPRx. In addition, the annualized cost-savings derived from medication discontinuation and generic interchange recommendations was $65,186 and the annualized cost savings opportunity was $131,687.

CONCLUSION: The role of ambulatory care pharmacists in providing virtual pharmacy patient-centered pharmaceutical care is innovative and focused on the needs of the individual patient while simultaneously coordinating with the care team to achieve healthcare goals for distinct populations.

216. Design and implementation of a large integrated healthcare system ambulatory management of anticoagulation therapy utilizing a registered nurse-pharmacist model. *Jessie Lish, Pharm.D., BCPS*[1], Brad Myers, Pharm.D., MBA, BCPS[2], Cheryl Weimer, RN, BSN[3], Mary Morin, RN, MSN, BSN, NEA-BC, RN-BC[4], Eric Lipton, M.D.[4]; (1)Ambulatory Clinical Pharmacy, Sentara Healthcare System-Sentara Medical Group, Norfolk, VA; (2)Department of Pharmacy, Sentara Healthcare System, Norfolk, VA; (3) Department of Nursing, Regulatory and Compliance, Sentara Healthcare System-Sentara Medical Group, Norfolk, VA; (4) Sentara Healthcare System-Sentara Medical Group, Norfolk, VA

PURPOSE: To develop and implement a comprehensive, evidence-based and standardized ambulatory anticoagulation therapy management program within a large integrated healthcare system utilizing a registered nurse (RN)-pharmacist model to improve patient safety, effectiveness, access and customer satisfaction.

METHODS: Clinical pharmacy specialists within a medical group ambulatory setting have partnered with RNs to create a virtual anticoagulation management model. Clinical pharmacy specialists created a collaborative practice agreement with providers to inde-

pendently manage patients' anticoagulation therapy in 11 clinics throughout Virginia. Evidence-based protocols were created for warfarin and new oral anticoagulant management, standardized staff and provider education modules were developed and standardized patient/caregiver education was established. RNs within the clinics assess, educate and independently provide warfarin dose adjustments per an established protocol. RNs collaborate with clinical pharmacy specialists for those patients for whom the protocols do not apply. RNs and clinical pharmacy specialists document progress notes for each patient within the same electronic medical record. An INR reminder list is utilized to track patients. A time in therapeutic range (TTR) report, adverse events tracking and clinical pharmacy specialist interventions (iVents) were developed to measure clinical outcomes.
RESULTS: 15 RNs managed 17,704 patient encounters during the first quarter 2014; two clinical pharmacy specialists have intervened on 1893 of those patients (10.7%). Data shows an approximate 65% time in therapeutic range for all anticoagulation patients managed during the first quarter 2014.
CONCLUSIONS: The RN-pharmacist model for anticoagulation management is innovative and focuses on the needs of the individual patient while concurrently practicing evidence-based care for an entire population. Both RNs and clinical pharmacy specialists practice to the full scope of licensure while ensuring safe and effective care.

217. Retrospective analysis of billing and reimbursement at a stand-alone medication therapy management clinic. *Keri Hager, Pharm.D.*[1], Rena Gosser, Pharm.D.[2]; (1)Department of Pharmacy Practice and Pharmaceutical Sciences, University of Minnesota College of Pharmacy, Duluth, MN; (2)University of Wisconsin Hospital & Clinics, Madison, WI
PURPOSE: In 2007, the American Medical Association approved permanent current procedural terminology (CPT) codes for billing Medication Therapy Management (MTM) services. These approved CPT billing codes are time-based; however, some payers have opted to reimburse MTM services based on a resource-based relative value scale (RBRVS) based on complexity of the encounter. Complexity is based on number of medications and medical conditions evaluated, as well as drug therapy problems identified and resolved during a patient encounter. The purpose of this study was to determine if there is a difference in billing and reimbursement using the RBRVS versus time.
METHODS: MTM encounters at a stand-alone MTM clinic from November 1, 2007 through April 22, 2014 were analyzed to compare billing via RBRVS versus what would have been billed for the face-to face time spent with the patient. A paired *t*-test was conducted using Statistical Package for the Social Scientist v21.
RESULTS: A total of 525 face-to-face MTM encounter billing claims were analyzed for 62 patients (31 male, 31 female) with a mean (standard deviation) age of 61(8) years at the time of encounter. The mean number of medical conditions, medications, and drug therapy problems evaluated per encounter were 9(4), 12 (6), and 1(1) respectively. The mean encounter length was 47(18) minutes. The mean amount billed via RBRVS was \$83.71 (\$36.67) compared with mean time-based billing of \$111.83 (\$34.55). The mean difference between RBRVS and time-based amount billed was \$28.12 ($p<0.0001$).
CONCLUSIONS: Billing via the RBRVS system consistently resulted in significantly less reimbursement than billing via time. Future research is needed to determine factors that can improve efficiency and to re-evaluate the components that determine complexity for the RBRVS system to ensure it reflects the resources (including time) necessary to care for patients.

218. Hospitalizations and patient outcomes between a pharmacist-physician diabetes co-management service and usual care. *Anita Airee, Pharm.D., BCPS*[1], Andrew W. Dake, M.D.[2], Pinky Mahbubani, Pharm.D. Candidate[3], Juli D. Williams, M.D.[2], R. Eric Heidel, Ph.D.[2]; (1)Department of Clinical Pharmacy, The University of Tennessee College of Pharmacy, Knoxville Campus, Knoxville, TN; (2)Graduate School of Medicine, The University of Tennessee Medical Center, Knoxville, Knoxville, TN; (3)The University of Tennessee College of Pharmacy, Knoxville Campus, Knoxville, TN
PURPOSE: This study assessed the impact of a pharmacist-physician co-management service for patients with type 2 diabetes mellitus on hospitalizations and disease-oriented endpoints compared to usual medical care in an academic practice.
METHODS: This retrospective case-control study enrolled patients greater than or equal to 18 years of age that were referred to the pharmacists-physician co-management service over a 32 month time-period compared to patients who were managed by usual physician care. Cases were provided direct care in a collaborative manner with primary care physicians whereas controls received usual medical care from physicians only. Primary outcomes evaluated included change in A1c and change in total number of hospitalizations. A mixed ANOVA was conducted to assess significant main and interactional effects between treatments groups.
RESULTS: A total of 260 patients were enrolled in the study. The mean baseline A1c for cases was $9.31 \pm 2.33\%$ and $7.11 \pm 1.66\%$ for controls At the end of the study period the mean A1c was $7.03 \pm 2.30\%$ for cases and $6.74 \pm 1.20\%$ for controls. There was a significant main interaction between groups and A1c ($p=0.003$) and no differences in hospitalizations between cases and controls ($p=0.46$). There was a significantly higher odds of receiving foot exams ($p=0.007$), pneumococcal vaccine ($p=0.003$) and influenza vaccine ($p<0.001$) with cases compared to controls.
CONCLUSIONS: Implementation of a pharmacist-physician co-management service in an academic medical center compared to usual care significantly decreased A1c values yet had no impact on hospitalizations compared to usual care. The impact of items related to health maintenance compared to usual care is noteworthy.

219. Description of collaboration between primary care clinical pharmacy and dermatology. *Stephanie Cho, Pharm.D., BCPS*, Sara Klockars, Pharm.D., BCPS; Kaiser Permanente Colorado, CO
PURPOSE: Dermatology poses a unique opportunity for clinical pharmacy services given expanding and costly pharmaceutical choices for complex dermatologic conditions. Our purpose is to describe the role, activities, and growing opportunity for clinical pharmacy services within dermatology.
METHODS: The clinical pharmacy liaison role in dermatology at Kaiser Permanente Colorado is designed as remote practice-share support from two primary care clinical pharmacy specialists (PCCPS). Within a closed, managed care setting we provide virtual support for four dermatology clinics comprised of twenty-six physician and mid-level providers. Our liaison role includes patient-specific consults from dermatology providers as well as dermatology-related questions from PCCPS colleagues. In addition, we are responsible for dermatology provider education, updating dermatology resources (i.e., patient education, guidelines), and acting as content experts within the organization (i.e., drug monographs). Collaborative pharmacy initiatives include working with dermatology providers to update electronic medication order entry tools to guide safe medication use and promote cost-effective prescribing (i.e., streamlining topical corticosteroids) as well as ongoing review of high cost medication use (i.e., monitoring dosing of etanercept for psoriasis).
RESULTS: Current assessment of topical corticosteroid substitutions is ongoing and cost avoidance estimates are pending. In an evaluation of patients on prolonged off-label twice weekly etanercept, clinical pharmacy intervention resulted in successful step down with an estimated \$41,000 of cost avoidance within a 6-month period. Over the past 6 months, 142 patient-specific clinical dermatology interventions were documented by clinical pharmacy dermatology liaisons.

CONCLUSION: Clinical pharmacy services dedicated to dermatology affords new opportunities for promoting cost-effective and safe care. Our experiences highlight some of the benefits of current practice and future potential growth.

220. Development of a Patient Care Standard in a Multi-site PGY1 Pharmacy Residency in Ambulatory Care.. *Anita Sharma, Pharm.D.*, Sarah Westberg, Pharm.D., BCPS; University of Minnesota College of Pharmacy, Minneapolis, MN
PURPOSE: The University of Minnesota College of Pharmacy has an ASHP-accredited multi-site PGY1 Pharmacy Practice Residency in which residents concentrate their learning experiences in a variety of ambulatory care practice settings, including community pharmacies, clinics and rural health systems The primary objective of this study was to determine whether thereÕs a value in defining a minimal set of patient care experiences within the University of MinnesotaÕs PGY1 ambulatory care residency program, and what those minimal standards should be within the University of MinnesotaÕs residency program.
METHODS: Four telephonic focus groups were held December 2013 March 2014 with preceptors from the University of Minnesota College of PharmacyÕs PGY1 ambulatory care residency program. Focus groups were divided into: 2 groups from clinic-based practices, 1 group from community pharmacies, and 1 group from rural health systems. Fourteen out of 15 sites participated in the focus groups.
RESULTS: Four themes were identified relating to minimal standards for PGY1 ambulatory care residency programs. Three themes revolved around comprehensive medication management, patient care process, and the follow up process. One theme expressed concerns regarding establishment of standards without further information. The results from these themes helped develop a one-page document summary on patient care standards for the University of Minnesota College of PharmacyÕs Ambulatory Care residency program, which was approved by program preceptors in Spring 2014.
CONCLUSION: Sites within the University of Minnesota Ambulatory Care Residency Program will provide comprehensive medication management services to patients. This includes participation in the full patient care process of assessment, care plan development, follow-up evaluation, and appropriate documentation of this care. This minimal set of patient care standards for this multi-site PGY1 ambulatory care residency program, outlined through this study, can serve as a model for other ambulatory residency programs throughout the country.

Cardiovascular

221E. Infectious complications associated with induced hypothermia for cardiac arrest. *Kerry Schueler, Pharm.D.*, Ryan Hobbs, B.S. Pharm.; Department of Pharmaceutical Care, University of Iowa Hospitals and Clinics, Iowa City, IA

Presented at the American Society of Health-System Pharmacists Midyear Clinical Meeting, Orlando, FL, December 8–12, 2013.

222. Collaboration between inpatient and outpatient pharmacy departments to improve 30-day all cause readmission for patients with acute myocardial infarction. *Lindsay Arnold, Pharm.D.*, James Palatty, R.Ph., Man Lam, R.Ph., Sylvia Chan, Pharm.D.; Department of Pharmacy, Boston Medical Center, Boston, MA
PURPOSE: As part of an institutional quality improvement initiative a multifaceted approach to the management of patients with acute myocardial infarction (AMI) was undertaken. This study serves to evaluate the impact of collaboration with inpatient and outpatient pharmacists to increase patient education & access to medications following AMI.
METHODS: All patients admitted to the cardiology services with a primary diagnosis of STEMI or Type I NSTEMI received daily disease state & medication education from an inpatient pharmacist. On the day of discharge, patients receive additional counseling & bedside medications delivery by an outpatient pharmacist. Patients who received counseling & medication delivery from May 2013–April 2014 were compared to patients who did not receive medication delivery. Patients were excluded who went on to surgery, died during hospitalization or were discharged to location other than home. Primary outcome was all cause 30 day readmission. Secondary outcomes included persistence of refills at 30 and 60 days.
RESULTS: All-cause 30 day readmission decreased during the study period compared to our historical cohort (14% vs 19.8%, $p<0.05$). During the study period, 138 patients were identified as having a STEMI or type 1 NTEMI. Mean age was 63.8 years & 65.2% were male. There were no significant differences in patients who received bedside medication delivery (n = 94) compared to those who did not (n = 44) in 30 day readmission (15.9% vs 13.6% respectively, $p=0.72$). Of patients who had bedside medication delivery, 52.1% refilled prescriptions at 30 days. Readmission rate at 30 days for patients who refilled medications at 30 days 10.2% vs 22.2% in patients who did not refill medications ($p=0.06$).
CONCLUSIONS: A multifaceted approach to the management of patients with AMI improved all cause 30 day readmission. There was no significant difference in readmission rates among patients who received bedside medication delivery.

223. Outcomes associated with restricted use of sodium bicarbonate when compared with normal saline for the prevention of contrast-induced nephropathy. *Oksana Barakat, Pharm.D., BCPS-AQ-Card*[1], Haywood Rhodes, Pharm.D.[1], Jenna M. Huggins, Pharm.D., BCPS[2]; (1)Department of Pharmacy, WakeMed Health & Hospitals, Raleigh, NC; (2)WakeMed Health and Hospitals, Raleigh, NC
PURPOSE: An interchange for sodium bicarbonate, when prescribed for prevention of contrast-induced nephropathy, was instituted in October 2012 at WakeMed Health and Hospitals due to a critical sodium bicarbonate shortage. A review of literature found sodium bicarbonate not superior to normal saline for prevention of contrast-induced nephropathy. A drug utilization review was performed at WakeMed Health and Hospitals to compare the rates of contrast-induced nephropathy in patients undergoing percutaneous coronary intervention before and after restriction of sodium bicarbonate.
METHODS: A retrospective chart review comparing the rates of contrast-induced nephropathy in patients undergoing percutaneous coronary intervention who received sodium bicarbonate prior to restriction on October 2012 or normal saline after the restriction date.
RESULTS: 85 patients in sodium bicarbonate group and 97 patients in normal saline group were identified for review. Contrast induced nephropathy (defined as >25% or >0.5 mg/dl increase in the baseline creatinine level in the absence of an alternative etiology during the first postprocedural 24–72 hours) occurred in five patients (6%) in sodium bicarbonate group compared to two (2%) patients in normal saline group.
CONCLUSION: A review of utilization data at WakeMed Health and Hospitals has not demonstrated an increase in contrast-induced nephropathy associated with using normal saline during the shortage of sodium bicarbonate.

224. Clinical outcomes of a post-discharge heart failure medication reconciliation clinic. Stephanie Ogorzaly, Pharm.D.[1], Julie Gee, R.N., M.S.N, C.N.P.[2], Robert Wenzell, Pharm.D.[1], Christopher Burant, Ph.D.[3], Jose Ortiz, M.D.[2], Sherry Milfred-LaForest, Pharm.D.[1]; (1)Department of Pharmacy, Louis Stokes Cleveland Department of Veterans Affairs Medical Center, Cleveland, OH; (2)Department of Cardiology, Louis Stokes Cleveland Department of Veterans Affairs Medical Center, Cleveland, OH; (3)Geriatric Research, Education & Clinical Center (GRECC), Louis Stokes Cleveland Department of Veterans Affairs Medical Center, Cleveland, OH

PURPOSE: Recent pay for performance standards have reduced reimbursement for heart failure (HF) readmissions, leading health systems to develop innovative strategies to care for HF patients in the outpatient setting. A pharmacist-led multidisciplinary HF medication reconciliation (MedRec) clinic was developed to facilitate optimization of medication therapy early post-discharge. Pharmacists in the MedRec clinic perform medication reconciliation, assess patient clinical status, collaborate with providers, and optimize medications. The primary objective of this study was to compare the all-cause 30-day readmission rate post-HF hospitalization in patients seen in MedRec clinic to patients who received usual post-discharge care.
METHODS: A case-control retrospective chart review was conducted. Patients were included following a HF admission between November 2010 and December 2012. Data collected included hospitalizations, mortality, follow-up visits, and medication changes. Chi-squared test was used for categorical variables and t-test was used for continuous variables.
RESULTS: A total of 166 patients were included, 83 in each group. The all-cause 30-day readmission rate was 10% in the MedRec group versus 23% in the control group, a 64% decrease in the odds of being readmitted (odds ratio 0.36, 95% confidence intervals 0.15–0.88, p=0.021). Mean time to readmission in the MedRec group was 22 days versus 15 days in the control group (p=0.019). There was no difference in total number of hospitalizations or deaths within 6 months. Mean time to first follow-up was 9 days in the MedRec group versus 11 days in the control group (p=0.037). More patients had medication changes made in the MedRec group compared to controls (59% vs 40%, p=0.014).
CONCLUSIONS: Patients in a pharmacist-led multidisciplinary HF MedRec clinic had a 64% decrease in the odds of 30-day readmission compared to patients who received usual post-discharge care. This was seen along with longer time to readmission, more medication adjustments, and earlier follow-up appointments.

225. Characterization of a pharmacist-managed heart failure medication titration clinic: patient population, outcomes, and barriers to titration. *Shubha Bhat, Pharm.D.*[1], Mayank Kansal, M.D.[2], Thomas Stamos, M.D.[2], George Kondos, M.D.[2], Vicki L. Groo, Pharm.D.[1]; (1)Department of Pharmacy Practice, University of Illinois at Chicago, Chicago, IL; (2)Department of Medicine, University of Illinois at Chicago, Chicago, IL
PURPOSE: Optimal management of systolic heart failure (HF) includes target doses of angiotensin converting enzyme inhibitors (ACEi), angiotensin-receptor blockers (ARB), and/or beta blockers (BB). To improve use of guideline directed medical therapy (GDMT), a pharmacist-managed medication titration clinic (MTC) was established. Patients are seen biweekly until target doses are achieved then discharged to their primary cardiologist. We characterized the MTC patient population, outcomes, and barriers to titration.
METHODS: Single center retrospective chart review of adults with ejection fraction (<40%) referred to MTC from 7/6/11 to 7/31/13. Medical history, demographics, vitals, and basic metabolic panel were collected. HF medication regimens from first visit in study period, months 1,2,3,6,9,12, and final visit were documented. Barriers to titration per progress notes were recorded and compared to patients managed by general cardiology (GC) alone in the same study period.
RESULTS: Seventy-seven MTC patients, predominantly NYHA Class I–II, Stage C, African-American males were managed in MTC. Excluding patients lost to follow up, 90.3% of patients were titrated to target ACEi/ARB and 92.2% to target BB. The average number of visits in MTC was 2.66 (range, 1–9). Eighty-two and 78% of MTC and GC (n = 112) patients experienced one or more barriers to titration (p=ns). Missed visits (62%), clinical factors (hypotension, bradycardia or declining renal function) (51%) and adherence related issues (44%) were the most common barriers identified in the MTC managed patients. Missed visits (84%), clinical factors (33%) and providers not addressing the need for HF medication titration (26%) were the most common barriers for GC managed patients.
CONCLUSION: The pharmacist-managed MTC is effective in achieving target doses of GDMT and identifying adherence problems in a stable HF population. While barriers to HF medication titration exist, GC would benefit from education on importance of HF medication titration in stable patients and availability of MTC as a resource.

Clinical Administration

226. Discharge medication reconciliation by pharmacists to improve transitions following hospitalization. Rebecca Sawyer, Pharm.D., BCPS, Jessica Odom, Pharm.D., BCPS, *Jasmine Jennings, Pharm.D., BCPS*; Department of Pharmacy, Greenville Health System, Greenville, SC
PURPOSE: Improper medication reconciliation at discharge is one of the leading causes of adverse drug events (ADEs), patient readmissions, and unnecessary spending. Our objectives were to evaluate readmission rates and cost avoidance associated with pharmacist-led discharge medication reconciliation.
METHODS: This prospective, cohort pilot study was conducted from September through October 2012. Patients eligible for this process were adults with more than one discharge medication. During this pilot phase, only patients seen by Hospitalist physicians on the pulmonary unit and discharged between 8:00 am and 4:00 pm on Monday through Friday received pharmacist-led medication reconciliation. The primary outcomes of this study included the number and type of pharmacist intervention and the potential cost avoidance associated with the intervention. Secondary outcomes included change in 30-day readmission rates and change in HCAHPS (Hospital Consumer Assessment of Healthcare Providers and Systems) survey scores.
RESULTS: Fifty-eight patients met the inclusion criteria for receiving pharmacy-led discharge medication reconciliation. Sixty patients discharged from the same unit during the study period did not meet inclusion criteria and served as the comparison group. There were a total of 116 recommendations across the 58 patients in the intervention population. Seventy-four of 116 recommendations were accepted by the physician (63.7%). The total cost avoidance of all the recommendations was estimated to be $66,192. Seventeen percent of patients receiving pharmacy-led discharge medication reconciliation were readmitted to our institution within 30 days of hospital discharge which was not statistically different from the comparison group. No significant difference was seen between HCAHPS scores in the intervention versus the comparison group.
CONCLUSION: Pharmacists have a valuable role in the discharge medication reconciliation process. Pharmacists' interventions at discharge can contribute to more interdisciplinary collaboration, as well as prevent unnecessary medication costs.

227. Evaluation of a therapeutic substitution of albuterol/ipratropium combination inhalers to nebulizers at an Academic Medical Center. *Steven Loborec, Pharm.D.*, Shawn Johnson, Pharm.D., MPH, BCPS, BCNSP, Ellen Keating, Pharm.D., M.S.; Department of Pharmacy, The Ohio State University Wexner Medical Center, Columbus, OH
PURPOSE: Respiratory inhalers constitute a large portion of medication expenditure within health systems, and this cost is projected to increase. The literature describing methods institutions are using to control these costs is sparse. This study assessed the financial impact to our institution and analyzed the impact on respiratory therapy (RT) after a therapeutic substitution from albuterol/ipratropium inhalers to albuterol/ipratropium nebulizers was implemented.
METHODS: Data were collected from October to December of 2012 and 2013 to compare similar timeframes before and after the formulary substitution. Data collected to evaluate the impact of the substitution included medication administration, cost, admissions, patient days, and acuity. Additional personnel, drug expense, and technology implementation were also included in our analysis. Medications evaluated include albuterol inhalers and nebulizers, ipratropium inhalers and nebulizers, tiotropium

inhalers, budesonide/formoterol inhalers, fluticasone inhalers, budesonide nebulizers, formoterol inhalers and nebulizers, racemic epinephrine and albuterol/ipratropium combination inhalers and nebulizers. Purchasing data were compared to measure the cost impact of therapeutic substitution to the department. Additionally, documented administrations were assessed to evaluate the change in RT workload.
RESULTS: The therapeutic interchange resulted in an annual drug cost savings of $397,432 within the department of pharmacy. The substitution required added costs which reduce the institutional cost savings. The capital investment in new technology was $111,130 as a one-time investment, plus $62,496 yearly. RT workload was increased resulting in hiring an additional FTE. Taking these costs into account, there was an overall savings of $146,806 during the implementation year, and a projected savings of $257,936 for subsequent years. Purchasing volume of albuterol/ipratropium inhalers went from 13,667 inhalers in the before timeframe compared to zero in the post timeframe.
CONCLUSION: This therapeutic substitution increased the workload for the respiratory therapy department but resulted in substantial cost savings to the health system.

Community Pharmacy Practice

228. Community pharmacists' attitudes toward dispensing errors at community pharmacy setting in Central Saudi Arabia. *Mohamed Alarifi, Ph.D.*; Clinical Paharmacy, College of Pharmacy, King Saud University, Riyadh, Saudi Arabia
PURPOSE: The main objective of this study was to survey pharmacists' attitudes toward dispensing errors in community pharmacy settings in Saudi Arabia.
METHODS: A cross-sectional survey of community pharmacists in Riyadh region, Saudi Arabia was conducted over a period of 6 months from March through September 2012. A stratified random sample of eight hundred registered pharmacy practitioners was collected all over Riyadh region. Statistical analysis was done using SPSS version19.0 for windows (SPSS Inc., Chicago, Illinois).
RESULTS: The response rate was almost 82%. The majority of the respondents are young adults (90.2%). The median for years of registration of respondent pharmacists was 9 years (range 1–37 years). About 62% (407) of the respondents have a positive response while only 37.8% (n = 248) have a negative response in this respect. The major factors identified were pharmacist assistant (82.2%) and high workload (72.5%). The most appreciated factors that help reducing dispensing errors are improving doctors' hand writing and reducing work load of the pharmacist (82.9% and 82.8% respectively), having drug names that are distinctive (76.1%) and having more than one pharmacist in duty (75.5%).
CONCLUSION: In conclusion, majority of community pharmacists indicated that the risk of dispensing errors was increasing and most of them were aware of dispensing errors. It is obvious from the study results that dispensing errors is a big concern for community pharmacy practice in Saudi Arabia. Therefore, there is an urgent need for the professional organizations and Pharmacy Boards in Saudi Arabia to determine standards for the profession.

229. Community pharmacist's role in a county-wide health initiative aimed at decreasing the incidence of type 2 diabetes. *Robin Parker, Pharm.D.*[1], Ben Gross, Pharm.D., CDE, BCPS, BCACP, BC-ADM[2], Richard Randolph, Pharm.D.[1]; (1)Marcrom's Pharmacy, Manchester, TN; (2)Department of Pharmacy Practice, Lipscomb University College of Pharmacy, Nashville, TN
PURPOSE: The prevalence of type 2 diabetes is currently on the rise, with the number of undiagnosed and with pre-diabetes increasing. Pharmacists are a readily accessible healthcare entity, and are often the first resource utilized by patients in rural communities. The purpose of this study was to see how a pharmacist in a rural setting can be utilized in a weight-loss initiative through the provision of health information and point-of-care testing.
METHODS: Subjects were included if they were participating in a grant-funded initiative aimed at decreasing the incidence of obesity and type 2 diabetes. The grant funded participation in a unique weight-loss program, individual health analysis, and educational classes. Data gathered through a questionnaire at baseline and at the end of the 10-week program included the following: weight, BMI, cholesterol, blood glucose, hemoglobin A1c and blood pressure. Subjective information, including disease state knowledge, was also obtained.
RESULTS: Of the 168 patients consenting to participate in the program, 122 (73%) completed post-program screening. All participants began with an overweight or obese status (BMI $\geq$25), and 88 (52%) of those screened had an A1c $\geq$5.7%. The 122 participants completing the program had various beneficial outcomes, including an average BMI decrease (n = 112; 92%) of 2.95 and an A1c decrease (n = 66; 54%) of 0.51%. In addition to objective improvements various educational components increased diabetes awareness evident through end-point questionnaire results.
CONCLUSIONS: Pharmacist interaction with participants improved both subjective and objective outcomes. Pharmacist involvement is currently underutilized in weight loss interventions. Although impact could vary depending on location and population, patients are interested in the program and value pharmacy input. Pharmacist involvement provides community outreach to the community while enhancing patient perception of the expanding role of pharmacists in healthcare.

Critical Care

230E. Efficacy and safety of high dose dexmedetomidine in cardiac and medical intensive care patients. *Deanna Bice, Pharm.D., BCPS*, April Quidley, Pharm.D., BCPS, FCCM, Chad Alligood, Pharm.D., Rena Beth Morse, Pharm.D., Christy Forehand, Pharm.D., BCPS; Vidant Medical Center, Greenville, NC

Presented at 45th Southeastern Residency Conference, Athens, GA. May 1–2, 2014.

231. Characterization of intervention rates by expanded, after-hour, decentralized critical care pharmacy services at an Academic Medical Center. *Erik J. Rachwalski, Pharm.D., BCPS*, Bryan D. Lizza, Pharm.D., BCPS, Kasey M. Greathouse, Pharm.D., BCPS, Deepika R. Pereira, Pharm.D., BCPS, Kimberly Levasseur-Franklin, Pharm.D., BCPS, Kristen March, Pharm.D., BCPS, Michael Postelnick, R.Ph., BCPS (AQ ID); Department of Pharmacy, Northwestern Memorial Hospital, Chicago, IL
PURPOSE: The profession of pharmacy has evolved over the past four decades. While numerous clinical services have been created where pharmacists have played an integral role, the impact of clinical pharmacy services has been predominantly limited to daytime hours. In high-risk populations, such as the critically ill, service limitations may adversely affect patient outcomes. The impact of expanding clinical pharmacy services in the intensive care unit (ICU) beyond daytime hours has not been established. Our primary objective was to characterize intervention rates by decentralized, ICU clinical pharmacists when utilized beyond daytime hours (from 1600 to 2300H).
METHODS: Interventions were prospectively recorded on a standardized data collection template for 1000 consecutive hours (from May 2013 to November 2013). A clinical pharmacist with post-graduate training in critical care or equivalent experience was available between the hours of 1600–2300 by pager and/or dedicated mobile phone. ICU clinical pharmacists documented their participation in pharmacokinetic consultations, dose adjustments for organ dysfunction, emergency response (both airway and cardiac arrests), medication history and reconciliation, drug information or prevention of adverse drug events.
RESULTS: The average daily ICU census during the study period was 78. A total of 11,083 patient days were recorded among the various ICUs during the study period. A total of 688 inter-

ventions were documented, yielding an intervention rate of 6.2 interventions per 100 patient days. The majority of interventions documented were pharmacokinetic consultations for various agents and participation in emergency response teams.
CONCLUSION: Incorporating a decentralized clinical pharmacist in the ICU during expanded evening hours resulted in an intervention rate comparable to previous studies in critically ill patients. Future analyses should establish the pharmacoeconomic benefit of a clinical pharmacist during expanded hours.

232. Improved survival after Advanced Cardiovascular Life Support: outcomes associated with the implementation of pharmacist documentation during in-hospital cardiac arrest events. *Mojdeh Heavner, Pharm.D.*[1], Jessica Nuzzo, MPH[2], Jason Heavner, M.D.[3], Frances Veiga, B.S.[2], David Pritchard, Pharm.D.[1], Renee Fekieta, Ph.D.[2], Ginger Morris, Pharm.D.[1], Melani Semlow, RN, MSN[4], Grace Jenq, M.D.[5], Marie Devlin, RN[4], Kathleen Testa, RN, MPH[2], William Crede, M.D.[2]; (1)Department of Pharmacy Services, Yale-New Haven Hospital, New Haven, CT; (2)Quality Improvement Support Services, Yale-New Haven Hospital, New Haven, CT; (3)Section of Pulmonary, Critical Care, and Sleep Medicine, Yale School of Medicine, New Haven, CT; (4)Yale-New Haven Hospital, New Haven, CT; (5)Department of Medicine, Yale School of Medicine, New Haven, CT
PURPOSE: Noncompliance with Advanced Cardiovascular Life Support (ACLS) is common despite the association of increased cardiac arrest survival with ACLS adherence. Pharmacist participation on cardiac arrest teams improves ACLS adherence and hospital mortality. We hypothesized that adding pharmacists to the ACLS documenter role would be associated with improved documentation completion, ACLS compliance and duration, and cardiac arrest survival.
METHODS: In 2012, ACLS-certified pharmacists were added to cardiac arrest teams during weekdays as an intervention to improve ACLS documentation at our 1541-bed academic hospital. The role of the pharmacist included ACLS documentation and medication consultation. We reviewed available ACLS records from 26 patients before and 54 patients after implementation. Event characteristics, documentation completion, ACLS metrics, and pharmacist intervention data were collected. The primary outcome was documentation completion. Secondary outcomes included cardiac arrest survival, ACLS compliance, and duration of ACLS.
RESULTS: Cardiac arrest occurred during the defined weekday period in 22/80 (27.5%) patients and did not vary before and after implementation of this initiative (p=0.30). After implementation, there was overall improvement in documentation completion (0.0% pre-implementation vs 27.8% post-implementation; p=0.002) and ACLS compliance (7.7% pre-implementation vs 31.5% post-implementation; p=0.024). During nights and weekends, there was no difference in documentation completion (p=0.29), ACLS compliance (p=0.47), ACLS duration (p=0.69), and cardiac arrest survival (p=0.41) before and after intervention. However, during daytime hours when the pharmacist was present, there was improvement in completed documentation (0.0% vs 64.7%; p=0.035), ACLS compliance (0.0% vs 58.8%; p=0.04), ACLS duration (36.0 minutes vs 20.5 minutes; p=0.005), and cardiac arrest survival (0.0% vs 58.8%; p=0.04).
CONCLUSIONS: The addition of pharmacists to the ACLS documenter role was associated with improved documentation completion and patient outcomes. The impact of nighttime and weekend pharmacists in the ACLS documenter role, and the identification of contributing factors to cardiac arrest survival require further study.

233. Ergocalciferol supplementation in critically ill patients with vitamin D deficiency. *Mona Patel, Pharm.D.*[1], Vivek Moitra, M.D.[2]; (1)Department of Pharmacy, New York-Presbyterian Hospital, Columbia University Medical Center, New York, NY; (2)Columbia University College of Physicians and Surgeons, NewYork-Presbyterian Hospital, Columbia University Medical Center, New York, NY
PURPOSE: Low vitamin D levels have been associated with increased mortality, ICU stay, infection, and renal dysfunction in critically ill patients. Despite growing evidence illustrating the relationship between vitamin D deficiency and negative outcomes, the body of literature on dosing vitamin D supplementation in critically ill patients remains small. The objective of this study was to evaluate the impact of enterally administered ergocalciferol 50,000 IU daily on serum 25-hydroxyvitamin D [25(OH)D] levels in critically ill patients.
METHODS: An-IRB approved, retrospective chart review was conducted from January 2013 through May 2014 in surgical ICU patients >18 years of age who received enteral ergocalciferol 50,000 IU daily. Deficiency was defined as 25(OH)D <15 ng/mL, insufficiency 16–29 ng/mL, and sufficiency >30 ng/mL. Data are presented as median (IQR).
RESULTS: Of the ten patients included, all were either vitamin D deficient or insufficient with a baseline 25(OH)D of 15 (9.8–17.5) ng/mL. Baseline 25(OH)D levels were drawn on ICU day 15 (9.8–17.5). After 6–7 days of ergocalciferol therapy, the median 25(OH)D increased from 14 (13–13) ng/mL to 19 (15–29) ng/mL. Only 3 patients had normalization of 25 (OH)D after 6–7 days of therapy. The mean 25(OH)D increased from 12 to 50 ng/mL in the two patients who received 13 or 14 days of therapy, and 16 to 43 ng/mL in one patient who received 18 days of therapy.
CONCLUSION: Normalization of 25(OH)D was rare after 7 days of high dose ergocalciferol supplementation. Adequate vitamin D levels were observed in patients who had a longer duration of daily enteral therapy.

234E. Assessment of clinical outcomes in pneumonia patients treated with enteral antibiotics in the surgical intensive care unit. Kathryn Elofson, Pharm.D.[1], Rachel Forbes, M.D., MBA[2], *Anthony Gerlach, Pharm.D., BCPS, FCCM*[3]; (1)Huntsman Cancer Hospital, University of Utah Hospitals & Clinics; (2) Vanderbilt University Medical Center; (3)The Ohio State University Wexner Medical Center

Presented at Elofson KA, Gerlach AT, Forbes RC. Assessment of clinical outcomes in pneumonia patients treated with enteral antibiotics in the surgical intensive care unit. Society of Critical Care Medicine Annual Congress, San Fransisco, California; January 2014.

Education/Training

235. Pre-operative screening of patients at a university-affiliated periodontal clinic carried out by pharmacy students trained in the performance and interpretation of findings from a physical assessment of vital signs. *Christine Leong, B.Sc., B.Sc.(Pharm.), Pharm.D.*[1], Anastasia Cholakis, D.M.D.[2], Christopher Louizos, B.Sc.(Pharm.)[1], Neal Davies, B.Sc.(Pharm.), Ph.D, R.Ph.[1], Douglas Brothwell, D.M.D. D.D.P.H. M.Sc.[2]; (1)Faculty of Pharmacy, University of Manitoba, Winnipeg, MB, Canada; (2)Faculty of Dentistry, University of Manitoba, Winnipeg, MB, Canada
PURPOSE: The application of skills in physical assessment is increasingly recognized as an important part of providing patient care. A module on *Skills in Physical Assessment*focusing on vital signs was implemented into the Faculty of Pharmacy curriculum for third-year pharmacy students at the University of Manitoba in 2013. We aim to describe the integration of a pre-operative screening of vital signs carried out by pharmacy students who completed this module at a periodontal clinic.
METHODS: All pharmacy students who completed the physical assessment module presented to the periodontal clinic located at the Faculty of Dentistry in groups of three throughout the academic year. Each student performed a blood pressure reading, using an automated or manual sphygmomanometer, and a heart rate reading on a patient prior to their dental operation. Students

were required to review the patient's chart and medications prior to approaching the patient and to practice the pharmaceutical care thought process while working collaboratively with a periodontics resident from the Faculty of Dentistry. Pharmacy students provided open-comment feedback on their perspectives of this experience at the end of the program.
RESULTS: Forty-eight third-year pharmacy students attended the periodontal clinic. Student feedback revealed that students were encouraged to think about interventions that were safe to carry out given a specific blood pressure reading pre-surgery. While most of the patients seen at the clinic were relatively healthy and on few medications, students appreciated the interaction with live patients and clinicians from the Faculty of Dentistry. The experiential practice site achieved a *Points for Interprofessional Education Systems*core of 40 points.
CONCLUSION: The periodontal clinic exposure provided students with a unique opportunity to apply physical assessment skills in a specialized practice setting. Findings from this program introduce a novel service that involves the application of pharmacy skills in an interprofessional setting.

236. Pharmacy education in Saudi Arabia towards clinical teaching and practice. *Yousif Asiri, Ph.D.*; Clinical Pharmacy Department, College of Pharmacy – King Saud University, Riyadh, Saudi Arabia
PURPOSE: The major changes from the inception of a small pharmacy faculty in 1959, the College of Pharmacy at the King Saud University, Riyadh, Saudi Arabia to the model of progress and a prototype of pharmacy colleges in Saudi Arabia was discussed.
METHODS: The trends in curriculum changes over 50 years have been traced and the significant curriculum and administrative changes have been discussed. Several interviews were made with previous Deans and Department chair persons have been also made.
RESULTS: The 50 years chronological array of College of Pharmacy at King Saud University were documented. The steps of changing the curriculum from "product orient" to "patient oriented" curriculum was discussed. The concept of clinical pharmacy has applied in the College by establishing a "clinical Pharmacy Dept.," in 1980. Recently, the academic system in Saudi Arabian Pharmacy has adopted a more clinically-oriented Pharm. D. curriculum. In addition, the achievement of the CCAPP accreditation and ACPE certification will be discussed in this paper.
CONCLUSION: Doctor of Pharmacy program is now established to better shape up the pharmacy profession in Saudi Arabia and better education for pharmacists. The demand for qualified pharmacists is growing and is projected to grow considerably in the future. The number of pharmacy graduates is increasing each year by many folds and to meet the needs the system lays stress upon a constant revise

237. Providing pharmacy services in third world countries. *Michelle Holm, Pharm.D., BCPS*; Mayo Clinic, Rochester, MN
PURPOSE: Current medical information and effective medication management systems are both crucial needs of hospitals located in third world countries. Mayo Clinic provides the only pharmacy-driven underserved global health initiative in the world. We deliver highly sought-after medical education including specific objectives and endpoint measurements. We also provide the expertise to optimize medication management systems as a separate entity from the rest of a medical team.
METHODS: A needs assessment of several Haitian medical facilities determined that core lecture topics and more efficient medication management systems were of highest priority. Verification of educational and interpersonal skills desired was evaluated for each interested pharmacist. Preparation encompassed briefing each team on the objectives and goals of the mission along with editing and translating the educational presentations. Core lecture topics given to Haitian pharmacists, physicians, and nurses included: recent guidelines, classes of medications, and appropriate utilization of each medication. Mayo Clinic pharmacists also worked with the each hospital to improve their medication management systems by introducing the Pharmacy Computerized Inventory Program (PCIP) which facilitated their medication use process by assuring vital medications were always in stock.
RESULTS: In the past 4 years 10 pharmacists have traveled on 17 trips to educate in Haiti. A total of 81 lectures have been given with 37 lectures remaining to give. The PCIP has increased the quantity of medication requests by 62% and over 300 health care members have been affected including: physicians, nurses, pharmacists, and hospital staff.
CONCLUSION: Pharmacists have an opportunity to provide highly effective core topic lectures as well as vastly improve each hospital's medication management system. We are qualified to act as a separate entity of the medical team with unique goals and objectives. Future goals include expanding services to additional third world countries as well as engaging more pharmacists to participate in underserved global health.

238. Implementing a layered learning model in a small, community hospital: economic and patient satisfaction outcomes. *Mate Soric, Pharm.D., BCPS*[1], Jason Glowczewski, PharmD., MBA[2], Rachael Lerman, Pharm.D., BCPS[1]; (1)Department of Pharmacy, University Hospitals Geauga Medical Center, Chardon, OH; (2) University Hospitals Health System, Shaker Heights, OH
PURPOSE: Clinical pharmacy services are known to improve patient care. These services are often available in large medical centers but have not become widely available in smaller hospitals. The layered learning model (LLM) represents one avenue to expand clinical pharmacy services. This study aims to quantify the economic and patient satisfaction impact of a LLM in a small, community hospital.
METHODS: The LLM consisted of a clinical pharmacist, 2 PGY1 residents and 24 student-months of coverage participating on rounds and providing patient education. Physician-specific drug expenditure data was analyzed from January 1, 2011 to December 31, 2012. The primary endpoint was mean total drug expenditures per discharge between the LLM physicians (intervention group) and the non-LLM physicians (control group). Secondary outcomes evaluated drug expenditures for 8 common diagnoses. Patient satisfaction was assessed by comparing HCAHPS medication education scores during the study period to the 2 years immediately prior to implementation. Statistical analysis was performed using the student's t-test, Mann-Whitney U, chi-squared test and descriptive statistics.
RESULTS: The intervention group consisted of 2737 discharges compared to 3983 discharges for the control group. The groups were not significantly different at baseline. The difference in mean total drug expenditures per discharge was \$82.65 (\$307.55 $\pm$ 766.80 vs \$390.20 $\pm$ 757.89, $p<0.0001$), favoring the LLM group. Drug costs for pneumonia (\$296.30 $\pm$ 208.86 vs \$449.98 $\pm$ 314.20) and urinary tract infection (\$157.42 $\pm$ 101.83 vs \$301.45 $\pm$ 251.41) were significantly lower in the LLM group ($p<0.01$). Patient satisfaction with medication education improved significantly during the LLM period when compared to the pre-implementation period (8th percentile vs 39th percentile, $p<0.001$).
CONCLUSION: The LLM reduced drug expenditures and improved patient satisfaction. This data supports utilizing the LLM to rapidly expand clinical services in community hospitals and improve patient care. Expanding the LLM to cover the control group physicians could result in a \$164,500 drug costs savings per year.

239E. Evaluation of a student interprofessional team disclosure of a medication error to a patient. Kelly Ragucci, Pharm.D.[1], *Sarah P. Shrader, Pharm.D., BCPS*[2]; (1)Department of Clinical Sciences and Outcomes Sciences, South Carolina College of Pharmacy, Charleston, SC; (2)University of Kansas School of Pharmacy, KS

Presented at All Together Better Health 7 Conference, Pittsburgh, PA June 5–8, 2014.

240. Evaluation of the Interprofessional Teaching Clinic model: preparing medical, nursing, and pharmacy students to collaborate. James Kleoppel, Pharm.D.[1], Cari Chestnut, Pharm.D. Candidate[1], Jana Zaudke, M.D.[2], *Sarah P. Shrader, Pharm.D., BCPS*[3]; (1)University of Kansas School of Pharmacy; (2) University of Kansas Medical Center; (3)University of Kansas School of Pharmacy, KS

PURPOSE: Experts recommend simultaneously transforming interprofessional education and practice models to fulfill the Triple Aim of healthcare. Although interprofessional education and practice are expanding, assessment of models that combine education and practice is needed. The objective of this study was to evaluate the impact of the Interprofessional Teaching Clinic (IPTC) rotation model on students' interprofessional communication.

METHODS: The IPTC model includes a traditional primary care clinic that was operationally transformed into an interprofessional primary care training site where interprofessional student teams provide direct patient care under the supervision of faculty preceptors. In addition, students participate in an interprofessional education curriculum one half-day per week. This rotation was designed and students are intentionally placed there to develop their interprofessional collaboration skills. An interprofessional teaching objective structured clinical experience (iTOSCE) was developed as a combined assessment and education tool. For the iTOSCE, one standardized patient was created and students completed an initial (pre-IPTC) and follow-up visit (post-IPTC). Pre-IPTC occurred during the first week of the rotation and post-IPTC occurred during the last week. Evaluation rubrics for interprofessional communication of the team were completed by peer and faculty observers (0 = not observed, 1 = needs improvement, 3 = exemplary). Mean pre- and post-IPTC iTOSCE scores were compared using the Chi Square measure.

RESULTS: Sixty-four students participated in the IPTC rotation during the 2013–14 academic year (medicine = 20, nursing = 8, and pharmacy = 36). Scores on the iTOSCE were significantly improved after completing the IPTC rotation. Mean faculty pre- and post-IPTC scores were 1.45 and 1.75, respectively ($p<0.05$). Student peer observation mean pre-and post-IPTC scores were 1.71 and 1.84, respectively ($p<0.05$).

CONCLUSION: Students exposed to the IPTC rotation model improved their behavior regarding interprofessional communication. Other schools and clinics could adapt this rotation model to meet the growing needs for integrating interprofessional education and clinical practice.

241. The implementation of an advance pharmacy practice experiential student program at a supply chain management organization. *Shaffeeulah Bacchus, Pharm.D.*; Pharmacy Department, Yankee Alliance Inc, Andover, MA

PURPOSE: To create an advance pharmacy practice program that engages a student to develop their pharmacy practice management skills through active participation in pharmacy initiatives at a supply chain management organization.

METHODS: A rigorous curriculum was created to allow the student to actively participate in a variety pharmacy supply chain operations with a special focus on: data analysis, medication utilization evaluation, pharmacy contracting, drug shortages, member support, cost analysis, pharmacy operations, business development, marketing, leadership, and research. The student was assigned a single specific project within each area. Each project was managed and evaluated using a propriety productivity development tool designed for this advance pharmacy practice experiential program. The student's impact was assessed for each project on a weekly basis for savings, cost avoidance and value-add to overall supply chain management membership. In addition, weekly readings and summations, at least two journal clubs, evidence based research and drug information support were also assigned. The student attended all contracting, operations and leadership meetings during the rotation.

RESULTS: The student was assigned twelve projects including a major project that was managed using the productivity development tool. Eleven of these projects were completed within the 6-week rotation period. The major project resulted in a measurable savings of $74,000.

CONCLUSION: This was the first supply chain management advance pharmacy practice experiential rotation available to pharmacy students at Northeastern University. The advance pharmacy practice experiential student provided measurable impact to the supply chain management organization.

242. Active learning simulation preparing students for community pharmacy: a peer teaching experience. *Melissa Ruble, Pharm.D.*[1], Jaclyn Cole, Pharm.D.[1], Erini Serag-Bolos, Pharm.D.[2]; (1) Pharmacotherapeutics and Clinical Research Department, University of South Florida College of Pharmacy, Tampa, FL; (2)Pharmacotherapeutics and Clinical Research, University of South Florida College of Pharmacy, Tampa, FL

PURPOSE: The purpose of this simulation activity was to introduce all first year pharmacy students to basic terminology and technical processes encountered in a community pharmacy, in addition to empowering students through peer teaching. By incorporating this activity in spring of the PY1 year, students should be able to better transition into their Introductory Pharmacy Practice Experience in a community setting (IPPE II) during the PY2 year with fundamental knowledge and confidence.

METHODS: Students in the Pharmaceutical Skills II course were sent an electronic survey to assess previous experience in community pharmacy.

RESULTS: Were used to assign group leaders to peer teach the simulation. The simulation was held at the University of South Florida's Center for Advanced Medical Learning and Simulation Center (CAMLS) in the pharmacy training center over a series of three sessions. Five teaching stations were utilized: prescription drop off/pick up, dispensing, reconstitution, prescription transfers, and prescription transcription. Each station lasted 20 minutes with two to three faculty members proctoring each session. Results: Survey results revealed that 37% of students had previous community experience, with the majority of students having one to 3 years of experience (47.5%). Upon completion, students were asked to provide verbal feedback assessing the simulation and areas for improvement. Students unanimously reported feeling more prepared for their IPPE II course, enjoyed the peer teaching component, and appreciated the opportunity to have an active learning experience. The major area for improvement included the desire to provide peer leaders a discussion rubric to ensure they do not miss any key teaching points.

CONCLUSION: Based on student feedback, this was a successful active learning simulation that prepared students for expectations of community pharmacy. The simulation will continue to evolve based on student feedback, and more objective post-activity surveys will be utilized in the future to provide more validated results.

243. Pharmacy student interventions for medicaid patients during a major formulary change. Bradley M. Wright, Pharm.D., BCPS[1], Haley M. Phillippe, Pharm.D., BCPS[2], *Miranda R. Andrus, Pharm.D., BCPS*[3]; (1)Auburn University, Harrison School of Pharmacy, Huntsville, AL; (2)Auburn University, Harrison School of Pharmacy, Brownsboro, AL; (3)Auburn University Harrison School of Pharmacy, Auburn, AL

PURPOSE: In August 2013, Alabama Medicaid announced major changes to the formulary system. Beginning in January patients were limited to 5 prescriptions per month, excluding antiretrovirals, antipsychotics and antiepileptics. Certain generic maintenance medications were required to be filled for a 3 month supply, so that prescriptions could be staggered to allow more than 5 total medications. Over-the-counter (OTC) medications were no longer covered. An intervention was needed to prepare patients and providers for this complicated formulary change.

METHODS: Student pharmacists designed a medication form to categorize medications and plan for staggering of prescriptions by month. Students also developed a comprehensive database of drug discount plans that could be used to choose medications to be paid for in cash. A report of adult Medicaid patients within the Internal Medicine and Family Medicine Clinics was obtained. Student pharmacists reviewed patient profiles (n = 406) and began scheduling patients with the most complicated medication lists to see the clinical pharmacist. In addition a "Medicaid Brown Bag" day was organized by student pharmacists in December 2013 for patients with 10 or more medications who had previously not been seen by a pharmacist.
RESULTS: A total of 124 patients had a medication plan developed. Patients were on an average of 13 medications each and the final medication lists consisted of an average of 5–30 day medications, 3–90 day medications, two cash medications, and two OTC medications per patient. While conducting the reviews, student pharmacists discontinued 89 medications, therefore reducing polypharmacy. In addition, a total of 5 medications were identified as contraindications and discontinued, while a total of 24 medications were switched to combination tablets or formulary agents.
CONCLUSION: Student pharmacists made a major impact in preparing Medicaid patients and physicans for a major formulary change.

Emergency Medicine

244. Emergency medicine clinical pharmacist's impact on the medication reconciliation process. *Elaine DePrang, Pharm.D., BCPS*[1], Arun Mathews, M.D.[2]; (1)Trauma Department, Medical Center Hospital, Odessa, TX; (2)Medical Center Hospital, Odesa, TX
PURPOSE: To meet new meaningful use requirements while improving the validity of the medication reconciliation process and expand medication management for patients in the emergency department with a clinical pharmacist. We focused on the time requirements to complete the medication reconciliation, as well as the multiple tasks necessary to complete this process.
METHODS: The study period was 90 days with pharmacist driven medication reconciliation provided 9 hours per day every day of the week. Medication reconciliations were completed on every patient admitted from the emergency department during the specified trial times. A pre survey and post survey to assess the perception of pharmacist driven medication reconciliation and utility of a clinical pharmacist in the emergency department were also completed by physicians, nursing, pharmacists, and pharmacy administration. For each medication reconciliation the pharmacist documented the time required to complete the process, the number of medications to be reconciled, and the tasks required to complete the medication reconciliation.
RESULTS: Perception of the utility for pharmacists completing the medication reconciliation process was high pre and post survey. The total number of medication reconciliations completed was 569, with an average number of medications of 7.64, and an average time to complete of 31 minutes.
CONCLUSION: This data helped to substantiate the need and demonstrate the benefit a clinical pharmacist can have on the medication reconciliation process, and also established clinical pharmacists as a valuable resource for medication information to physicians and nursing. Medication reconciliation completed by pharmacists shows improved medication safety, cost savings, and meets requirements of meaningful use. Additionally, based on the findings of this study a grant to fund the development of pharmacist driven medication reconciliation in our institution was obtained.

245. Appropriateness of post-exposure rabies prophylaxis in a Community Hospital Emergency Department. *Kimball Owens, Pharm.D., BCPS*, Dustin Waters, Pharm.D., BCPS, Tyson Bigelow, Pharm.D., BCPS, Britta Bergstrom, Pharm.D., BCPS, Aleesha Galeria, Pharm.D., BCPS, Christian Larsen, Pharm.D., BCPS; Intermountain Healthcare, Ogden, UT
PURPOSE: This study was conducted to determine the appropriateness of rabies post-exposure prophylaxis (PEP) based on national and state guidelines. We hypothesized that many patients who receive rabies immunoglobulin and/or rabies vaccine following exposure to a potentially rabid animal are treated inappropriately with associated increased cost and utilization of healthcare resources.
METHODS: Electronic medical records of 222 encounters involving 81 patients who had received rabies immune globulin and/or rabies vaccine during the years 2010 through 2013 were reviewed. Justification for treatment provided in electronic records was compared to the Utah Department of Health Guide to Rabies Post-Exposure Evaluation and Management. Investigators classified treatment as "indicated" or "not indicated", and determined whether the treatment course was completed per CDC guidelines.
RESULTS: Between 2010 and 2013, 81 people were exposed to a potentially rabid animal, evaluated in the emergency department, and received one or more doses of PEP. Animals involved included 26 dogs (32.1%), 19 cats (23.5%), 23 bats (28.4%) and various other mammals (15%). Thirteen (16%) patients received PEP when not indicated. A cost-analysis, based on average wholesale price, estimated $21,339.24 was spent on inappropriate rabies PEP.
CONCLUSION: Post-exposure rabies prophylaxis was over-utilized during a 3 year period with associated increased cost and utilization of healthcare resources. Reasons for overutilization included: administering PEP when the animal was available for testing or in situations deemed low-risk and continuing to administer rabies vaccination to patients after the animal in question tested negative for rabies during the PEP course. Inappropriate administration of PEP and costs can be reduced by adhering to state and national guidelines.

246. Analgesic response to intramuscular ketorolac in the obese patient population in the Emergency Department. Megan Van Berkel, Pharm.D., BCPS[1], Brittany Jonap, Pharm.D., BCPS[2], Lori Davis, EMT-P[3], *Ana Negrete, Pharm.D., BCPS*[1]; (1)Pharmacy Department, Methodist University Hospital, Memphis, TN; (2) Department of Pharmacy, Methodist University Hospital; (3) Emergency Department, Methodist University Hospital
PURPOSE: Analgesic selection in the Emergency Department (ED) can be challenging due to possible opioid abuse or absence of intravenous access. Additionally, intramuscular (IM) injection in the obese population may be problematic, given the standard IM needle length. This study evaluated the effect of body mass index (BMI) on analgesic response to IM ketorolac in non-obese, obese, and morbidly obese patients treated in the ED.
METHODS: This was a retrospective study of adult patients treated for pain with 60 mg IM ketorolac in the ED from November 2013 through April 2014. Pain scores were completed at the discretion of the nursing team using a traditional 10 point Likert pain scale, and the change in pre and post treatment scores was compared for patients who are non-obese (BMI <30 kg/m^2), obese (BMI 30.1–35 kg/m^2), and morbidly obese (>35 kg/m^2). Exclusion criteria were a post pain score collected <30 minutes from the time of ketorolac injection, concomitant administration of another analgesic, or incomplete demographic and pain score data.
RESULTS: During the inclusion period, 120 patients met eligibility for inclusion out of 388 charts reviewed. There was no difference in patient age, location of pain, location of IM injection, or pre-treatment pain scores. There were more females in the obese and morbidly obese groups (p=0.0012). There was no difference in the primary outcome of average change in pain response for patients in the non-obese (6.6 ± 3.0), obese (6.0 ± 3.7) and morbidly obese (6.0 ± 3.1) groups, (p=0.593). A multiple regression analysis was performed for the primary outcome and found no difference between groups after controlling for time to post-treatment pain score and location of injection (p=0.634).

CONCLUSIONS: BMI did not affect mean change in pain score suggesting effective administration in the obese population. Data will be collected for additional analysis.

Endocrinology

247. Clinical effect of sitagliptin on hemoglobin A1c after sleeve gastrectomy. *Christopher M. Bland, Pharm.D., BCPS*[1], Christos Hatzigeorgiou, M.D.[2], David A. Bookstaver, Pharm.D.[3], Lori B. Sweeney, M.D.[4], Margueritede Haseth, Pharm.D.[5]; (1) Department of Clinical Pharmacy, Eisenhower Army Medical Center, Fort Gordon, GA; (2)Department of Internal Medicine, Eisenhower Army Medical Center, Fort Gordon, GA, GA; (3) Eisenhower Army Medical Center, Fort Gordon, GA; (4)Division of Endocrinology and Metabolism, Department of Internal Medicine, Virginia Commonwealth University, Richmond, VA; (5)Medical University of South Carolina, Charleston, SC
PURPOSE: Bariatric surgeries are increasingly performed as a means for improving glucose control in obese (BMI ≥ 35) Type 2 diabetes patients resulting in a significant reduction in pharmacotherapy. Improved glucose control is thought to be related to increased glucagon-like peptide 1 (GLP-1) concentrations post-surgery, which is also an indirect effect of sitagliptin by dipeptidyl peptidase-4 inhibition. There are limited data supporting primary choices of pharmacotherapy following sleeve gastrectomy. We sought to evaluate the clinical effect of sitagliptin on hemoglobin A1c levels after sleeve gastrectomy.
METHODS: A retrospective chart review from January 2007-April 2014 was conducted at a single center to evaluate for change in hemoglobin A1c levels after initiation of sitagliptin in the post-sleeve gastrectomy patient. Baseline hemoglobin A1c levels were compared to the first hemoglobin A1c level obtained after sitagliptin initiation. BMIs at time of initiation of sitagliptin therapy and at first A1c level were also recorded.
RESULTS: Eleven patients met criteria for evaluation. Hemoglobin A1c levels were obtained an average of 111 days after initiation of sitagliptin therapy. Average BMIs at baseline and time of first A1c level were 34.76 and 35.88 respectively (p=0.78). Average hemoglobin A1c levels were 7.55 and 7.21 at baseline and at time of first A1c level respectively (p=0.34).
CONCLUSION: Sitagliptin therapy did not have a clinically significant effect on hemoglobin A1c levels in the post sleeve gastrectomy patient. This is potentially due to already increased GLP-1 levels in response to bariatric surgery. Further evaluation should be conducted to determine optimal pharmacotherapy for diabetes mellitus in the post sleeve gastrectomy patient.

Family Medicine

248E. Call me maybe? A pharmacist-managed, telephonic transitions of care program in a patient centered medical home (PCMH): effect on hospital readmission. *Amanda Wojtusik, Pharm.D., BCPS*[1], Jennie Broders, Pharm.D., BCPS[2]; (1) Department of Medical Education, UPMC St. Margaret, Pittsburgh, PA; (2)UPMC St. Margaret Family Medicine Residency Program, UPMC St. Margaret, Pittsburgh, PA

Presented at Presented at the Annual Spring Conference of the Society of Teachers of Family Medicine (STFM), San Antonio, TX, May 3–7, 2014.

249. Prospective pharmacist identification of drug therapy problems in the medical home. Tamara Lallier, Pharm.D., MBA[1], *James D. Hoehns, Pharm.D., BCPS, FCCP*[2]; (1)Northeast Iowa Medical Education Foundation/Waverly Health Center, Waterloo, IA; (2)University of Iowa College of Pharmacy and Northeast Iowa Family Practice Center, Waterloo, IA
PURPOSE: Medication management is an essential component of patient care in the Patient Centered Medical Home. Few ambulatory clinics provide routine prospective pharmacist review of a patient's medication regimen. A previous pilot study at Northeast Iowa Family Practice Center (NEIFPC) established a system for pharmacists to inform providers of patient drug therapy problems via the electronic medical record (EMR) prior to their scheduled appointment. The objective of this study was to implement and expand a systematic process for pharmacists to provide prospective chart review and make patient specific drug therapy recommendations to physicians at NEIFPC.
METHODS: The study used a quality improvement design incorporating prospective chart review, attendance at pre-visit team huddles, and select face-to-face encounters with high-risk patients (diabetes, heart failure, or those taking ≥6 medications). Data were collected for 5 months.
RESULTS: Pharmacy staff prospectively reviewed 3394 of 7573 patient charts (44.8%) prior to their office visit. The resident and student pharmacists completed 72% and 28% of medication reviews, respectively. Pharmacy staff made 752 prospective drug therapy recommendations. Face-to-face medication reviews were completed for 43.6% (103/236) of high-risk patients. Analysis of recommendations demonstrated a 48% acceptance rate, with similar acceptance from resident and faculty physicians.
CONCLUSION: With limited resources, pharmacy staff was able to prospectively review nearly half of clinic patient's EMRs prior to their appointment. As pharmacists may need to expand the pool of ambulatory patients they provide services to, this is a pharmacist care model which could readily be adapted to other medical homes.

Gastroenterology

250. Pharmacy coordinated prescribing of hepatitis C medications in an ambulatory care clinic. *David Quan, Pharm.D.*, Aileen Chi, Pharm.D.; Department of Pharmaceutical Services, UCSF Medical Center, San Francisco, CA
PURPOSE: To describe and evaluate the success of the hepatitis C prescribing program developed by the department of pharmaceutical services in a large academic ambulatory care medical center.
METHODS: A retrospective chart review of patients prescribed medications for the treatment of hepatitis C infection between the months of December 2013 through March 2014.
RESULTS: A total of 200 patients were prescribed antiviral medications for the treatment of hepatitis C infection between December 2013 and March 2014. In those 200 patients, a total of 512 antiviral medications were prescribed. An average of 2.56 antiviral medications were prescribed per patient. Sofosbuvir accounted for 39.1% of prescriptions, followed by ribavirin with 33.4%, simeprevir with 15.4%, and peginterferon with 12.1% of prescriptions. A total of 163 (81.5%) patients were able to initiate hepatitis C treatment, with an average of 46 days (median 40 days) from prescribing to treatment initiation. There were 37 (18.5%) patients unable to start treatment due to insurance reimbursement issues or changes in clinical status.
CONCLUSION: The pharmacy program was able to successfully facilitate the initiation hepatitis C treatment in a majority of patients prescribed antiviral medications in a large academic ambulatory care medical center.

Geriatrics

251. Program of all-inclusive care for the elderly: an evaluation of enrollee physical health outcomes and impact of pharmacist involvement on chronic disease state management. *Macey Williams, Pharm.D.*[1], Amber Lanae Smith, Pharm.D., BCPS[1], Prabha Dhanapal, Pharm.D., BCPS, BCOP[1], Megan Mills, Pharm.D., CGP[2], Donna Beydoun, Pharm.D., CGP[3]; (1)Department of Pharmacy Services, Henry Ford Hospital, Detroit, MI; (2)Center for Senior Independence; (3)Merck
PURPOSE: Program of All-Inclusive Care for the Elderly (PACE) is a Centers for Medicare and Medicaid Services program that coordinates comprehensive care to keep elderly enrollees living safely within the community. The objective of this

study was to assess the effect of PACE enrollment on physical health outcomes and describe the impact of pharmacist services.
METHODS: This study was an IRB-approved pre-post cohort that included patients enrolled in PACE from January 2011 to June 2012. Enrollees were excluded if they were enrolled <1 year, enrolled in hospice during the study period, had missing blood pressure (BP) data at baseline, missing BP data at 1-year post enrollment, or had documented medication non-adherence. The primary endpoint was percent at BP goal; and the secondary endpoints were percent at low-density lipoprotein (LDL) and hemoglobin A1c (HgbA1c) goal, number of pharmacist interventions, and types of pharmacist interventions.
RESULTS: A total of 76 subjects were included for analysis; median age was 81 years, 67% had hypertension, 52% had hyperlipidemia, and 34% had diabetes. Only 27% of enrollees with hypertension were at goal at baseline compared to 51% 1 year post-enrollment (p=0.02). Median change in systolic and diastolic blood pressure was 152 mmHg to 139 mmHg (p=0.002) and 76 mmHg to 73 mmHg (p=0.04), respectively. The percent at goal for LDL and HgbA1c was not statistically significant. A total of 129 pharmacist interventions were made—majority were recommending to discontinue a medication (36%) or initiate a medication (33%).
CONCLUSION: PACE programs may improve the physical health outcomes of its enrollees, and there may be a role for pharmacists to improve chronic disease state management. Results suggest the need for larger prospective randomized controlled trials to confirm the impact of PACE.

252. Prevalence and description of potentially inappropriate medications found in a community-based rural-dwelling elderly population. *Shara Elrod, Pharm.D.*[1], Leigh Johnson, Ph.D.[2], Ashley Toale, Pharm.D.[3]; (1)Department of Pharmacotherapy, University of North Texas System College of Pharmacy, Fort Worth, TX; (2)Department of Internal Medicine, University of North Texas Health Science Center, Fort Worth; (3)Department of Pharmacotherapy, University of North Texas System College of Pharmacy, Fort Worth
PURPOSE: To describe the number and type of potentially inappropriate (Beers List) medications found in a community-based rural-dwelling elderly population.
METHODS: This study population included a subset of patients (adults ≥65 years) who participated in Project FRONTIER (Facing Rural Obstacles to healthcare Now Through Intervention, Education & Research), which is an epidemiological study of healthcare issues in rural-dwelling adults ≥40 years. Patients were excluded from the study if they did not know the names of any of their medications or took only medications not available in the US. A patient-reported medication list was independently compared to the 2003 and 2012 American Geriatrics Society Beers Criteria (i.e. Beers List) by two pharmacists (S.E., A.T.) to determine the name, type, and number of potentially inappropriate medications present in each patient's medication list. Discrepancies were resolved through consensus.
RESULTS: A total of 210 participants were identified for inclusion, with a mean age of 75.1 years with 64.8% being female. Patients reported taking an average of 5.2 medications (range 0–20). Forty-eight (22.8%) and 83 (39.5%) participants were considered to be on one or more potentially inappropriate medications when compared to the 2003 and 2012 lists, respectively. When compared to the 2003 Beers List, the most frequently reported Beers List medications include conjugated estrogens, naproxen, amitriptyline, and propoxyphene. When compared to the 2012 Beers List, the most frequently reported Beers List medications include conjugated estrogens, glyburide, and lorazepam.
CONCLUSION: This study revealed a significant number of elderly, rural-dwelling patients report using potentially inappropriate medications on a regular basis. This description of Beers List medications in rural-dwelling older adults will aid in increasing awareness of the prevalence of the use of Beers List medications, helping to reduce the use of potentially inappropriate medications in the elderly.

Health Services Research

253. Determining the impact of a new medication-history Pharmacy Technician Program. *Kayta Kobayashi, Pharm.D., BCPS*, Huong Le, Pharm.D.; Department of Pharmacy Services, Memorial-Hermann Hospital, Houston, TX
PURPOSE: To evaluate the performance of a recently implemented medication-history pharmacy technician program, and to identify areas for improvement.
METHODS: At Memorial-Hermann Hospital – Texas Medical Center (MHH-TMC), medication history pharmacy technicians, whose sole responsibility is to collect medications histories, were deployed in summer 2013. In February 2014, we initiated a quality improvement project to evaluate the Medication History Pharmacy Technician (MHPT) program. Over a 3-day period, 197 patient medication histories were randomly collected from various acute care floors of MHH-TMC for analysis. Medication histories were analyzed missing dosing information, therapeutic duplications, and the credential of the personnel documenting the medication history.
RESULTS: Pharmacy personnel documented a total 83 of 197 medication histories (42%), of which MHPTs accounted for 73 of 83 (88%). Prescribers and nurses documented 78 (40%) and 36 (18%) medication histories, respectively. In comparison to medication histories collected by prescribers, medication histories collected by pharmacy personnel had less missing dose frequencies (7.5% vs 32.0%, p=0.0002), less missing dose routes (2.5% vs 12.0%, p=0.0279), and less therapeutic duplications (8.8% vs 24.0%, p=0.151). Comparing nursing to pharmacy medication histories, frequencies of missing dose, routes, or frequencies were not statistically significant. However, nursing histories contained only a median of 2.5 medications per history, compared to 5 medications in pharmacy-collected histories. In addition, pharmacy medication histories were more likely to cite the source(s) of information from which it derived when compared to prescribers (62.7% vs 43.6%, p=0.0181), and to specify dosing times of once-daily medications (47.6% vs 13.0%, p<0.0001).
CONCLUSION: MHPTs can contribute significantly to the quality and accuracy of medication histories. Nevertheless, this project has also identified several target areas for improving the MHPT program and the findings will be used to develop a continuing education program for MHPTs.

Hematology/Anticoagulation

254. Warfarin dose requirements after sleeve gastrectomy surgery. *Christopher M. Bland, Pharm.D., BCPS*[1], David A. Bookstaver, Pharm.D.[2], Christos Hatzigeorgiou, M.D.[3], Lori B. Sweeney, M.D.[4]; (1)Department of Clinical Pharmacy, Eisenhower Army Medical Center, Fort Gordon, GA; (2)Eisenhower Army Medical Center, Fort Gordon, GA; (3)Department of Internal Medicine, Eisenhower Army Medical Center, Fort Gordon, GA; (4)Division of Endocrinology and Metabolism, Department of Internal Medicine, Virginia Commonwealth University, Richmond, VA
PURPOSE: There are limited data describing warfarin dosage requirements after bariatric surgery, especially sleeve gastrectomy. It is unclear whether warfarin dose requirements change after sleeve gastrectomy. This study sought to evaluate change in warfarin dose requirements in patients after sleeve gastrectomy.
METHODS: A retrospective chart review from January 2008-March 2014 was conducted at a single center to evaluate for change in warfarin dose up to 6 months postoperatively in patients who had undergone sleeve gastrectomy. Weekly warfarin dosage requirements were compared from baseline to 1 month postoperatively, and baseline to 6 months postoperatively. INR values were also monitored and recorded at the same time intervals.
RESULTS: Eleven patients receiving warfarin therapy were evaluated. The mean weekly dosage of warfarin at baseline, 1 and 6 months were 48 mg, 35 mg, and 43 mg respectively. Average INR values during the same time periods were 2.41, 2.78, and 2.32 respectively. Compared to baseline, 1 month warfarin

requirements decreased trending toward statistical significance (p=0.07). Two patients required a 50% dosage reduction from baseline. Requirements increased over time to near baseline values at 6 months. Six month postoperative requirements were not statistically different from baseline (p=0.55).
CONCLUSION: Clinically significant decreases in warfarin dosage requirements occurred for the majority of patients within the first month after surgery. Clinicians should strongly consider a reduction in warfarin requirements in the immediate postoperative setting and expect an eventual return to near baseline dosages at 6 months.

255. Retrospective cohort analysis to evaluate the adherence of institutional guidelines for pharmacologic VTE prophylaxis in hospitalized medically-ill patients. *Suhair Shawar, Pharm.D. Candidate*[1], Toby C. Trujillo, Pharm.D., BCPS (AQ Cardiology)[2]; (1)Skaggs School of Pharmacy and Pharmaceutical Sciences, University of Colorado Skaggs School of Pharmacy and Pharmacutical Sciences, Aurora, CO; (2)Department of Clinical Pharmacy, University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO
PURPOSE: The University of Colorado Hospital (UCH) has implemented institutional guidelines for VTE prevention subsequent to the release of the 2012 Chest guidelines. Implementation included guideline dissemination, provider education, provision of decision support tools, and optimization of order entry options. This study aims to assess the appropriateness of VTE prophylaxis prescribing at UCH for medically ill patients before and after hospital guideline implementation, and assesses the utility of PADUA risk score to predict clinical VTE events.
METHODS: This retrospective comparative cohort study included medically ill patients admitted to UCH 9 months before and 9 months after implementation of institutional VTE prevention guidelines in September 2012. Patients included had a minimal hospital stay of 48 hours. Patients admitted with VTE, bleeding or currently on therapeutic anticoagulation were excluded. The primary endpoint is the rate of appropriate VTE prophylaxis prescribing in the pre and post patient cohorts. Secondary endpoints included the incidence of VTE by clinical presentation and major bleeding in both groups. Major bleeding is defined as either clinically overt bleeding, a fall in hemoglobin of >2 g/dL within 24 hours, or a transfusion of >2 units of packed red blood cells. A sample size of 300 patients in each group is needed to detect an absolute difference of 10% in the primary endpoint with 80% power and a significance level of 0.05.
RESULTS: Preliminary results for the primary endpoint showed, 70% (n = 161) of patients in the pre cohort were appropriately prophylaxed compared to 88.3% (n = 161) in the post cohort (p=0.0001). Major bleed occurred in 43 patients (26.7%) in the pre cohort verses 31 patients (19%) in the post cohort (p=0.11). Similar numbers of VTE events were noted between the two groups (10 vs 11 events).
CONCLUSION: Full Results to be presented.

256. Review of the appropriateness of apixaban, rivaroxaban, and dabigatran therapy. Haley M. Phillippe, Pharm.D., BCPS[1], Bradley M. Wright, Pharm.D., BCPS[2], *Miranda R. Andrus, Pharm.D., BCPS*[3], Kathryn Bowerman, Pharm.D. Candidate[4], Breanna P. Tigue, Pharm.D. Candidate[4]; (1)Auburn University, Harrison School of Pharmacy, Brownsboro, AL; (2)Auburn University, Harrison School of Pharmacy, Huntsville, AL; (3) Auburn University Harrison School of Pharmacy, Auburn, AL; (4)Auburn University, Harrison School of Pharmacy
PURPOSE: To review the appropriateness of apixaban, rivaroxaban, and dabigatran therapy in adult patients of two family medicine and internal medicine outpatient centers. To assess the need of further monitoring in the management of novel oral anticoagulants.
METHODS: A retrospective chart review was conducted of all patients receiving apixaban, rivaroxaban, or dabigatran therapy. Indication, dose, duration, age, weight, blood pressure control, adherence, drug interactions, bleeding risk/history, renal function, and hepatic function were all evaluated. A specified data collection form was used to review all patient charts.
RESULTS: A total of 54 patient charts were reviewed. NOACs were inappropriately prescribed in 23of the 54 patients (42.5%). Five patients were prescribed a NOAC for valvular atrial fibrillation, 2 patients were prescribed a NOAC for coronary artery disease, and 1 patient was prescribed a NOAC for protein S deficiency. Eight patients were prescribed an incorrect dose and 3 patients were prescribed a NOAC for an inappropriate duration. Additional concerns include: 4 patients >90 years of age, 8 patients were previously nonadherant to warfarin therapy, 5 patients were prescribed dabigatran or rivaroxaban therapy after developing a GI bleed while on warfarin therapy, and 16 patients were prescribed ASA, Plavix, NSAIDs, and/or corticosteroid therapy in addition to a NOAC without a GI protectant agent.
CONCLUSION: Although there were limitations to this retrospective analysis, the results of this study demonstrate that additional education is needed to improve prescribing of the NOACs. These results also demonstrate the importance of medication reviews of novel anticoagulants by a pharmacy team.

257. Pharmacist evaluation of anticoagulation care plans. *Elizabeth Renner, Pharm.D., BCACP, BCPS*[1,2], Brian Kurtz, Pharm.D., BCACP[1,2]; (1)Outpatient Anticoagulation Service, University of Michigan Hospitals and Health Centers, Ann Arbor, MI; (2) University of Michigan Health System, Ann Arbor, MI
PURPOSE: Patients may be referred to the Outpatient Anticoagulation Service at the University of Michigan for warfarin management by any physician in the health system. Providers' care plans may not always be in accordance with current evidence-based standards. This study describes the nature & frequency of anticoagulation care plan problems identified and subsequent therapy changes recommended by pharmacists to improve adherence to evidence-based practice guidelines.
METHODS: A list of all patients newly referred to the Outpatient Anticoagulation Service is created at the end of each calendar month. Each patient's chart is reviewed by a pharmacist and the initial care plan (including duration of treatment and INR target range) on the referral is compared with evidence-based guideline recommendations from ACCP 2012. Pharmacists discuss recommended changes to the care plan with referring providers and make adjustments when appropriate.
RESULTS: Over 8 months, 1246 new patient referrals were evaluated. 45 problems were identified, 36 of which were inappropriate therapy duration. 9 were inappropriate INR targets. The most frequent recommendation made by a pharmacist was to decrease duration of therapy, and all 24 of these were for patients with diagnosis of provoked DVT/PE. Notably, only 23 (51%) of all recommendations made were accepted by the referring provider. 12 of these resulted in a shorter duration of anticoagulation, 8 resulted in an increased duration of therapy, 2 resulted in a lower INR range, and 1 in a higher INR range.
CONCLUSION: Despite the availability of evidence-based guidelines for anticoagulation, inappropriate plans for anticoagulation are prescribed. Pharmacists can play a key role in improving evidence-based care.

258. Impact of a pharmacist-managed target-specific oral anticoagulation service. *Brian Kurtz, Pharm.D., BCACP*, Elizabeth Renner, Pharm.D., BCACP, BCPS, BCPS; Outpatient Anticoagulation Service, University of Michigan Hospitals and Health Centers, Ann Arbor, MI
PURPOSE: While anticoagulation services have been established for warfarin management, their role in the management of target-specific oral anticoagulants (TSOACs), including dabigatran, rivaroxaban, and apixaban, is unclear. In 2013, the University of Michigan Outpatient Anticoagulation Service developed a pharmacist-managed TSOAC-monitoring service to ensure appropriate use of TSOACs, including appropriate medication selection, dos-

ing, and monitoring. Here we evaluate the impact of this new service by describing drug-related problems (DRPs) identified and therapy changes made by pharmacists.
METHODS: Patients are enrolled in the service upon receiving a referral from a University of Michigan physician. Physicians can refer for monitoring of a pre-selected TSOAC or for assistance in prescribing a TSOAC. After receiving a referral, patients are contacted via telephone to provide patient-specific anticoagulation education and confirmation of therapy affordability. A follow-up call 2 weeks later assesses adherence and potential adverse effects. After the 2-week appointment, calls are scheduled every 3–6 months to re-evaluate dosing, barriers to medication adherence, and adverse effects. At all visits, pharmacists make additional recommendations on antiplatelet therapy and order laboratory tests (SCr, AST/ALT) if clinically indicated.
RESULTS: To date, 74 patients have been enrolled in the service. Of the 74 patients, 61 were referred for TSOAC monitoring and 13 for pharmacist assistance in initial therapy selection. Fifty-one patients have had at least one follow-up. Pharmacists recommended modification to anticoagulation therapy for 11 patients (18.0%) on a TSOAC medication at the initial visit. Changes were recommended to anticoagulation or antiplatelet therapy for 29 patients (39.2%) during the course of therapy.
CONCLUSION: A pharmacist-managed TSOAC service assists providers in improving anticoagulation care by ensuring proper drug selection, correct medication dosing based on patient-specific factors, therapy affordability, and by providing ongoing anticoagulation education to patients.

HIV/AIDS

259E. Simplification of PI/RTV+FTC/TDF to E/C/F/TDF maintains HIV suppression and is well-tolerated. William Towner, M.D.[1], Edwin DeJesus, M.D.[2], U. Fritz Bredeek, M.D., Ph.D.[3], Jose Arribas, M.D.[4], *Jeffery Olson, Pharm.D.*[5], Ramin Ebrahimi, M.S.[6], David Piontkowsky, J.D., M.D.[7]; (1)Infectious Disease, Kaiser Permanente Southern California, Los Angeles, CA; (2)Orlando Immunology Center, Orlando, FL; (3)Metropolis Medical, San Francisco, CA; (4)Hospital La Paz, Madrid, Spain; (5)Managed Care/Government Account Medical Sciences, Gilead Sciences, New York, NY; (6)Biostatistics, Gilead Sciences, Foster City, CA; (7)Medical Affairs HIV, Gilead Sciences, Foster City, CA

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260. Establishing a clinical pharmacy practice in an integrated-service HIV Outpatient Clinic. *Andrea Pallotta, Pharm.D., BCPS, AAHIVP*[1], Sherrell Lipscomb, M.Ed., LSW[2], Marisa Tungsiripat, M.D.[2]; (1)Department of Pharmacy, Cleveland Clinic, Cleveland, OH; (2)Department of Infectious Diseases, Cleveland Clinic, Cleveland, OH
PURPOSE: A multidisciplinary approach to care can fulfill complex needs of the HIV patient population. HIV Clinic at Cleveland Clinic services over 800 patients and includes infectious diseases, digestive disorders and mental health physicians, fellows, social workers, nurses, and full-time clinical pharmacist. We discuss successes and opportunities to improve patient care associated with comprehensive pharmacy involvement in HIV clinic.
METHODS: The HIV pharmacist's activities include daily outpatient chart review and documentation in electronic medical record (EMR) for drug interactions, HIV and comorbidity management, adherence, immunizations, medication procurement. As part of the team, the pharmacist provides policy/procedure review, improvement of Ryan White Grant utilization, patient counseling, and provider education. The study describes the incorporation of a clinical pharmacist in outpatient HIV clinic and the impact on measures including no-show rates and inappropriate Ryan White Grant charges.
RESULTS: Cleveland Clinic Department of Pharmacy fully funds the HIV pharmacist position, starting Oct 2012. 116 outpatient pharmacist appointments were completed in 2013. Pharmacist created EMR templated notes and custom-built patient lists to improve efficiency. Overall no-show rates for HIV physician appointments decreased from 27% (n = 412/1528) in 2012–22% (n = 411/1868) in 2013. The number of inappropriately filled Ryan White Grant prescriptions decreased from thirteen in April 2013 to zero in Dec 2013, after implementation of a new prescription verification process in May 2013.
CONCLUSIONS: Addition of a clinical pharmacist in an integrated-service HIV clinic helped to improve no-show rates and improve Ryan White Grant utilization. Savings afforded to the Ryan White Grant allowed for reallocation of medication funds to other needed services. Future pharmacy services will focus on transitions-of-care post-discharge pharmacist appointments for medication reconciliation and care coordination.

261. Statin use in the ATP III guidelines compared to the 2013 ACC/AHA guidelines in HIV primary care patients. Anges Cha, Pharm.D., Elise Kim, Pharm.D., *Pansy Elsamadisi, Pharm.D.*, Safia Latif, Pharm.D.; Arnold & Marie Schwartz College of Pharmacy and Health Sciences, Long Island University
PURPOSE: The updated 2013 Cholesterol Guidelines include an atherosclerotic cardiovascular disease (ASCVD) risk score calculator derived from diverse cohorts to determine 10-year risk of CHD as well as stroke. The applicability of this ASCVD calculator and its predecessor, the Framingham risk score (FRS) in ATPIII have been limited in our HIV patients, as they are inherently at higher risk of heart disease. The objective of this study was to compare the new 2013 Cholesterol Guideline's ASCVD risk score to the ATP III guideline's FRS in the initiation of statin therapy in HIV patients.
METHODS: We conducted a retrospective chart review of HIV patients on statin therapy from October 1, 2013 to April 1, 2014. The data collected included: age, race, gender, baseline lipid panel, past medical history, blood pressure, antiretrovirals, smoking status, statin started, dose, and non-statin lipid lowering medications started prior to statin. The primary endpoint evaluated the level of agreement between the guidelines using the Kappa test.
RESULTS: Of the 155 patients who met the inclusion criteria, 116 were treated similarly with both guidelines. This showed a moderate level of agreement ($p<0.001$) between both guidelines. However, 38 out of the 86 patients requiring statins were placed on an incorrect intensity statin using the 2013 guidelines. When comparing the risk scores, the median risk score was 8.8% with ASCVD calculator and 6.0% with the FRS. Although the median risk score was higher with the ASCVD calculator, regardless of which guidelines were used, a majority of our patients required statin therapy for either primary or secondary prevention.
CONCLUSION: A moderate agreement was found between both guidelines in terms of statin use when both guidelines were applied to our HIV patient population. However, based on the new guidelines, 44.4% of the patients were treated with an incorrect statin dose/intensity.

262E. Analysis of baseline HIV-1 genotypes in naïve subjects with HIV in a correctional setting. *Melissa E. Badowski, Pharm.D.*[1], Ryan Werner, Pharm.D. Candidate[1], Jeremy Young, M.D., MPH[2], Pyrai Vaughn, M.A.[2], Louis Shicker, M.D.[3], Mahesh Patel, M.D.[2]; (1)College of Pharmacy, University of Illinois at Chicago, Chicago, IL; (2)College of Medicine, University of Illinois at Chicago; (3)Illinois Department of Corrections

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263. Implementation of a mandatory pharmacy medication review consult for HIV/AIDS patients receiving antiretroviral therapy in an Urban Teaching Hospital. *Aaron Hoffman, Pharm.D.*, Kersten Weber-Tatarelis, Pharm.D.; Department of Pharmacy, Advocate Illinois Masonic Medical Center, Chicago, IL

PURPOSE: Patients receiving antiretroviral therapy (ART) for the treatment of HIV infection experience a particularly high rate of medication errors upon hospital admission. This initiative was designed to utilize a mandatory pharmacy consult to identify and prevent such errors from occurring.
METHODS: Beginning in July 2013, all inpatient orders for ART required utilization of a computerized ART order set which included a mandatory pharmacy consult. Pharmacists reviewed ART medication regimens for accuracy based on one or more of the following: patient interview, consultation with the patient's HIV care provider, or verification with an outpatient pharmacy. Throughout the patient's admission, pharmacists also screened for renal and hepatic impairment as well as drug interactions which might necessitate dose adjustments or changes in therapy. Any errors or issues identified were addressed with the ordering physician and corrected when necessary.
RESULTS: Between July 2013 and April 2014, pharmacy consults were completed for 219 patient encounters. Pharmacists identified 53 patients (24%) with at least one ART-associated problem, including 37 patients (17%) whose ART orders contained some type of error. Identified errors included wrong drug(s), wrong dose(s), incorrect frequency, and omission of one or more drugs. Renal dose adjustments were required in 11 patients while an additional 11 patients had significant drug interactions associated with ART. An additional 21 patients (10%) had errors related to medications taken to prevent or treat opportunistic infections, with omission of such medications noted to be the most common error (11 patients). All issues and errors identified via the pharmacy consult were corrected after discussion with the ordering physician.
CONCLUSIONS: Medication errors and other problems associated with ART in HIV patients can be identified and corrected in a timely fashion by instituting a mandatory pharmacy consult for all ART orders.

264. HIV telemedicine in the correctional setting. *Melissa E. Badowski, Pharm.D.*; University of Illinois at Chicago College of Pharmacy, Chicago, IL
PURPOSE: The prevalence of Human Immunodeficiency Virus (HIV) is increased in the correctional setting where one in seven of HIV-infected patients pass through a correctional facility on an annual basis. This is an important opportunity to test, diagnose, educate and treat these individuals to prevent additional HIV transmission. Subspecialty management by a medical team trained in HIV can minimize the risk for opportunistic infections, adverse events, and drug-drug interactions while improving survival. Correctional facilities are often located in rural areas where officers and vehicles are required to bring offenders to an off-site HIV clinic since many prisons lack trained medical personnel to appropriately manage HIV. Geographic and transportation limitations of HIV-infected patients can be overcome through telemedicine. Telemedicine exchanges medical information from one site to another through the use of electronic communications to optimize patient health.
METHODS: The University of Illinois at Chicago provided HIV care via telemedicine to HIV-infected patients incarcerated in twenty-six correctional facilities throughout the State of Illinois beginning in July 2010. Multidisciplinary HIV care was provided by HIV-trained medical staff including physicians, clinical pharmacists, and a case manager. An electronic stethoscope and exam camera were used to assist in physical exam. Antiretroviral medications were dispensed and mailed to each facility through our university based pharmacy.
RESULTS: Our program has provided care to over 1100 patients with more than 6000 patient visits. The subspecialty telemedicine clinic was associated with significantly greater virologic suppression and higher CD4 counts compared to those who were managed by non-specialists prior to telemedicine implementation.
CONCLUSION: A multidisciplinary team of HIV subspecialists improved patient outcomes and provided more timely and efficient care through telemedicine to individuals incarcerated in the State of Illinois.

Infectious Diseases

265. Evaluation of a novel vancomycin versus linezolid ICU cycling protocol in documented MRSA nosocomial pneumonia. *Nikunj Vyas, Pharm.D.*[1], Douglas Slain, Pharm.D., BCPS[2], Lisa Keller, Pharm.D.[1], Arif R. Sarwari, M.D., M.Sc., MBA[3]; (1)West Virginia University Healthcare, Morgantown, WV; (2)West Virginia University School of Pharmacy, Morgantown, WV; (3) Department of Medicine, Section of Infectious Diseases, West Virginia University, Morgantown, WV
PURPOSE: At our 535 bed university hospital, for gram-positive coverage for nosocomial pneumonia in the ICU, linezolid and vancomycin are cycled every 6 months for empiric MRSA coverage. The purpose of this study is to assess the efficacy and safety of fixed-dose linezolid and dose-optimized vancomycin during cycling for treatment of documented MRSA nosocomial pneumonia in the ICUs.
METHODS: This is an observational study from January 2009 to December 2013 involving hospitalized adult patients with nosocomial MRSA pneumonia confirmed by bronchoscopy. Patients in the linezolid cohort were matched (for age, sex and renal function) to patients receiving vancomycin. The primary endpoints were survival at discharge (SOD) and clinical cure (CC) at end of therapy. The resistance patterns of MRSA and VRE were evaluated throughout the study. Multi-logistic regression analysis (MLRA) was used to assess potential impact factors on cure and survival such as of antibiotic, cardio-pulmonary co-morbidities, CURB-65, modified APACHE II score, MRSA bacteremia, polymicrobial infection, ventilation, and SCr.
RESULTS: Of 200 patients evaluated with documented MRSA pneumonia, 81 patients from each treatment arm of linezolid and vancomycin were matched to one another. At the end of treatment CC was achieved in 60/81 (74.1%) of linezolid and 55/81 (67.9%) of vancomycin recipients (p=0.489). At hospital discharge, 57/81 (70.4%) of linezolid and 54/81 (66.7%) of vancomycin recipients had survived (p=0.735). With MLRA, the mAPACHE II score was the only independent variable associated with CC (0.871, 95% CI: 0.791–0.954) and SOD (0.801, 95% CI: 0.722–0.883, $p \leq 0.0001$). No significant differences in gram-positive resistance and nephrotoxicity were observed (vancomycin 9.9% vs linezolid 3.7%, p=0.210) during the study period.
CONCLUSION: Our results suggest gram-positive cycling with linezolid and vancomycin was similar in efficacy and toxicity in MRSA pneumonia. Contrary to recent literature, both drugs appear to be similar in terms of efficacy in MRSA pneumonia.

266. Reduced levofloxacin utilization following revision of electronic community-acquired pneumonia order sets and provider education as part of an inpatient antimicrobial stewardship program initiative. *Brad R. Laible, Pharm.D., BCPS-AQ ID*[1], Kathryn Dzintars, Pharm.D., BCPS[2], Jawad Nazir, M.D.[1]; (1)Avera McKennan Hospital and University Health Center, Sioux Falls, SD; (2)The Johns Hopkins Hospital, Baltimore, MD
PURPOSE: This inpatient antimicrobial stewardship program (ASP) initiative was developed in response to excessive levofloxacin ordering despite steadily declining levofloxacin susceptibilities among *Escherichia coli* and *Pseudomonas aeruginosa*. The goal of this program is to reduce levofloxacin use.
METHODS: Electronic community-acquired pneumonia (CAP) order sets were revised to emphasize beta lactam-based regimens (ceftriaxone plus either azithromycin or doxycycline, which are regimens in compliance with IDSA guidelines) as levofloxacin alternatives. These revised electronic sets direct providers to reserve levofloxacin for patients with severe beta-lactam allergies, but compliance with these recommendations is voluntary. To encourage compliance with ASP recommendations, an ID physician and clinical pharmacist provided verbal and written education regarding electronic order set revisions and susceptibility trends among *E. coli* and *P. aeruginosa*to hospitalist, internal medicine, pulmonary, and emergency medicine physicians. Education occurred from December 2012 to January 2013. Implementation of the revised sets occurred in February 2013. Due to limited

resources, this initiative was implemented without the use of formal levofloxacin restriction policies.
RESULTS: Overall levofloxacin utilization throughout the hospital (both CAP and non-CAP indications) reduced from a mean of 55 days of therapy (DOT)/1000 patient days (range 46–71 DOT/1000 patient days) during the 6 months prior to implementation of the revised order sets (August 2012–January 2013) to 32 DOT/1000 patient days (range 25–41 DOT/1000 patient days) in the 12 months following implementation (February 2013–January 2014).
CONCLUSION: Electronic CAP order set revisions augmented with provider education contributed to a 42% reduction in overall inpatient levofloxacin utilization without the use of levofloxacin restriction. The impact of this intervention on susceptibility trends among *E. coli* and *P. aeruginosa* will be evaluated 2 years post-implementation.

267. Impact of 72-hour antibiotic time-out pharmacy protocol on *Pseudomonas aerugonisa* therapy in sub-urban and rural Community Hospital Network. *Immanuel Ijo, Pharm.D.*, Ruth Rabinovitch, M.D., Jo Stuart, R.Ph., Allan Henrichs, MT (ASCP); Asante Health System, Medford, OR
PURPOSE: Prioritizing antimicrobial stewardship has remained a challenge among sub-urban and rural hospitals with limited resources. One approach to advancing antimicrobial stewardship is to develop protocols improving outcomes of patients with serious infections. The study aims to (i) determine the impact of 72-hour antibiotic time-out protocol on *Pseudomonas aerugonisa* (PSA) days of therapy and (ii) evaluate pharmacy recommendations on anti-pseudomonal therapy within a sub-urban and rural community hospital network.
METHODS: Electronic medical records of PSA-treated patients were assessed within a 378-bed suburban and 125-bed rural hospital network. The protocol provides guidance for pharmacists to assess appropriateness of empiric antibiotics by 72 hours of physician antibiotic orders. Days of PSA therapy were compared between pre- (May to September 2013) and post-protocol implementation (October 2013 to February 2014). Timeliness, acceptance rate and type of pharmacy recommendations for physicians per protocol were recorded.
RESULTS: In pre- and post-protocol periods, 25 and 17 PSA cases were reviewed. Pre- and post-protocol PSA days of therapy per 1000 hospital admissions were 12.2 and 5.5 (p=0.087), respectively. Before protocol implementation, 76 percent of PSA cases were reviewed by 72 hours of antibiotic orders compared to 82 percent post-protocol. Pre- and post-protocol mean days between start of antibiotic orders and initial pharmacy assessment was 2.7 and 1.8 (p=0.031), respectively. Acceptance rate of pharmacy recommendations were 96 and 94 percent in pre- and post-protocol, respectively. Of these recommendations, 56 percent was attributed to pharmacy monitoring for antibiotic appropriateness, 25 percent for dose optimization, 12 percent for de-escalation and 6 percent for antibiotic substitution.
CONCLUSION: Protocol implementation was associated with reduced PSA inpatient days of therapy and greater likelihood for PSA therapy to be assessed by pharmacists within 72 hours of antibiotic orders. Pharmacy recommendations pertained mainly to monitoring for appropriate discontinuation of unnecessary broad-spectrum antibiotics and optimizing dosage.

268. Provider acceptance and impact of a consultative, non-coercive antimicrobial stewardship program at a Veterans Affairs Medical Center. *Pamela A. Foral, Pharm.D., BCPS*[1], Elizabeth Jamieson, Pharm.D.[2], Marvin Bittner, M.D.[3], Gary Gorby, M.D.[3], Edward Horowitz, M.D.[3], Karim Ali, M.D.[3], Kari Neeman, M.D.[3], Renuga Vivekanandan, M.D.[3], Cezarina Mindru, M.D.[3], Mir Ali, M.D.[3], Michaela Hrdy, Pharm.D.[2], John Horne, M.D.[3], Leo Dobronski, M.D.[3], Laurel Preheim, M.D.[3]; (1)Creighton University School of Pharmacy and Health Professions, Omaha, NE; (2)Veterans Affairs Nebraska-Western Iowa Health Care System, Omaha, NE; (3)Creighton University School of Medicine, Omaha, NE
PURPOSE: An Antimicrobial Stewardship Program (ASP) was established in January 2012. The multidisciplinary team monitored patients receiving intravenous broad spectrum or high cost antimicrobials/antifungals. Clinical recommendations and education were offered to the prescribing team. The purpose of this review was to evaluate the clinical interventions (CI), acceptance and impact of the ASP.
METHODS: ASP data on CI were prospectively documented in the electronic medical record, ASP monitoring form, and Excel database. The ASP CI from 2012 through 2013 were analyzed for intervention type, acceptance rate (AR) of recommendations, and ARs per primary care service. Outcome data for nosocomial *Clostridium difficile* rates were evaluated. Data (mean ±SD) were evaluated using SPSS-PC (ver. 21, Chicago, IL).
RESULTS: The patients (n = 610) comprised of 97% males, had a mean age 67.1 ± 12.7 years, and a mean serum creatinine 1.3 ± 1 mg/dL. The ASP team provided 810 antimicrobial/antifungal recommendations, (1.3 ± 0.7 interventions/patient). Multiple recommendations were made for 152 patients, (2.3 ± 0.6 interventions/patient). There were 681 (84.1%) interventions recommending a change in antimicrobial/antifungal therapy. Eighty-four interventions (10.4%) recommended obtaining additional cultures, diagnostic procedures, or continuing therapy for stopped antimicrobial orders. An infectious diseases (ID) consult was recommended in 44 (7.2%) patients, with additional ID consults initiated in 22 (3.6%) patients after an ASP intervention was communicated. The most frequent recommendations involved streamlining therapy (n = 281), route of administration change (n = 114), and discontinuing therapy (n = 112). The majority of recommendations (n = 547) were patients from a general medicine service. The overall AR was 88.8%. Nosocomial *C. difficile* infection rates did not change significantly between 2011 and 2013 (0.77 per 1000 patient-days vs 0.81 per 1000 patient-days, respectively).
CONCLUSIONS: The implementation of a consultative, non-coercive ASP was favorably received at our institution resulting in high AR. With continued patient evaluation, 24.9% of patients had multiple interventions.

269. The impact of liver dysfunction on therapeutic outcomes in patients receiving vancomycin therapy. Sweta Patel, Pharm.D. (c)[1], *Luigi Brunetti, Pharm.D., MPH*[2], Stuart Vigdor, R.Ph.[2], Ronald Nahass, M.D., MHCM[2]; (1)Rutgers, The State University of New Jersey, Ernest Mario School of Pharmacy, Piscataway, NJ; (2)Robert Wood Johnson University Hospital Somerset, Somerville, NJ
PURPOSE: To evaluate the impact of liver dysfunction (LD) on the incidence of supratherapeutic vancomycin trough levels and adverse drug events (ADEs).
METHODS: A retrospective cohort study of patients receiving vancomycin at RWJS between November 2011 and December 2012 was performed. Patients were stratified into "no-to-mild" and "moderate-to-severe" LD, calculated using the Child-Pugh score. Patients were also stratified into "severe" (<2.5 mg/dL) and "non-severe" (2.5–3.4 mg/dL) hypoalbuminemia. The primary outcome was proportion of patients with a supratherapeutic trough level (>20 μg/mL). Secondary outcomes included acute renal failure (ARF), length of stay (LOS), and mortality.
RESULTS: Of the 314 patients included in the analysis, 168 had no-to-mild and 146 had moderate-to-severe LD. Hypoalbuminemia was documented in 234 patients, 90 classified as severe and 144 as non-severe. Supratherapeutic vancomycin trough levels at the time of first sampling (approximately before the 4 th dose) were more common in patients with moderate-to-severe LD (22.6% vs 10.1%; p=0.003) and in patients with severe hypoalbuminemia (27.8% vs 11.8%, p=0.002). ARF, LOS, and mortality were significantly higher in moderate-to-severe LD versus none-to-mild LD (6.2% vs 1.2%, p=0.017; 13.5 ± 10.4 days vs 7.4 ± 7.0 days, p<0.0001; 13.7% vs 3.6%, p=0.001; respectively). These outcomes were also significantly higher in severe hypoalbuminemia versus non-severe hypoalbuminemia (7.8% vs 2.1%, p=0.036; 15.8 ± 11.3 days vs 9.3 ± 8.1 days, p<0.0001; 21.1% vs 4.9%, p=0.0001; respectively).

CONCLUSION: Evaluation of the severity of liver disease and serum albumin is warranted when determining a vancomycin dosing strategy. Considering these patient parameters may improve the attainment of therapeutic drug levels and mitigate ADEs.

270E. Evaluation of the *in vitro* potency of itraconazole, voriconazole, and posaconazole and resistance in aspergillus isolates from the United States. *Nathan Wiederhold, Pharm.D.*, Annette Fothergill, M.S., Dora McCarthy, M.T., Carmita Sanders, M.T., Deanna Sutton, Ph.D.; Department of Pathology, School of Medicine, UT Health Science Center at San Antonio, San Antonio, TX

Presented at 6th Advances Against Aspergillosis Meeting, Madrid, Spain, February 27–March 1, 2014.

271. Evaluation of steady state vancomycin trough concentrations post implementation of various dosing regimens. Matthew Gibson, Pharm.D., Kari Mount, Pharm.D., BCPS, Eric Wenzler, Pharm.D., BCPS, Jordan Lundberg, Pharm.D., *Karri Bauer, Pharm.D., BCPS*; The Ohio State University Wexner Medical Center

PURPOSE: Current guidelines recommend targeting vancomycin (V) trough concentrations of 15–20 mg/L. To achieve this target, V loading (LD) and increased maintenance doses (MD) may be necessary. The primary objective was to evaluate the percentage of patients who achieved a steady state V trough concentration of 15–20 mg/L after implementation of various dosing regimens at an academic medical center.

METHODS: Adult patients (pts) who received V and had a steady state trough concentration during one of three time periods were evaluated. Demographic characteristics, dosing and ideal body weights, serum creatinine (Scr), creatinine clearance, V regimen, duration of therapy, trough concentration, and site of infection were evaluated.

RESULTS: A total of 59 pts (group 1), 64 pts (group 2) and 107 pts (group 3) were evaluated; median age 56 (38–69) years, median weight 83.4 (58.1–120) kg, median CrCl 75.8 (44.2–139) mL/minute. The median duration of therapy was 5 days. Pts received V for the following indications: skin and soft tissue (24%), bacteremia (21%), pneumonia (16%), febrile neutropenia (9%), osteomyelitis (6%), and empiric (23%). There were no statistically significant differences between the percentage of pts who achieved a steady state V trough concentration between the 3 regimens.

Regimen	<15 mg/L, %	15–20 mg/L, %	>20 mg/L, %
Group 1 (8/6/12–8/12–12) Loading dose: None Maintenance dose: 15 mg/kg	47.5	31.5	22
Group 2 (5/5/13–5/11/13) Loading dose: 20 mg/kg Maintenance dose: 15 mg/kg	58	22	20
Group 3 (11/1/13–11/15/13) Loading dose: 25 mg/kg Maintenance dose: 20 mg/kg	50	24	26

CONCLUSION: Achieving therapeutic V concentrations of 15–20 mg/L at steady state remains a challenge. Implementation of a LD and increased MD did not result in an increased percentage of pts achieving a trough concentration of 15–20 mg/L. An alternative monitoring marker should be considered.

272. Implement colistin loading dose to improve the efficacy and safety. *Judy Jui-Fen Chang, Pharm.D., B.S., C.D.E.*, Lan-Hsi Lin, B.S., Meng-Ting Hsu, M.S., Chia-Shan Tsai, M.S., Tong-Ling Chien, B.S., Wuan-Jin Leu, M.S.; Department of Pharmacy, Shuang Ho Hospital, Taipei Medical University, New Taipei City, Taiwan

PURPOSE: In the past decades, the use of colistin was limited due to its renal toxicity and neurotoxicity. In recent years, the Multiple Drug Resistant (MDR) Gram-(-) bacteria have led to serious nosocomial infections; thus, colistin reemerged as a treatment option. Recent pharmacokinetics studies show that the use of colistin loading dose has better therapeutic outcome without significant increasing serum creatinine. However, only two clinical studies with smaller sample size have been conducted regarding to colistin's efficacy and safety. The aim of this research is to assess the efficacy and safety of colistin loading dose in a teaching hospital in Taiwan.

METHODS: Shuang Ho hospital established the Colistin Dosing Guideline on October 2012 by using standard loading dose. This study retrospectively analyzed 108 patients using colistin in Shuang Ho hospital during January 2011 to April 2014. Then, this study compared the clinical outcome, microbiological outcome, and the renal damage defined by RIFLE criteria between groups with and without colistin loading dose. This study also discussed patients infected with *A. baumannii* as a subgroup.

RESULTS: The microbiology eradication rate among patients with and without loading dose were 57.1% and 35.7% respectively (p=0.16). In a subgroup of patients infected with *A. baumannii*infection, the clinical cure rate among patients with loading dose was 60%, only 37.7% patients were cured in patients without loading dose(p=0.065) The kidney toxicities defined by RIFLE criteria were not statistically different between two groups, either on day 3 (p=0.95) or day 7 (p=0.744). It suggested that loading dose would not increase the risk of renal toxicity.

CONCLUSION: This clinical study with larger sample size compared to previous studies showed that loading dose group has better efficacy without increasing renal toxicity. However, further study is still needed because data were not significant statistically.

Medication Safety

273E. Consumer medication information: a reliable source of information on grapefruit juice interactions?. Donna Huynh, Pharm.D., M.A., Linh Van, Pharm.D., James Breen, Pharm.D., Nicholas Ratto, Pharm.D.; Consumer Drug Information Group, First Databank, Inc. (FDB), South San Francisco, CA

Presented at Presented at the National Patient Safety Congress, Orlando, FL, May 14–16, 2014.

274. Pharmacist discharge medication reconciliation on an advanced heart failure service prevents medication errors. *Christina Doligalski, Pharm.D., BCPS*; Department of Pharmacy, Tampa General Hospital, Tampa, FL

PURPOSE: Accurate hospital discharge medication lists are vital to ensuring optimal patient outcomes. End-stage heart failure (HF), mechanical circulatory support (MCS), and heart transplant (HT) patients receive high-risk medications with major adverse events possible due to medication errors. Pharmacist discharge medication reconciliation was piloted on a HF/MCS/HT service.

METHODS: In November 2013, all patients admitted to the HF/MCS/HT service at a single center were monitored for discharge orders. Following discharge reconciliation by the HF/MCS/HT providers, a pharmacotherapy specialist reviewed and reconciled discharge orders. Identified errors were corrected prior to patient discharge and recorded by type of error as well as medication class involved.

RESULTS: Twenty discharges were reviewed during the study period; 40% (n = 8) were MCS recipients, 40% HT recipients, and 20% (n = 4) HF patients. Eighty medication errors were identified. Most discharges (18/20, 90%) had at least one medication error present, with an average of 3.8 errors/discharge; 20% (n = 4) had >6 errors. Type of error varied: medications ordered when they shouldn't be (25/80, 32%), incorrect dose (21/80, 26%), and incorrect administration instructions (21/80, 26%)

were most common. Duplicate medications (5/80, 6%) and incorrect dosage form (4/80, 5%) were less common errors. Insulin was the most common type of medication with errors (15/80, 21%), followed by heart failure (13/80, 18%), immunosuppression (9/80, 12%), and anticoagulation (6/80, 8%).
CONCLUSION: High risk, complicated medications such as insulin, immunosuppression, and anticoagulation are highly prone to medication errors. Based on this pilot, a pharmacist review of discharge orders is critical in preventing medication-related adverse events.

275. Pharmacist medication reconciliation in an advanced heart failure clinic prevents medication errors. *Christina T. Doligalski, Pharm.D., BCPS*; Department of Pharmacy, Tampa General Hospital, Tampa, FL
PURPOSE: Accurate medication lists and early identification of medication-related issues are vital to ensuring optimal patient outcomes. End-stage heart failure (HF), mechanical circulatory support (MCS), and heart transplant (HT) patients receive high-risk medications with major adverse events possible due to medication errors. Pharmacist-lead medication reconciliation was piloted in a HF/MCS/HT ambulatory clinic.
METHODS: In October 2013, all patients seen in a single cardiologists' HF/MCS/HT clinic were seen by a pharmacist after initial RN intake but prior to physician encounter. The pharmacist re-obtained a medication history and queried medication compliance. Identified medication list errors were corrected prior to physician encounter, and errors were recorded by type of error as well as medication class involved.
RESULTS: Most (39/49, 80%) of patients scheduled for clinic were seen by a pharmacist; 41% were HT recipients, 41% HF patients, and 17% MCS recipients. Fifty-five medication errors were identified, and 30/39 (77%) patients had errors in their medication lists. The most common errors were incorrect dose (26/55, 47.2%), incorrect dosage form (16/55, 29.1%), and medications missing from the medication list (7/55, 12.7%). Anticoagulants (15/55, 27.2%), immunosuppressants (14/55, 25.5%), and HF medications (12/55, 22.1%) comprised the majority of medication errors identified. Compliance issues were identified in 10 patients (25.6%).
CONCLUSION: High risk, complicated medications such as anticoagulation, immunosuppression, and HF therapies are highly prone to medication errors. Pharmacists can play a pivotal role in the ambulatory setting by ensuring accurate medication lists and identifying compliance concerns.

276. Drug disposal: what can we learn from the contents of a drug disposal drop box?. *Jayne Pawasauskas, Pharm.D.*[1], Kelly Matson, BSNutr., Pharm.D.[2], Emily Matthew, Pharm.D.[3]; (1)University of Rhode Island, Kingston, RI; (2)Department of Pharmacy Practice, University of Rhode Island, Kingston, RI; (3)University of Rhode Island College of Pharmacy
PURPOSE: Drug disposal drop boxes continue to be established in community sites. These boxes serve as a collection mechanism for unused or unwanted pharmaceuticals, including controlled substances. Use of such disposal containers helps promote medication safety by limiting contact with pharmaceuticals by unintended parties. In addition, they provide a mechanism for drug disposal that is safer and more environmentally friendly than flushing medications down the toilet or placing in the trash. This study analyzed the contents of a disposal box located within a police department in Rhode Island.
METHODS: This study does not involve human subjects; therefore, institutional review board waived review/approval. The contents analyzed were deposited in the box over a 3-month period. Investigators used drug identification software to correctly categorize each dosage form.
RESULTS: A total of 8995 dosage forms were collected, excluding topicals, liquids, and inhalers (0.17%). The majority (69%) were non-controlled prescription medications. Approximately 17.7% were over-the counter medications, 8.15% were controlled substances, 0.08% were veterinarian medications, and 4.7% were unidentifiable. Some of the medications were expired samples from pharmaceutical industry, in the original packaging. After careful examination, a small proportion of tablets were found to contain mold. One bottle contained adulterated analgesic pharmaceuticals.
CONCLUSION: Findings indicate that patients/consumers should be educated regarding storage of pharmaceuticals in proper environments and the need to monitor the storage of prescription medications. Health care providers who prescribe controlled substances could request that patients bring bottles of prescription medications for inspection during office visits, particularly those containing controlled substances.

277. What do patients do with their prescription medications? Pooled analysis from 4 medication safety studies. Jayne Pawasauskas, Pharm.D.[1], *Kelly Matson, BSNutr., Pharm.D.*[2]; (1)University of Rhode Island, Kingston, RI; (2)Department of Pharmacy Practice, University of Rhode Island, Kingston, RI
PURPOSE: Prescription drug abuse has reached an epidemic level according to the Centers of Disease Control. The United States Office of National Drug Control Policy released a Prescription Drug Abuse Prevention Plan in 2011 which addresses 4 areas of focus: Education, Monitoring, Proper Medication Disposal, and Enforcement. The purpose of this study was to evaluate risk of prescription drug abuse across a variety of patient care settings.
METHODS: Observational survey studies were conducted in 4 distinct patient care sites: adult hospital, primary care, pediatric hospital, and college health center. Participants were offered a voluntary survey which assessed perceptions and behaviors regarding medication safety.
RESULTS: Pooled analysis from 4 populations (n = 591) studied found that approximately one in 5 patients have shared their prescription medications with a friend or family member. One in 3 reported that a friend or family member shared a medication with them. The greatest incidence of these behaviors was found in the college student population. Overall, 73.4% reported never storing medications in a locked place, and 38.4% reported they would save unused medications for a later time, as opposed to disposing of them. Of patients who would dispose unused medications, the most common method is by flushing down the toilet. The specific arm conducted in parent population found that only 53% reported ever talking to their children about prescription drug abuse.
CONCLUSION: Different community populations lack an understanding of proper handling and disposal of prescription medications. Pharmacists' participation in patient counseling should address avoidance of medication sharing, proper storage and disposal of prescription medications.

278. Evaluation of medication reconciliation conducted by clinical pharmacists at a newly established hospital in Qatar. Hala Sonallah, Pharm.D.[1], *Tarek Ibrahim, MClinPharm.*[1], Mohamed Izham, M.I., Ph.D.[2]; (1)Clinical Pharmacy, Al-Wakra Hospital: Hamad Medical Corporation, Al-Wakra, Qatar; (2)College of Pharmacy, Qatar University, Doha, Qatar
PURPOSE: This study was conducted to evaluate the medication reconciliation (MR) process as a newly initiated service by clinical pharmacists at Al-Wakra Hospital in Qatar. A standardized MR form was developed and used by clinical pharmacists as a tool to detect medication discrepancies and document clinical pharmacist interventions.
METHODS: This was a retrospective, descriptive and post-interventional study. MR forms were collected from the medical, intensive care and surgical inpatient wards from April till October 2013. The number and types of medication discrepancies as well as the clinical pharmacists' interventions were all documented.
RESULTS: A total of 232 MR forms were collected and 1640 medications were reconciled. The majority of the medications reconciled were cardiovascular medications (n = 144; 62.2%), followed by endocrinology medications (n = 118; 51.1%) and nutritional supplements and electrolytes (n = 69; 30%). One hun-

dred and seventy eight cases (76.8%) had medication discrepancies upon hospital admission, with a median (IQR) average of medications discrepancies of 2.0 (5.0, 1.0). Most of the discrepancies were due to medication omissions (66.1%), followed by incorrect dosages (16.3%) and different medications (13.3%). Clinical Pharmacists' interventions were carried out in 150 cases (64.8%). There was a significant correlation between the number of clinical pharmacists' interventions and percentage of discrepancies (Spearman rho coefficient = 0.479; $p<0.01$).
CONCLUSION: The study highlighted the importance of clinical pharmacists in conducting MR to prevent medication errors. Implementation of a systematic MR process using a standard form facilitated the detection and resolution of medication discrepancies. Therefore, the MR process should be considered as an essential clinical pharmacy practice across all government hospitals in Qatar.

Other

279. The impact of a clinical pharmacist on the compliance of adult in-patient VTE assessment within a General Hospital. *Mohamed Obiedalla, M.Pharm.*; Clinical Pharmacy, Al Wakra Hospital, Hamad Medical Corporation, Doha, Qatar
PURPOSE: To assess the impact of interventions made by a clinical pharmacist on the provision of a venous thromboembolism (VTE) prophylaxis assessment protocol for adult in-patients with the aim of achieving at least 90% compliance rate.
METHODS: The baseline assessment compliance percentage was obtained by reviewing 20 patient files in the hospital medical records department for patients who were previously admitted between October 2012 and October 2013. A VTE prophylaxis assessment order set was designed by the clinical pharmacist using up-to-date evidence and international guidelines with the approval of the hospital corporate committee. Various departmental meetings were held in November 2013 by the clinical pharmacist to educate the nurses and physicians on the use of the VTE prophylaxis order set. The implementation of the VTE prophylaxis assessment was launched in December 2013 across all adult in-patient units with the aim of assessing all adult in-patients within 24 hours of admission.
RESULTS: The baseline of the physicians' compliance in VTE assessment compliance out of the 20 files reviewed was 35% (n = 7). In December 2013, 56.4% (n = 96) of new admissions were assessed for VTE on admission. In January 2014 it was 74.1% (n = 494) compliance rate. February 2014 saw 84.3% (n = 623) of the assessments being completed with 24 hours of admission. In March, April and May the compliance was 91.5% (n = 729), 90.3% (n = 699) and 94.2% (n = 518), respectively.
CONCLUSION: The clinical pharmacist played a vital role in implementing a VTE prophylaxis assessment protocol. As a result of holding frequent and continuous educational sessions for the nurses and physicians the compliance of physicians in assessing patients within 24 hours of admission improved substantially impacting on the patients' care through minimizing the risk of hospital acquired VTE incidents.

280. Improvements in medication history outcomes with student pharmacists. Aubrie Rafferty, Pharm.D., BCPS[1], *Elizabeth Michalets, Pharm.D., BCPS, FCCP*[2], Barbara Kostic, Pharm.D., BCPS, CPP[1]; (1)Department of Pharmacy, Mission Hospital, Asheville, NC; (2)Mission Health System and UNC Eshelman School of Pharmacy, Asheville, NC
PURPOSE: Pharmacy departments within health systems have embraced key performance indicators (KPI) that include achievement of targeted clinical outcomes, increased direct patient contact, reduced harm and improved patient satisfaction. Approximately 20% of preventable medication errors have been shown to occur during hospital admission. Student pharmacists can assist in meeting KPIs for institutions.
METHODS: This prospective, observational, descriptive study is part of a larger transitions of care initiative within the institution. Fourth year student pharmacists on internal medicine, family medicine, cardiology, and advanced hospital clerkships were asked to obtain admission medication histories for patients during the 2013–2014 academic year. Students interviewed patients and requested information from community pharmacies and primary care providers to obtain a complete and comprehensive admission medication history for patients targeted by their preceptors. They updated the electronic medical record and pursued resolution of identified discrepancies.
RESULTS: Student pharmacists interviewed 165 patients and spent an average of 21.6 minutes of direct contact with each patient. They identified and pursued resolution of 705 medication-related problems. The most common were medication omission (31%), missing/incomplete allergy (16%), incorrect dose (15%), and incorrect frequency/schedule/formulation (14%). Student pharmacists identified medication-related problems when there was no medication history (5.8/patient) or if previously obtained by a nurse (5.8/patient), physician (4.3/patient), or certified pharmacy technician (2.7/patient). The service was expanded for the 2014–2015 academic year to include an evening longitudinal experience with medication reconciliation review.
CONCLUSION: The success of a student-driven pharmacy medication history service enabled our institution to reduce harm and provide additional direct contact in 165 patients. Student pharmacists were able to obtain a more accurate and comprehensive history when compared to other health care providers. This led to service expansion to an evening longitudinal experience with medication reconciliation review.

281. Highlights of the history and achievements of the Ambulatory Care PRN. Catherine Bourg, Pharm.D.[1], Maria Thurston, Pharm.D.[2], *Emily McCoy Armstrong, Pharm.D., BCACP*[3], Stephanie Nigro, Pharm.D.[4], Robin Koffarnus, Pharm.D.[5], Marissa Quinones, Pharm.D.[6]; (1)University of Georgia College of Pharmacy, Athens, GA; (2)Mercer University; (3)Auburn University Harrison School of Pharmacy Mobile Campus, Mobile, AL; (4)MCPHS University; (5)TTUHSC; (6)Southeast Dallas Health Center
PURPOSE: To highlight the history and achievements of the Ambulatory Care PRN.
METHODS: In 2009, ACCP celebrated its 30th anniversary. In anticipation of that milestone, all Practice and Research Networks (PRNs) were urged to record their organizational history. The reports were meant to document the pivotal roles ACCP's PRNs have played in the success of the College, as well as their contributions to clinical pharmacy.
RESULTS: Established in 1992, the Ambulatory Care PRN was one of the first two ACCP PRNs to be formed. The founders, Timothy Ives and Terry Seaton, invited all ACCP members practicing in ambulatory care to join, resulting in 63 official members the first year. The PRN has published an electronic newsletter at least biannually since March 1998. The PRN also hosts a very active e-mail list that serves as a communication route for PRN officers to disseminate updates and allows members to pose clinical questions to others. The PRN hosted its first joint networking forum in 1997. In addition, the Ambulatory Care PRN regularly develops focus sessions for the Annual and Spring Meetings. The PRN fully supports scholarship and research efforts. Following project formalization in 2002, The "Survival Guide" became a published tool for PRN members to access from the PRN Web site. The Ambulatory Care PRN has published joint opinion papers and its members have also been integral in developing multiple ACCP position statements and white papers. Furthermore, the Frontiers Fund and Ambulatory Care PRN Seed Grant Program support member research. Since 1994, the PRN has elected leadership positions to assist in accomplishing PRN goals and initiated the Ambulatory Care PRN Achievement Award in 2005.
CONCLUSIONS: The Ambulatory Care PRN continues to seek opportunities for growth and development of the organization and support the contributions and accomplishments of its leaders and members.

282. The intersection of pharmacy and global health. *Diane Nguyen, Pharm.D.*; Ernest Mario School of Pharmacy, The State University of New Jersey, Rutgers, Spring, TX
PURPOSE: Global health has been described as focusing on issues that transcend national boundaries, embracing both prevention in populations and clinical care in individuals, and ultimately promoting health equity among nations and for all people. Clinical pharmacy services are well positioned to address global health matters, as clinical pharmacists provide not only clinical services, but care to people, and play a role in the healthcare system as an expert in the therapeutic use of medications. The PGY2 Public Health Residency through The State University of New Jersey, Rutgers and Bristol-Myers Squibb Foundation provides a unique opportunity to apply the principles of clinical pharmacy in a global health context and help improve health outcomes in underserved populations and resource-constrained settings domestically and internationally.
METHODS: N/A.
RESULTS: The poster will showcase the integration of clinical pharmacy with the work of community-based organizations in rural South Africa to help develop a coordinated care model for mental health disorders, substance abuse, and HIV/AIDS; promote diabetes and nutrition awareness; and mobilize the community to improve demand for maternal and child health services. Pharmacy-led assessment of medication storage and handling practices among primary care givers and adolescent patients to improve patient safety in a pediatric HIV clinic in Lesotho, and research initiated to assess knowledge, attitudes, and behaviors regarding isoniazid preventative therapy for tuberculosis in Swaziland will be described. U.S.-based work that will be highlighted include pharmacist-led diabetes initiatives and efforts to translate innovative models of care for chronic diseases into public health policy in the Mississippi Delta, and the support of a clinical pharmacist in the Family Health Coach model to engage youths at-risk or living with type 2 diabetes in the Navajo tribal community.
CONCLUSION: Global health is highly interdisciplinary and multidisciplinary, and the diverse clinical pharmacy services described lie at the intersection of pharmacy and global health.

Pain Management/Analgesia

283E. Efficacy and safety of a pharmacist-managed patient controlled analgesia service. Katrina Mcgonigal, Pharm.D.[1], Brian Raveau, B.S.[2], Christopher A. Giuliano, Pharm.D.[2], *Jeff Hurren, Pharm.D.*[1]; (1)Department of Pharmacy Services, St John Hospital & Medical Center, Detroit, MI; (2)Wayne State University Eugene Applebaum College of Pharmacy and Health Sciences, Detroit, MI

Presented at Presented at the 29th Annual Great Lakes Pharmacy Resident Conference, West Lafayette, IN, April 23–25, 2014.

284. Impact of the perioperative use of intravenous acetaminophen in patients undergoing intraabdominal and breast reconstruction surgery. *Kimberly Tallian, Pharm.D., BCPP, FASHP, FCCP, FCSHP*[1], Jonathan Schmidt, Pharm.D.[2]; (1)School of Pharmacy, Keck Graduate Institute, Claremont, CA; (2)Department of Pharmacy, Scripps Memorial Hospital, La Jolla, La Jolla, CA
PURPOSE: The multimodal approach for managing acute pain, which consists of two or more analgesics with different mechanisms of action, is well accepted. This study compared the traditional management of perioperative pain in patients undergoing intraabdominal and breast reconstruction surgery with patients receiving concomitant intravenous acetaminophen (IV APAP). We evaluated the impact of adjunctive IV APAP on opiate burden, length of stay, and pharmacoeconomic outcome.
METHODS: This retrospective study of 120 patients, who received traditional pain management (N = 60) or concomitant IV APAP (N = 60) was conducted between January 2012 and December 2013. Patient demographics, clinical data, pain scores, drug therapy, length of stay, and cost data were documented for each patient. Descriptive statistics were used for baseline demographics as well as continuous and nominal data.
RESULTS: Baseline demographics were similar between those receiving and not receiving IV APAP. Patients who received concomitant IV APAP used 106.9 mg of IV morphine equivalents compared to 127.2 mg in the traditional pain management group ($p=0.24$). Daily mean pain scores and patient-controlled analgesia use did not differ significantly between the two groups ($p>0.05$). The length of stay in the concomitant IV APAP group was 127.1 hours versus 96.1 hours in the traditional group ($p<0.05$). The total average cost of stay per patient in the concomitant IV APAP group was $15,667 and $11,699 in the traditional group ($p=0.03$).
CONCLUSION: IV APAP may not be a cost effective adjunctive therapy in comparison to traditional pain management in patients undergoing intraabdominal and breast reconstruction surgery. Our study demonstrated similar opiate use, increased length of stay, similar daily mean pain scores, and increased costs.

Pharmacoeconomics/Outcomes

285. Application of piperacillin/tazobactam extended dosing strategy to improve clinical and cost effectiveness in the presence of a drug shortage. *Shaffeeulah Bacchus, Pharm.D.*; Pharmacy Department, Yankee Alliance Inc, Andover, MA
PURPOSE: To implement extended dosing strategies of piperacillin/tazobactam to address a drug shortage while maintaining clinical and financial goals within a group purchasing organization.
METHODS: As of April 2, 2014, there has been an on-going drug shortage reported by ASHP for piperacillin/tazobactam. It is well established that an extended dosing strategy for piperacillin/tazobactam is non inferior to the traditional dosing strategy. When applied, extended dosing will reduce the dosing regimen by one dose. A literature search was conducted on PUBMED using the following search words: piperacillin, tazobactam and extended infusion yielded 31 articles. 8 articles met criteria for inclusion. A comparison grid demonstrated either non inferiority or superiority of extended dosing strategy over traditional dosing strategy with exceptions in obese critically ill patients. Wholesaler purchase data was accessed to identify hospital acquisition trends for piperacillin/tazobactam. The hospitals included in the study were members of the same group purchasing organization for entire study period and purchased piperacillin/tazobactam within the same contractual pricing agreement. A cost analysis was performed utilizing a proprietary data analysis tool to characterize a usage report and shortage impact for the each facility. A summary of article comparison and shortage impact was presented to hospitals as an incentive to adopt an extended dosing strategy to address shortage while maintaining clinical efficacy.
RESULTS: A hospital affected by shortage implemented extended dosing strategy for all frozen piperacillin/tazobactam product. The 25% usage reduction resulted in an annualized savings of $74,672.28.
CONCLUSION: Extended dosing strategy is a viable option of addressing a piperacillin/tazobactam shortage while maintaining clinical and cost effectiveness.

Pharmacogenomics/Pharmacogenetics

286. The clinical pharmacogenetics implementation consortium (CPIC): facilitating the adoption of pharmacogenetics into routine clinical practice and the electronic health record. *Kelly E. Caudle, Pharm.D., Ph.D.*[1], James M. Hoffman, Pharm.D., M.S.[1], Michelle Whirl-Carrillo, Ph.D.[2], Cyrine E. Haidar, Pharm.D.[1], Kristine R. Crews, Pharm.D.[1], Teri E. Klein, Ph.D.[2], Mary V. Relling, Pharm.D.[1]; (1)Department of Pharmaceutical Sciences, St. Jude Children's Research Hospital, Memphis, TN; (2)Department of Genetics, Stanford University
PURPOSE: Despite substantial scientific progress over the last decade, implementation of pharmacogenetics into clinical practice has been relatively slow. One barrier to implementation of clinical pharmacogenetics is the lack of detailed gene/drug clinical practice guidelines. CPIC was formed in late 2009, as a shared project

between PharmGKB (www.pharmgkb.org) and the Pharmacogenomics Research Network (www.pgrn.org). CPIC provides freely available, peer-reviewed, updatable clinical guidelines that enable the translation of genetic laboratory test results into actionable prescribing decisions for specific drugs. CPIC guidelines are designed to show how available genetic test results should be used to optimize drug therapy, rather than whether tests should be ordered.
METHODS: CPIC guidelines are developed using established and rigorous methods that adhere to most of the practices outlined by the Institute of Medicine (http://www.iom.edu/Reports/2011/Clinical-Practice-Guidelines-We-Can-Trust.aspx) and include a standard system for grading levels of evidence linking genotypes to phenotypes and assigning a level of strength to each prescribing recommendation. More recently CPIC has formed the CPIC Informatics working group to support the incorporation of CPIC guidelines within an electronic health record (EHR). CPIC Informatics coordinates developing comprehensive tables that translate genotype test results into inferred phenotypes, and from phenotypes into direct clinical recommendations that can be implemented as clinical decision support within an EHR.
RESULTS: As of June 2014, CPIC has published 13 guidelines, providing genotype-based therapeutic recommendations for 23 drugs. CPIC guidelines have been endorsed by professional organizations, are available on AHRQ's guidelines.gov and PharmGKB, and are linked to NIH's genetic test registry (https://www.ncbi.nlm.nih.gov/gtr/).
CONCLUSION: CPIC welcomes feedback on its existing and planned gene/drug pair guidelines (https://www.pharmgkb.org/cpic/pairs). This presentation provides an overview of CPIC, illustrates how CPIC guidelines can be used to make specific prescribing decisions based on available genetic information, and demonstrates how CPIC guidelines are translated into actionable prescribing recommendations in St. Jude Children's Research Hospital's EHR.

287. Barriers to implementing pharmacogenetic testing in an urban population. *Yee Ming Lee, Pharm.D.*[1], Katarzyna Drozda, Pharm.D.[1], Jinger Hoop, M.D.[2], Julio D. Duarte, Pharm.D., Ph.D.[1], Edith A. Nutescu, Pharm.D., M.S.[1], Larisa Cavallari, Pharm.D.[3]; (1)University of Illinois at Chicago, College of Pharmacy, Chicago, IL; (2)Department of Psychiatry, University of Illinois at Chicago, Chicago, IL; (3)Department of Pharmacotherapy and Translational Research, University of Florida, FL
PURPOSE: As Pharmacogenetic (Pgx) testing begins to enter clinical practice, it is imperative to understand patient perception of testing. This study aimed to determine patient knowledge, awareness, interest and acceptance of Pgx testing and identify barriers to its implementation.
METHODS: At the University of Illinois Hospital and Health Sciences System (UI-Health), genotype-guided therapy is done for inpatients starting on warfarin, with most following-up at the UI-Health Antithrombosis Clinic (ATC). A 23-item survey was conducted in patients during routine ATC visits. Patients were stratified to those with little-to-no interest (No-INT), moderate interest, and very-to-extreme interest (INT) in Pgx testing. T-test and Chi-square tests were used to compare survey responses between the No-INT and INT groups.
RESULTS: Among 120 patients surveyed (mean age 55 ± 14 years, 47% male, 69% African-American), 75% had not heard of Pgx testing. Among the 39 patients genotyped for warfarin, only 13% were aware the test was done. Most patients showed interest in Pgx testing, (58% INT vs 18% No-INT, $p<0.01$). Medical comorbidities, social support, self-reported adverse drug reactions, and income level were similar between groups. Compared to the No-INT group, the INT group were more likely to be African-American (73% vs 52%, $p<0.01$) and highly educated (29% vs 10%, $p<0.01$). Most patients in the No-INT group (81%) would not pay >$20 for the Pgx test (81% vs 60%, $p<0.01$), while more INT patients offered to pay >$50 (24% vs 5%, $p<0.01$). Identified barriers to Pgx testing included the need for more Pgx information (15%), the reliability of results (13%), and insurance coverage/privacy (10%).
CONCLUSION: Among our diverse patient population, the majority of patients have limited knowledge of Pgx testing, but showed interest once it was explained. Given the potential benefits with Pgx testing, it is imperative to address the barriers identified to facilitate the implementation of this service.

288. Development of an elective pharmacogenomics rotation for post-graduate year one and year two pharmacy residents. Fayth Edillor, Pharm.D.[1], Gina Caliendo, Pharm.D., BCPS[1], Joanne Meyer, Pharm.D.[1], Erwin Bottinger, M.D.[2], Omri Gottesman, M.D.[2], *Aniwaa Owusu Obeng, Pharm.D.*[2]; (1)Pharmacy Department, The Mount Sinai Hospital, New York, NY; (2)The Charles Bronfman Institute for Personalized Medicine, Icahn School of Medicine at Mount Sinai, New York, NY
PURPOSE: We describe a unique elective pharmacogenomics rotation jointly offered by the Charles Bronfman Institute for Personalized Medicine (IPM) at the Icahn School of Medicine and the Pharmacy Department at the Mount Sinai Hospital.
METHODS: Established in 2007, Mount Sinai's IPM is home to two parallel translational pharmacogenomics projects namely IPM PGx and eMERGE-PGx (Pharmacogenomics) projects. The IPM PGx project aims to establish optimal clinical implementation processes for pharmacogenomics whereas the multi-site eMERGE-PGx project explores the concept that PGx sequence information can be linked to EHR for clinical use. The Mount Sinai pharmacy residency program has trained PGY1 residents for decades and more recently, offered PGY2 specialty residencies in oncology and solid organ transplant. In 2013, IPM and the pharmacy department recruited a clinical pharmacogenomics pharmacist to lead the pharmacogenomics implementation projects and establish a pharmacogenomics rotation for the pharmacy residents.
RESULTS: The first pharmacogenomics elective rotation began in June 2014. This rotation exposed the inaugural PGY1 resident to both research and clinical applications of pharmacogenomics. The resident assisted in the development of clinical decision support language for TPMT-guided azathioprine and mercaptopurine therapies, as well as CYP2C19 and CYP2D6-guided tricyclic antidepressant therapy. The resident has also developed medication summaries for most therapeutic agents with known drug-gene interactions in an effort to build a pharmacogenomics medication library. Through research-intensive assignments, the resident additionally compiled and evaluated pharmacogenomics literature to formulate a review article on the influence of CYP3A5 polymorphisms on tacrolimus, in hopes of highlighting the potential for genotype-guided initial dosing in recent transplant recipients.
CONCLUSION: This elective rotation has afforded the resident the opportunity to participate in the development of clinical pharmacogenomics processes, and educational materials. With this experience, the resident gained an understanding of the clinical implementation of pharmacogenomics and an innovative collaborative training opportunity was introduced.

Psychiatry

289. Placement of a clinical psychiatric pharmacist within a primary care clinic. *Richard Silvia, Pharm.D., BCPP*; Department of Pharmacy Practice, MCPHS University, Boston, MA
PURPOSE: A clinical psychiatric pharmacist was placed within a primary care clinic to allow for improved patient access to behavioral health services. The goals were to decrease patient wait times to see a psychiatric provider from approximately 2 months to under a week, and to improve patients' mental health state. Integration of psychiatric practitioners within primary care is also a component of the Patient Centered Medical Home initiative, so a secondary goal for this program was to assist in meeting the standards of this national initiative.

METHODS: The clinic is a large community health center in Boston, with a large percentage of the patient population being from a lower socioeconomic class and/or Hispanic. The pharmacist developed a collaborative practice agreement with a physician, and obtained state and federal controlled substance registrations in order to prescribe. Patients were then referred to the pharmacist by the primary care providers, and patients were seen within the primary care clinic. The pharmacist is on-site 5 days per week, allowing for quick access to psychiatric services. In cases where patients required more complex interventions, they were referred to the center's behavioral health clinic, with the pharmacist assisting the patient in this process.
RESULTS: From the initiation of the program in July, 2013, over 125 patients have been referred to the pharmacist, with over 90% of these patients being maintained by the pharmacist for psychiatric care. Wait times for the pharmacist have averaged just under 7 days, with one-third of patients being seen the same or next day of referral. Patient and provider satisfaction with the program has been positive.
CONCLUSION: Patients are seen in a more expedient manner, with only more complicated patients being referred to the behavioral health clinic, improving efficiency as well. The goal of patient wait under 7 days has been achieved.

Transplant/Immunology

290. Evaluation of antifungal prophylaxis duration in kidney transplant recipients. *Christina Guerra, Pharm.D., BCPS*, Eric M. Tichy, Pharm.D., BCPS, Teena Sam, Pharm.D., BCPS, William S. Asch, M.D., Richard N. Formica, Jr, M.D., Sanjay Kulkarni, M.D., FACS; Yale-New Haven Hospital, CT
PURPOSE: Compare the efficacy of two strategies of thrush and *Candida* esophagitis prophylaxis with nystatin suspension (NPx) in kidney transplant recipients (KTR).
METHODS: A retrospective chart review was conducted of adult KTR at our center, where there was a change in protocol for fungal prophylaxis in March of 2013. KTR prior to the protocol change received NPx 500,000 units swish and swallow for 2 month (pre group) and KTR after the change received NPx for the duration of admission (post group). The primary outcome was the incidence of thrush and *Candida* esophagitis within 3 months post-transplantation (txp). Analyses were conducted both on all KTR (intention to treat, ITT) and only KTR receiving at least one dose of NPx (modified intention to treat, MT). Additional data collected included the duration of NPx and immunosuppression regimens (IS). Student's t-test and Fisher's exact test were utilized to calculate p values for continuous and categorical data.
RESULTS: A total of 84 KTR, 42 KTR in the pre group and 42 KTR in the post group, were included in the analysis. Baseline KTR characteristics and clinical outcomes are presented in the table below. There were no statistically significant differences in IS between the groups. The mean duration of NPx was 29 and 5.74 days in the pre and post groups, respectively. Overall, three KTR (3.6%) experienced an episode of thrush, all of whom were from the post group, and no patients experienced *Candida* esophagitis. Two KTR experiencing thrush did not receive any NPx. No KTR with thrush required hospital readmission.
CONCLUSION: Limiting the administration of NPx to the duration of admission after txp is sufficient for prophylaxis of fungal infections in KTR.

291. Hepatitis C medication management and reconciliation errors: impact of a clinical pharmacist. *Aileen Chi, Pharm.D.*[1], David Quan, Pharm.D.[1], Norah Terrault, M.D.[2]; (1)Department of Pharmaceutical Services, UCSF Medical Center, San Francisco, CA; (2)Division of Gastroenterology, UCSF Medical Center, San Francisco, CA
PURPOSE: The purpose of this study is to examine the impact of clinical pharmacists' involvements in medication management and medication reconciliation of patients infected with HCV at a large academic medical center ambulatory care setting.
METHODS: Retrospective review of patients seen by a pharmacist in the UCSF Hepatitis C clinic from 9/26/2012 to 7/31/2013.
RESULTS: In 57 patient encounters with a pharmacist, medication reconciliation errors were found 46/57 (81%) of patient encounters. Of 838 medications reconciled, there were 140 (17%) medication discrepancies found. Two percent of medication discrepancies were considered to be significant, while 39%, 57% and 2% were moderate, mild and not-significant respectively. A total of 132 medications were started, stopped or modified. A positive outcome (target therapeutic drug level, desired blood pressure/hemoglobin/neutrophil range, reduction of drug toxicities) could be measured in 40/132 (30%) of the time. It was not possible to measure an outcome in 84/132 (64%) of therapy changes; no effect was seen from therapy change 8/132 (6%). Drug-drug interactions (requiring dosage adjustments/therapy alternatives) were identified in 15% of medications reviewed.
CONCLUSION: A pharmacist in the Hepatitis C clinic can detect medication reconciliation errors and optimize drug therapy.

Residents and Fellows Research in Progress ADR/Drug Interactions

292. The effect of warfarin-drug interactions on INR and the evaluation of dosage adjustments in hospitalized patients. *Heather Mitchell, Pharm.D.*[1], Tina G. Hipp, Pharm.D.[2], Becky J. Szymanski, Pharm.D.[3]; (1)Pharmacy Department, CMC-NorthEast, Concord, NC; (2)Department of Pharmacy, Carolinas Medical Center – NorthEast, Concord, NC; (3)Carolinas Medical Center - NorthEast, Concord, NC
PURPOSE: Oral anticoagulation is largely obtained using warfarin therapy and often managed by pharmacists. The presence of warfarin-drug interactions can influence a patient's INR response to warfarin therapy. The purpose of this study was to reduce supra-therapeutic INR incidences by determining the time interval and degree to which INR is affected by warfarin-drug interactions.
METHODS: This was a retrospective review of all cases of supra-therapeutic INRs from March 1, 2013 to May 31, 2013. Patients age 18 years and older, and on chronic warfarin therapy admitted with a therapeutic or sub-therapeutic INR or patients started on warfarin therapy during admission were included for data analysis. The time interval after the start of interacting medications and rise in INR by 0.5 or more was assessed in addition to whether the dosage was adjusted.
RESULTS: There were 199 cases of supra-therapeutic INRs identified for the time period selected. A total of 57 patients were included in the study. Each patient had approximately 3.65 interacting medications during their admission. The most common interacting medications that patients were receiving were vancomycin (n = 27), levaquin (n = 26), methylprednisolone (n = 23), piperacillin-tazobactam (n = 19), prednisone (n = 19), azithromycin (n = 14), and ceftriaxone (n = 14). The average number of days it took to see an increase in INR by 0.5 or more for all interacting medications identified was 2.5 days versus 2.42 days for the most common interacting medications. All interacting medication groups experienced an INR change most often after only 1 day of receiving the interacting medication. Only 24% of patient's doses were adjusted prior to the INR increasing by 0.5 or more.
CONCLUSION: The use of multiple interacting medications may potentially impact INR response in warfarin patients within 2–3 days on average. Most patients experienced an increase in INR after only 1 day, suggesting that warfarin dose reductions implemented on day one of receiving interacting medications may help blunt the impact on INR.

Adult Medicine

293. Venous thromboembolism prophylaxis following total hip or knee arthroplasty. *Brittany Good, Pharm.D.*, Lindsay Hoffman, Pharm.D., BCPS, Stacey Dean, Pharm.D., BCPS; Virginia Commonwealth University Health System, Richmond, VA

PURPOSE: Total joint arthroplasty confers the highest risk of venous thromboembolism (VTE) among all surgical specialties. The estimated cumulative postoperative rate of symptomatic VTE is 4.3% in patients receiving no prophylaxis. Therefore, it is pertinent to provide VTE prophylaxis during the postoperative period. After 3 months, the incidence of VTE returns to the presurgical risk level. At Virginia Commonwealth University Health System (VCUHS), warfarin is most commonly used for VTE prophylaxis with an international normalized ratio (INR) goal of 1.8 to 2.5 for 4 weeks per orthopedic recommendation. Upon discharge, home health is provided for patients with twice weekly INR monitoring, which is managed remotely by the anticoagulation clinic at VCUHS.

METHODS: A retrospective electronic medical record review was conducted to evaluate VTE prophylaxis with warfarin or low molecular weight heparin (LMWH) following total hip arthroplasty (THA) or total knee arthroplasty (TKA) at VCUHS.

RESULTS: One hundred fifty patients were included in this review. Of these patients, 100 received a THA and 50 received a TKA. Most patients received warfarin for VTE prophylaxis (86.7%). Five symptomatic VTE events were identified, which included 1 pulmonary embolism (PE) and 4 deep vein thromboses (DVT). All symptomatic VTE events occurred in patients receiving warfarin for thromboembolism prophylaxis. The rate of VTE during the initial postoperative period, including days 0 through 14, was 3.1%. The cumulative rate of VTE was 3.6%. For patients receiving warfarin, the mean time to therapeutic range (TR) and the mean time within TR were 9.2 days and 26.1%, respectively.

CONCLUSION: The rate of VTE in patients receiving warfarin was similar to that which is reported in the literature for patients receiving no prophylaxis.

294. Median potassium increases and the effect of patient-specific factors with potassium supplementation in hospitalized adults. *Tina C. Lee, Pharm.D., MSCR*[1], Rebecca L. Attridge, Pharm.D., M.Sc., BCPS[2], Jason M. Cota, Pharm.D., M.Sc.[1], Cheryl K. Horlen, Pharm.D., BCPS[1], Russell T. Attridge, Pharm.D., M.Sc., BCPS[3]; (1) University of the Incarnate Word Feik School of Pharmacy, San Antonio, TX; (2)The University of Texas Health Science Center at San Antonio, San Antonio, TX; (3)South Texas Veterans Health Care System, Audie L. Murphy Division, San Antonio, TX

PURPOSE: Many clinicians practice that 10 mEq of potassium will raise serum potassium levels approximately 0.1 mEq/L in hypokalemic patients; however, this is mostly anecdotal and supported by limited research. Our primary objective was to identify changes in serum potassium after supplementation in hypokalemic, hospitalized patients.

METHODS: We performed a single-center, retrospective analysis between January 1, 2012 and March 1, 2014 at the Audie L. Murphy Memorial Veterans Administration Hospital in San Antonio, TX. We included patients who received ≥10 mEq of enteral or parenteral potassium chloride (KCl) for documented hypokalemia (≤3.5 mEq/L) and had repeat serum potassium levels within 24 hours. Exclusion criteria included dialysis, hemolyzed blood samples, surgical patients, and concomitant diabetic ketoacidosis. Descriptive statistics and the Wilcoxon Rank Sum test were used to analyze the primary outcome and differences among patients with comorbidities and concomitant potassium-altering medications.

RESULTS: Most of our 146 hypokalemic patients were male (91.1%) with a median age of 63 years (interquartile range [IQR] 49.75–73). Median initial potassium was 3.2 mEq/L (IQR 2.9–3.4) and median KCl supplementation was 40 mEq (IQR 40–50) per instance of hypokalemia. Median change in serum potassium per 10 mEq KCl was 0.1 mEq/L (IQR 0.05–0.15). Enteral versus parenteral KCl supplementation had similar median potassium changes (0.08, 0.05–0.15 vs 0.09, 0.03–0.17; p=0.95). There were no statistical differences in median potassium changes in patients with comorbid conditions (heart failure, cirrhosis, vomiting, diarrhea) or with potassium-sparing, potassium-wasting, or potassium-eliminating medications. Stratified by initial potassium of ≥3 or <3 mEq/L, median changes in serum potassium per 10 mEq KCl were significantly different (0.08 [0.05–0.15] vs 0.13 [0.10–0.18]; p=0.0003).

CONCLUSION: The median change in serum potassium per 10 mEq KCl supplemented was consistent with anecdotal practice. Median changes per 10 mEq KCl were similar for patients with comorbid conditions and for patients on potassium-altering medications; however, initial serum potassium level may have an effect on median potassium change.

Ambulatory Care

295. Feasibility of extended duration follow-up for patients receiving warfarin. *Nick Carris, Pharm.D., BCPS*, Steven Smith, Pharm.D., MPH, John Gums, Pharm.D., FCCP, Eric Dietrich, Pharm.D., BCPS; Department of Pharmacotherapy & Translational Research; Department of Community Health & Family Medicine, University of Florida, Gainesville, FL

PURPOSE: The 2012 CHEST guidelines recommended up to 12-week, rather than every 4-week, follow up for patients taking vitamin-K antagonists with consistently stable INRs. The purpose of this pilot study was to determine patient characteristics which enhance the feasibility of extended duration follow-up given the high risk for adverse outcomes associated with warfarin use and its indications.

METHODS: We prospectively recruited patients on stable warfarin therapy for ≥12 weeks. Follow-up interval was initially extended to 6 weeks, then 8 weeks, then 12 weeks for the remainder of the study. Patients were followed until they were no longer suitable for extend duration follow-up or a maximum 68 weeks. Patients were permitted to have a single significant INR excursion if a precipitating factor was identified, would be removed, and INR was expected to return to goal without dose adjustment. Descriptive statics were utilized to characterize the study population; Poisson regression will be used to identify predictors of weeks of extended duration follow-up.

RESULTS: Forty-eight patients were enrolled; preliminary data on one site (n = 11) is reported herein. Mean age was 63.4 years, 54.5% were male, and 54.5% were white; the most common indication was venous thromboembolism (63.6%). At baseline, patients had used warfarin on average 6.2 years and been stable 40.7 weeks. On average patients completed 23.4 weeks (range, 6 to 46 weeks) of follow-up. The most common reasons for study discontinuation were missed appointments and out-of-range INR requiring dose adjustment (27.3% each). The most common precipitating factors for out-of-range INRs were missed warfarin doses and altered vitamin-K consumption (18.2% each).

CONCLUSION: These data highlight additional research needs to identify patient characteristics favorable to extended duration follow-up since it may not be appropriate for all patients with previously stable INR. Complete data analyses on all 48 patients will be performed prior to presentation.

296. Evaluation of a pharmacist-provided discharge counseling service on hospital readmission rates in the Mercy Hospital St. Louis Ambulatory Care Clinics. Megan Ziegler, Pharm.D.[1], *Amy M. Drew, Pharm.D., BCPS*[1], Jamie M. Pitlick, Pharm.D., BCPS[1], Margaret Edwards, D.O.[2]; (1)St. Louis College of Pharmacy, St. Louis, MO; (2)Mercy Hospital St. Louis

PURPOSE: To determine if a pharmacist-driven telephone discharge medication review is beneficial at reducing the 30-day hospital readmission rates for two Mercy Hospital St. Louis Clinics.

METHODS: The study is a retrospective, quasi-experimental design to evaluate the primary outcome of 30-day readmission

rates before and after the initiation of the discharge service. Electronic medical charts were reviewed from patients of Mercy JFK Internal Medicine Clinic or Mercy Clinic Family Medicine. Patients were included if discharged from Mercy Hospital June 1–December 31, 2012 (pre-implementation group) and if received discharge counseling from pharmacists June 1 - December 31, 2013 (post-implementation group). The 60-day readmission rates, 30-day readmission rates for acute myocardial infarction, congestive heart failure, and community acquired pneumonia were also collected.
RESULTS: The post-implementation group (n = 100) had a trend towards a lower 30-day readmission rate than the pre-implementation group (n = 100) (9 vs 17 patients, p=0.08). Patients admitted with a primary diagnosis of congestive heart failure showed a reduction in 30-day readmission rates in the post-implementation group compared to the pre-implementation group (p=0.19).
CONCLUSIONS: Post-discharge medication reconciliation performed by pharmacists resulted in a non-significant reduction in 30-day hospital readmission rates; however, power may not have been reached to detect a difference. Polypharmacy, defined as greater than eight medications, was prevalent in those readmitted. Future focus on this group for medication reconciliation may prove beneficial in the reduction of medication errors and readmission rates.

297. A comprehensive pharmacist-run diabetes clinic in an underserved population: focusing on diabetes mellitus self-management. *Yennie Quach, Pharm.D.*[1], Michel Daher, Pharm.D.[1], Samaneh Zhian, B.S., M.S.[1], Matthew Atkinson, B.A.[1], Jessina C. McGregor, Ph.D.[2], Harleen Singh, Pharm.D., BCPS[2]; (1)College of Pharmacy, Oregon State University/Oregon Health & Science University, Portland, OR; (2)Oregon State University/Oregon Health Science University, College of Pharmacy, Portland, OR
PURPOSE: Self-management of type 2 diabetes mellitus (T2DM) in the underserved population can be extremely challenging due to multiple barriers. To overcome these challenges, a new robust pharmacist-run diabetes mellitus (DM) program was developed at a safety-net clinic. The objective of the program was to assist patients in achieving HbA1C goals through a comprehensive program that incorporates self-management strategies to overcome barriers to DM management
METHODS: The DM program includes: group education classes and individual follow-up visit to optimize DM care. Patients with newly diagnosed T2DM, or with HbA1C >8%, were enrolled in the program. Patients managed by an endocrinologist, were excluded. Self-management competency and DM knowledge were assessed using pre and post surveys and comparing HbA1C between baseline and 12-week follow-up visits. Surveys were administered before and after each educational session to assess factual knowledge and patient perceived competency. For each content area, the proportion of correct multiple choice questions answered correctly and differences in Likert scale responses were compared between pre- and post-surveys. HbA1C values at baseline and at 12-weeks were collected through chart review and a percent change between the two visits was calculated.
RESULTS: To date, 122 patients have been enrolled in the program, 64 with pre and post HbA1C values for comparison. Among the 64 patients, 13 were engaged in educational classes; 31 (48.4%) achieved HbA1c <8%. When compared to patients managed by primary care providers (PCP), 44.9% met HbA1C goal. The mean score improvement for DM knowledge questions and self-assessed DM management competency was 32.5% and 18.5% respectively.
CONCLUSION: Higher percentage of patients enrolled in the pharmacist-managed DM program focusing on self-management behaviors achieved HbA1C goal compared to standard PCP care. Strategies such as appointment reminders, flexible scheduling, assistance with housing, and frequent follow-ups contributed to the success in managing DM in this complex population.

298. Maintaining hypertension control: one-year post shared medical visit. *Barakha Yadav, Pharm.D.*[1], Sierra Thompson, Psy.D., Cole Kildow, Pharm.D., MSHA, BCACP, CDE[3], LaDonna Saxon, Ph.D., Crystal Brown, Pharm.D., BCPS, Harry Scher, M.S., APRN; (1)School of Pharmacy, Texas Tech University Health Sciences Center/Dallas VA Medical Center, Dallas, TX; (2)Texas Tech UHSC School of Pharmacy, Dallas, TX
PURPOSE: This study aims to assess blood pressure control rates in a Veteran population 1 year following completion of a multidisciplinary hypertension shared medical visit program.
METHODS: Medical records of approximately 50 completers of the hypertension shared medical visit program between February 1, 2012 and August 31, 2013 in the Dallas Veterans Affairs Medical Center were reviewed. Patients' medical history, antihypertensive medication regimen, and blood pressure control rates were documented at last shared medical visit and at least 1-year post program completion. Primary endpoint: percentage of patients at goal blood pressure as defined as <140/90 mmHg. Secondary endpoint: number of antihypertensive medications and percentage of patients at individualized goal blood pressure as defined by treating clinician.
RESULTS: Initial blood pressure control rate at last shared medical visit among the initial 50 completers was 50%. Final average blood pressure after successful completion of four visits was 141/74 mmHg. One year distal data collection with above primary and secondary endpoints is underway and will be presented.
CONCLUSION: The hypertension shared medical visit at the Dallas Veterans Affairs Medical Center enhances effective blood pressure control rates following completion of the program. Long-term success of this multidisciplinary hypertension shared medical visit program is dependent upon completers of this program sustaining blood pressure control.

299. Improving transitions of care through comprehensive medication management. *Andrea Rosenberg, Pharm.D.*[1], Todd Sorensen, Pharm.D.[2], Sarah Westberg, Pharm.D., BCPS[1], Lindsay Sorge, Pharm.D., MPH, BCACP[2]; (1)University of Minnesota College of Pharmacy, Minneapolis, MN; (2)Pharmaceutical Care & Health Systems, University of Minnesota College of Pharmacy, Minneapolis, MN
PURPOSE: This projectÕs purpose is to improve the medication-related issues during transitions of care for patients post-hospitalization and reduce readmissions by: (i) applying the IHI Model for Improvement to engage patients in comprehensive medication management (CMM) services in the ambulatory care setting within 7 days post-hospital discharge, (ii) evaluating drug therapy problems (DTPs) identified post-discharge, and (iii) collaborating with inpatient teams to facilitate improvements in the discharge process.
METHODS: Ambulatory care pharmacy residents are leading performance improvement work in 5 Minnesota health systems. Residents were oriented to the Model for Improvement via an introductory learning session and supported with monthly progress calls. Using this model, residents develop ÒPlan-Do-Study-ActÓ (PDSA) cycles to test changes to achieve CMM visits within 7 days post-hospital discharge. A standardized set of de-identified data (eg, the number, type, and severity of DTPs identified and their associated diagnoses) are collected for each CMM visit using a secure, web-based REDCap survey. PDSA cycles are submitted monthly to identify best practices to achieve the aim statement. DTP data will be analyzed for insight and trends that may support discharge planning improvements in the acute care setting.
RESULTS: At midpoint of the study period, data from 165 post-hospital discharge CMM visits have been reported; 64 encounters occurred within 7 days post-discharge. Twenty DTPs were directly related to the patientÕs reason for hospital admission and 137 DTPs were deemed to have a potential for moderate to severe harm if no intervention occurred. Residents developed 45 PDSA cycles to test process changes. Primary data collection will be complete by 10/1/2014.

CONCLUSIONS: Identifying DTPs related to reason for admission within the first week post-discharge could prevent harm and readmissions. This project demonstrates how performance improvement methods can be used to design site-specific strategies to reach patients post-discharge for CMM visits.

Cardiovascular

300. Outcomes associated with prothrombin complex concentrates. *Ashley Hedges, Pharm.D.*[1], James C. Coons, Pharm.D.[1], Roy Smith, M.D.[2]; (1)University of Pittsburgh School of Pharmacy/ University of Pittsburgh Medical Center, Pittsburgh, PA; (2) University of Pittsburgh School of Medicine/University of Pittsburgh Medical Center Cancer Pavillion, Pittsburgh, PA
PURPOSE: Prothrombin complex concentrates (PCCs) are indicated for urgent reversal of warfarin, and may be used for reversal of novel oral anticoagulants (NOACs), in patients with acute major bleeding or need for an urgent procedure. PCCs are thought to be advantageous in that they may achieve a more rapid reversal of oral anticoagulants than plasma as they have small infusion volumes and can be quickly administered without time needed for thawing. The purpose of this project was to evaluate efficacy and safety outcomes of PCC usage at our institution.
METHODS: A retrospective review of electronic medical records was conducted to identify patients that received one of the PCCs commercially available in the US (KCentraTM or ProfilnineR) at twelve hospitals in a tertiary care health system from July 1, 2013 to April 30, 2014. Demographic information was collected to define the population and indication of PCC administration, including location of bleed and type of surgery required. Clinical outcomes of interest included time to achieve a target INR <1.3, time to Hgb >7 g/dL, and incidence of thromboembolism.
RESULTS: As of April 2014, a total of 193 patients received a PCC product. The patient population was 41.4% female and 75.1% Caucasian, with a mean age of 73 years old. A total of 83.4% of patients were on anticoagulation; 143 patients were on warfarin (74.1%) and 18 patients (9.3%) were taking a NOAC. A total of 125 of 193 patients (65.8%) achieved an INR reduction to <1.3, within a median time of 8.03 hours (IQR 3.38–34.07). Indication for PCC administration and incidence of thromboembolism with the use of PCC remains to be determined.
CONCLUSION: The majority of patients receiving PCC therapy were on warfarin for anticoagulation. PCC administration was effective for INR reversal in approximately two-thirds of patients.

301. Impact of digoxin use in veterans with heart failure with reduced ejection fraction. *Kirsten M. Roberts, Pharm.D.*[1], Robert W. Savage, Pharm.D.[1], Robert B. Parker, Pharm.D.[2], Shannon W. Finks, Pharm.D.[2], Kelly C. Rogers, Pharm.D.[2]; (1)Department of Clinical Pharmacy, Veterans Affairs Medical Center, Memphis, TN; (2)Department of Clinical Pharmacy, University of Tennessee College of Pharmacy, Memphis, TN
PURPOSE: Veterans Affairs Medical Center (VAMC) heart failure guidelines mirror current treatment recommendations for heart failure with reduced ejection fraction (HFrEF) and encourage the addition of digoxin to reduce hospitalizations in appropriate patients. Digoxin does not improve mortality and recent evidence suggests digoxin could increase mortality in patients with HFrEF. Therefore, the purpose of this study is to evaluate the outcomes of digoxin therapy in Veterans with HFrEF.
METHODS: Patients with HFrEF from January 2011 to January 2014 were retrospectively reviewed to assess for digoxin use. Additional data collected included demographics, concomitant medications, and co-morbidities. Primary endpoints were differences in all-cause hospitalizations, emergency department (ED) visits, and mortality between patients receiving digoxin and controls not prescribed digoxin.
RESULTS: A total of 96 patients are identified to date, 46 patients prescribed digoxin and 50 controls. The mean age is 68 (± 9.4) years. The average ejection fraction is 24% (±8.1). There are no differences between the two groups in the percentage of patients with atrial fibrillation, chronic kidney disease, or coronary artery disease. The use of beta-blockers, ACE inhibitors, and aldosterone antagonists is also similar in the groups. Hospitalizations (p=0.7), ED visits (p=1.0), and mortality (p=0.6) do not differ between those receiving digoxin and those not receiving digoxin. No patients were admitted to the hospital for digoxin toxicity.
CONCLUSION: Based on the preliminary results of this study, the use of digoxin has no impact on hospitalizations, ED visits, or mortality. Data collection is ongoing and will be completed at the time of presentation.

Critical Care

302. Effect of methocarbamol on acute pain following trauma. *Ohoud Aljuhani, Pharm.D.*[1], Asad Patanwala, Pharm.D.[2], Brian Kopp, Pharm.D.[3]; (1)University of Arizona-College of Pharmacy: Department of Pharmacy Practice, University of Arizona Medical Center, University Campus, Tucson; (2)Pharmacy Practice and Science, The University of Arizona College of Pharmacy, Tucson, AZ; (3)University of Arizona Medical Center-University Campus
PURPOSE: The use of methocarbamol in a multimodal approach to pain management has been evaluated in perioperative patients with variable findings. In recent years, there has been an increased utilization of methocarbamol as an adjunct to pain management in trauma patients at our institution despite limited evidence. The primary purposes of this study are to determine the role of methocarbamol to reduce pain scores, decrease opioid requirements, and decrease hospital length of stay in adult trauma patients.
METHODS: This was a retrospective, matched cohort study conducted at an academic medical center comparing outcomes of trauma patients receiving methocarbamol to those that did not receive it. Adult trauma patients admitted between July 1, 2010 to June 30, 2013 were evaluated. Patients were matched using a propensity score calculated using age, gender, and ICD9-derived injury severity score. Data collected included baseline demographics, pain scores, type of trauma, injury severity scores, and opioid use prior to admission.
RESULTS: A total of 200 patients were included in the final cohort (100 in each group). Baseline characteristics were similar with the exception of a higher percentage of chest injuries in the methocarbamol group (p<0.001). Average daily pain scores were higher in the methocarbamol group on all 3 days patients were evaluated (p=0.011, p=0.004, p<0.001). There were no significant differences in opioid requirements between the groups with the exception of the first day when patients in the methocarbamol group had higher opioid requirements (p<0.001). There was no significant difference in the length of stay.
CONCLUSION: In our study, methocarbamol did not improve pain scores, decrease opioid requirements or hospital length of stay. It is possible that selection bias may have impacted the results given the higher rate of chest trauma in the methocarbamol group. Additional studies regarding the role of methocarbamol in trauma patients with chest trauma are warranted.

Education/Training

303. Phase 3: pharmacy resident perceptions with involvement in simulation training of code skills. *Philip K. King, Pharm.D.*[1], Jeffrey Schneiderman, NREMT-P, EMS-I[2], Michael J. Peeters, Pharm.D., M.Ed., BCPS[3]; (1)The University of Toledo Medical Center, Toledo, OH; (2)University of Toledo Interprofessional Immersive Simulation Center; (3)University of Toledo College of Pharmacy, Toledo, OH
PURPOSE: To assess if participation within interprofessional simulations affects pharmacy residents' perceptions of preparedness and involvement on code blue teams

METHODS: This IRB-approved study was one phase within a larger prospective project documenting a year-long, interprofessional code skills training program. This phase will conclude after June 2014. In this phase, we used a 19-item survey instrument (with 4-point Likert-like scale for each item) to evaluate pharmacy residents' perceptions of benefit from participating in periodic/bi-monthly high-fidelity, interprofessional code blue simulation sessions. The instrument was made available on the hospital intranet for participating residents to access. Those residents were asked to reflect on and complete the study instrument following their participation in actual code blue events within the hospital.
RESULTS: In the preliminary data, participating pharmacy residents completed the survey instrument following 23 actual code blue events. With a Cronbach's alpha of 0.93, the survey instrument had good internal consistency reliability. The mean total score was 46.1 (SD 11.1); variance among respondents was large. With our preliminary data, a multiple linear regression model on the outcome of total score ($R = 0.373$) revealed that the morning/evening/night shift on which a code blue occurred (and was reported by a resident for this study) most strongly influenced their perception ($\beta = -0.382$; p=0.10), followed by hospital unit of the code ($\beta = 0.110$; p=0.64), and time during residency [(ie first vs second half); $\beta = -0.049$; p=0.83].
CONCLUSION: Mixed results were seen among survey responders – some felt this training valuable while others did not. As pharmacist participation on code teams continues to become more widespread, it is important to continue assessment of (interprofessional) simulations, to positively affect pharmacists' involvement in actual high acuity, low incident code events. Additional future research should also assess perceptions of other team-members responding to codes.

Emergency Medicine

304. Antibiotic resistance patterns of discharged emergency medicine patients in an Academic Teaching Institution. *Megan Kunka, Pharm.D.*, Jessica Winter, Pharm.D., BCPS, Madeline Foertsch, Pharm.D., BCPS, Nicole Harger, Pharm.D., BCPS; Department of Pharmacy, UC Health – University of Cincinnati Medical Center, Cincinnati, OH
PURPOSE: The global presence of antibiotic resistance and prescriber unfamiliarity with community resistance patterns (CRP) questions the utility of targeted antibiogram development. This study evaluated appropriateness of empirically prescribed antimicrobials at an urban academic teaching institution for skin and soft tissue infections (SSTI) and urinary tract infections (UTI).
METHODS: This investigator-initiated, retrospective study evaluated patients who presented to the Emergency Department and were discharged on antibiotics for treatment of SSTI/UTI. The primary outcome included community antibiogram development describing resistance patterns of discharged emergency medicine patients. SSTI and UTI recurrence, defined as reinfection of the same organ system, was also compared between patients discharged on appropriate (microorganism sensitive to empiric antibiotic) and inappropriate (microorganism resistant to empiric antibiotic) empiric antibiotic treatment.
RESULTS: Preliminary results include 124 of 429 patients meeting inclusion criteria, allowing for 80% power with an alpha of 0.05. CRP were evaluated in *Staphylococcus aureus, Escherichia coli*, and *Klebsiella pneumoniae*. As compared to the inpatient hospital antibiogram, community pathogens showed increased resistance to clindamycin in methicillin-sensitive *Staphylococcus aureus* (MSSA) (69% vs 82%) and a 27% increase in susceptibility to methicillin-resistant *Staphylococcus aureus* (MRSA) (94% vs 67%). MSSA and MRSA showed improved susceptibility in the community to sulfamethoxazole-trimethoprim (SMX-TMP) (100% vs 53%; 100% vs 98%). A difference in antimicrobial susceptibility of ≥10% to *Escherichia coli* was observed for cefazolin (96% v. 85%), ciprofloxacin (87% vs 74%), and SMX-TMP (85% vs 74%), with increased sensitivity in the community. No differences were observed with *Klebsiella pneumoniae*. Ninety-nine patients were prescribed appropriate empiric therapy, and 25 were prescribed inappropriate empiric therapy. There was no difference in infection recurrence between groups (25.2% vs 36.0%, p=0.409).
CONCLUSION: Resistance patterns differed between community and inpatient hospital antibiograms for *Escherichia coli* and MRSA, with higher community susceptibility. No difference was observed between recurrent infections based on appropriate or inappropriate empiric therapy.

305. Ketamine and propofol versus propofol monotherapy for procedural sedation in the Emergency Department. *Timothy Roach, Pharm.D.*, Erik Feltz, Pharm.D.; Meriter Hospital, Madison, WI
PURPOSE: To determine if the combination of ketamine and propofol (ketofol) is associated with lower incidence of respiratory depression than propofol monotherapy for procedural sedation (PS) in the Emergency Department (ED).
METHODS: We conducted a retrospective, observational, single-center chart review of ED PS. Eligible patients included those who underwent procedural sedation at our institution's ED with either propofol or ketofol, and excluded if they received sedation for any purpose other than PS, or received monotherapy sedation with another regimen. The primary outcome was incidence of respiratory depression. Secondary outcomes included incidence of hypotension, total dose of propofol, total dose of opioid medications, adverse effects attributed to ketamine, and duration of procedure.
RESULTS: A total of 100 patients were included in the study where 67 patients received propofol and 33 patients received ketofol. There was no difference in the incidence of respiratory depression between propofol and ketofol (10.4% vs 21.2%; p=0.22). The total propofol dose was higher in the propofol monotherapy group than the ketofol group (0.99 mg/kg vs 0.72 mg/kg; p=0.006). Patients in the ketofol group had a trend towards a higher percentage that received opioids within 1 hour of PS than the propofol group (55% vs 35%; p=0.09). Duration of procedure was longer by approximately 5 minutes in the ketofol group compared to propofol group (20.7 vs 15.5 minutes; p=0.005). Ketamine was associated with no reported emesis events and 2 episodes of visual hallucinations which were mild and self-limiting.
CONCLUSION: There was no difference in respiratory depression between propofol monotherapy and ketofol, although there was a trend towards higher incidence with ketofol. The addition of ketamine was well-tolerated, with few adverse events attributed to ketamine. Future research is needed to adequately understand the differences between propofol and ketofol.

Geriatrics

306. Evaluation of aspirin prescribing practices for primary prevention in women over the age of 65 at an Academic Family Practice Clinic. *Alisyn Hansen, Pharm.D.*[1], Vanessa Stevens, Ph.D.[2], Marisa Brailsford, Pharm.D.[2], Timothy Farrell, M.D.[3], Karen Gunning, Pharm.D.[4]; (1)University of Utah Health Care, Salt Lake City, UT; (2)Pharmacotherapy Outcomes Research Center, University of Utah, Salt Lake City, UT; (3)Division of Geriatrics, University of Utah School of Medicine, Salt Lake City, UT; (4)University of Utah College of Pharmacy and School of Medicine, Salt Lake City, UT
PURPOSE: This study evaluated the medical records of elderly women over the age of 65 years at an academic family practice clinic in order to (i) evaluate prescribing trends for aspirin in the primary prevention of transient ischemic attack (TIA) and stroke and (ii) evaluate the appropriateness of aspirin therapy in elderly women based on individual risk factor stratification.
METHODS: Medical records of female patients over the age of 65 years receiving care at an academic family practice clinic between 5/1/2012 and 9/1/2013 were reviewed. Any women with a prior history of TIA, stroke, or acute coronary syndrome were excluded. A random sample of 250 women meeting inclusion criteria was evaluated. Based on risk stratification, patients were catego-

rized as receiving appropriate or inappropriate aspirin therapy. Women not currently on aspirin therapy were also evaluated. Individual risk factor stratification was determined by the use of the Western States Stroke Consortium Stroke Risk Calculator.
RESULTS: Aspirin therapy was prescribed in 33.2% of the elderly female population. Of the women who were prescribed aspirin therapy, those considered to be on appropriate aspirin therapy had a higher mean stroke risk (mean stroke risk score, 28.04%) compared to those with low stroke risk factors that did not warrant aspirin therapy (mean stroke risk score, 7.01%). [p-value<0.001] Women who were not on aspirin therapy were more likely to have low stroke risk factors (73.8%), compared to those with higher stroke risk factors (26.2%). [p-value 0.002]
CONCLUSIONS: Aspirin therapy should be continually evaluated in elderly women. Stroke risk, bleeding risk, and patient goals should all be taken into account when discussing the role of aspirin therapy for primary stroke prevention.

Health Services Research

307. Evaluating the impact of pharmacist-provided telephonic MTM on emergency room utilization in home health patients. *Stephanie Kleyman, Pharm.D.*[1], Alan J. Zillich, Pharm.D.[1], Heather A. Jaynes, R.N., M.S.[1], Jason M. Sutherland, Ph.D.[2], Margie E. Snyder, Pharm.D., MPH[3]; (1)Department of Pharmacy Practice, Purdue University College of Pharmacy, Indianapolis, IN; (2)University of British Columbia, Centre for Health Services and Policy Research, Vancouver, BC, Canada; (3)Department of Pharmcy Practice, Purdue University College of Pharmacy, Indianapolis, IN
PURPOSE: To evaluate the effectiveness of a telephonic medication therapy management (MTM) service on reducing emergency department utilization within a Medicare-insured home health population.
METHODS: This is a retrospective analysis of data from a cluster-randomized controlled trial examining Medicare insured patients within forty randomly selected, geographically diverse home-health centers. The intervention consisted of an initial telephonic medication reconciliation with a pharmacy technician; a telephonic pharmacist-provided medication review; and follow-up pharmacist phone calls at day seven and then as needed for another 30 days. Data were collected by in-home nurses utilizing the Center for Medicare and Medicaid Services' OASIS-C instrument, and patients were followed for 60 days. The primary outcome for this ongoing exploratory analysis is 60-day all-cause emergency department utilization. Bivariate analysis will be computed for patients' baseline risk of ED-utilization, number of medications taken daily, and other OASIS-C data elements and variables with a p-value of <0.2 will be used to generate a multivariate logistic regression model. This model will test the intervention's effect on the probability of ED utilization.
RESULTS: A total of 895 patients (intervention n = 415, control n = 480) were block-randomized to the intervention or usual care. Among intervention patients, 16.5% utilized the ED, whereas 18.9% of usual care patients utilized the ED.
CONCLUSION: Further results of this ongoing analysis will be presented at the 2014 ACCP Annual Meeting in Austin, TX.

Hematology/Anticoagulation

308. Pharmacist-led aspirin discontinuation in targeted patients receiving combination warfarin and aspirin. *Allison Schroeder, Pharm.D., BCPS*[1], Nathan Clark, Pharm.D., FCCP, BCPS[2], Samuel G. Johnson, Pharm.D., FCCP, BCPS, (AQ, – Card)[3], Thomas Delate, Ph.D., M.S.[4], Daniel M. Witt, Pharm.D., FCCP, BCPS[4]; (1)Skaggs School of Pharmacy and Pharmaceutical Sciences – Clinical Pharmacy Research Team, University of Colorado – Kaiser Permanente Colorado, Aurora, CO; (2) Anticoagulation and Anemia Management Services, Kaiser Permanente Colorado, Aurora, CO; (3)Kaiser Permanente, Aurora, CO; (4)Kaiser Permanente Colorado, Aurora, CO
PURPOSE: This study describes implementation of a system-wide quality improvement initiative aimed at reducing risk for bleeding among patients receiving concomitant chronic warfarin anticoagulation and aspirin (combination therapy) managed by a centralized clinical pharmacy service. Patients meeting specific criteria were targeted for aspirin discontinuation due to risks of combination therapy outweighing perceived benefits.
METHODS: Following literature searches and input from multiple physician specialties (i.e., cardiology, family medicine, internal medicine, neurology, and hematology/oncology), consensus criteria were developed to systematically identify patients receiving combination therapy who should discontinue aspirin. These included: (i) no history of warfarin failure, (ii) absence of coronary artery disease, (iii) absence of mechanical heart valves, (iv) absence of antiphospholipid antibody syndrome, and (v) absence of vascular disease requiring vessel reconstruction. Subsequently, Kaiser Permanente Colorado's (KPCO) Clinical Pharmacy Anticoagulation and Anemia Service (CPAAS) collaborative drug therapy management protocol was revised to reflect these criteria. This revision was approved by KPCO's Pharmacy and Therapeutics committee and aspirin discontinuation for targeted patients became part of CPAAS workflow. For this report, patient demographics and indication breakdown for patients meeting aforementioned criteria are presented.
RESULTS: Combination therapy was identified in 2791 CPAAS patients. Of these, 803 were identified as candidates for aspirin discontinuation based on administratively collected data. This population had 419 males (52.2%) with a mean age of 74.2 years (+/- 11.3 years). We found that 504 patients had atrial fibrillation as the primary indication (62.8%), 157 with deep vein thrombosis/pulmonary embolism (19.6%), and 142 patients with other indications (17.7%).
CONCLUSION: Working collaboratively with physician leaders we were able to establish specific criteria and create a workflow for KPCO CPAAS pharmacists to appropriately discontinue aspirin in targeted patients receiving combination therapy. To assess impact of this quality improvement initiative, bleeding and thrombotic outcomes will be assessed for 6 months following aspirin discontinuation.

HIV/AIDS

309. Characterization of rilpivirine use in a human immunodeficiency virus (HIV) Ambulatory Infectious Diseases Clinic. *Teresa Cicci, Pharm.D.*, Patricia Fulco, Pharm.D., BCPS, FAHP, AAHIVP; Department of Pharmacy Services, Virginia Commonwealth University Health System, Richmond, VA
PURPOSE: Rilpivirine is a second generation non-nucleoside reverse transcriptase inhibitor (NNRTI) indicated for HIV-1-infected treatment-naïve adults with baseline viral loads (VL) ≤100,000 copies/mL In clinical trials, virologic failure occurred more frequently in rilpivirine-treated patients with higher baseline VLs and resulted in the emergence of NNRTI genotypic mutations. Pharmacokinetic concerns also exist with rilpivirine, necessitating its administration with a high caloric meal and avoiding concurrent use with acid suppressants or strong cytochrome 3A4 inducers. First-generation NNRTIs also commonly result in a rash with subsequent discontinuation, and it is unknown if rilpivirine may be sequentially used. Based on these concerns, an assessment of rilpivirine prescribing practices was performed.
METHODS: This was a retrospective, single-center medical record review conducted at a HIV Infectious Diseases ambulatory clinic. Study subjects included HIV-positive patients with an electronic rilpivirine prescription. The primary outcome was to define the number of patients prescribed rilpivirine for treatment-naive versus treatment-experienced HIV infections. Secondary outcomes were to assess 6-month virologic response rates, to quantify potential drug/food interactions, and to identify patients with prior NNRTI-associated rash.

RESULTS: Of the patients assessed (n = 105), 56% were treatment-naïve (baseline VL = 31,048 copies/mL). Ten treatment-experienced patients (baseline mean VL = 32 copies/mL) were prescribed rilpivirine for simplification therapy. Six-month virologic response (<20 copies/mL) rates were 73%, 68%, and 78% for treatment-naive, treatment-experienced, and simplification patients, respectively (p=0.83). Dietary counseling was provided to 38% of patients. Potential drug interactions occurred with proton-pump inhibitors (n = 9), H_2 receptor antagonists (n = 14), azole antifungals (n = 13), and protease inhibitors (n = 5). One patient had a historical NNRTI-associated rash and subsequently tolerated rilpivirine.
CONCLUSION: Rilpivirine was primarily prescribed for treatment-naive patients with low baseline VLs. Successful virologic response was also demonstrated in treatment-experienced patients. Additional data are needed to evaluate safe rilpivirine use in patients with a historical NNRTI-associated rash. Areas of opportunity include optimizing rilpivirine administration with regard to drug/food interactions.

310. Refill claims data as a measurement tool for antiretroviral adherence in HIV-infected patients. *Wei Cheng Yuet, Pharm.D.*, Michelle Liedtke, Pharm.D., BCPS, Jamie Miller, Pharm.D., BCPS, Kevin Farmer, Ph.D., FAPhA, C. Ryan Tomlin, Pharm.D., BCPS, R. Chris Rathbun, Pharm.D., BCPS; Department of Clinical and Administrative Sciences, College of Pharmacy, University of Oklahoma Health Sciences Center, Oklahoma City, OK
PURPOSE: To evaluate the relationship between antiretroviral refill adherence, virologic outcomes, and demographic variables in patients with HIV infection.
METHODS: A retrospective study of HIV Drug Assistance Program (HDAP) claims data was conducted of adult HIV-seropositive patients receiving care at the OU Health Sciences Center Infectious Diseases Institute. HDAP patients receiving antiretroviral therapy for a minimum of 6 months between January 2011 and December 2012 were included. Data collected included refill claims, HIV viral load, antiretroviral regimen type, and demographic information. Descriptive and inferential statistics were performed to characterize refill adherence, and regression analyses will be used to identify relationships between refill adherence, demographic factors, and virologic suppression.
RESULTS: A total of 704 patients were eligible; 570 (81.0%) males, 393 (55.8%) Caucasian, and mean age 40.1 ± 10.5 (SD) years. Over the 24-month study period, 424 (60.3%) patients refilled their antiretrovirals for ≥ 23 consecutive months. The most common regimen types were non-nucleoside reverse transcriptase inhibitor (NNRTI)-based (56.1%) and protease inhibitor (PI)-based (37.9%). The mean medication possession ratio (MPR) for all regimen types was 72.7% (95% CI: 70.6–74.8). The mean MPR for NNRTI-based regimens and PI-based regimens was 76.8% (95% CI: 74.2–79.4%) and 67.7% (95% CI: 64.0–71.4%), respectively (p<0.0001; unpaired T test).
CONCLUSION: Patients receiving NNRTI-based regimens exhibited greater adherence than those on PI-based therapy. Final analysis of results will evaluate the correlation between refill adherence rates and virologic outcomes and whether demographic factors are predictive of refill adherence. These data will assist with interpreting the utility of prescription claims data for analyzing adherence in relation to virologic outcomes.

311. Management of hypertensive HIV-positive patients in a patient-centered medical home. *Rebecca Hluhanich, Pharm.D.*[1], Joy Vongspanich, Pharm.D.[1], Machelle Wilson, Ph.D.[2], Patricia Poole, Pharm.D.[1]; (1)Cares Community Health, Sacramento, CA; (2)University of California, Davis Medical Center, Sacramento, CA
PURPOSE: This study assessed the impact of pharmacist initiatives within a patient-centered medical home model (PCMH) on the management of hypertensive HIV-positive patients and explored the relationship between difficult to treat hypertension and poor HIV virologic control.
METHODS: This retrospective, crossover study was conducted between August 1, 2013 and April 1, 2014. Patients were identified by an EMR search for blood pressure ≥ 140/90 mmHg or physician-referred. Patients with two measurements ≥ 140/90 mmHg who completed a pharmacist intake appointment were included in the study. The primary endpoint was the mean change in blood pressure 2-months post intervention. The secondary endpoints were HIV viral load 5-year peak, CD4+ T-cell 5-year nadir, number of blood pressure medications, PCMH disciplines involved in care, pharmacist's interventions, and blood pressure 3- and 4-months post intervention.
RESULTS: Sixteen patients were enrolled. All patients received education on disease state and lifestyle modifications. In 50% of patients, anti-hypertensive medications were changed, initiated and/or titrated. These efforts resulted in statistically significant decreases in both systolic and diastolic blood pressures 2-months post intervention: average decrease in systolic was −16.8 mmHg and diastolic was −9.9 mmHg (p-value<0.05). These decreases were maintained at 3- and 4-month post intervention. Smoking resulted in less reduction in blood pressure compared to non-smokers (p-value 0.08). No correlation was observed between CD4 T-cell nadir, viral load peak and number of blood pressure medications or between hypertension and antiretroviral drug class, metabolic syndrome, diabetes/HOMA score, LDL, BMI, or ethnicity.
CONCLUSION: A pharmacist-led hypertension clinic in a PCMH is an effective approach to improving blood pressure in complex patients. No correlation between CD4+T-cell nadir and difficult to treat hypertension was observed. Smoking was trending as a significant risk factor for difficult to treat hypertension.

Infectious Diseases

312. Oral vancomycin plus intravenous metronidazole versus oral vancomycin in severe Clostridium difficile-associated diarrhea: a single center study. *Grace Shyh, Pharm.D.*[1], Darko Todorov, Pharm.D.[1], Henry Cohen, Pharm.D.[1], Roya Mukhtarzad, M.D.[2], Steve Brooks, Ph.D.[2]; (1)Department of Pharmacy, Kingsbrook Jewish Medical Center, Brooklyn, NY; (2)Department of Medicine, Kingsbrook Jewish Medical Center, Brooklyn, NY
PURPOSE: Current guidelines stratify *Clostridium difficile*-associated diarrhea (CDAD) into mild-to-moderate, severe, and severe complicated diseases based on the patient's symptomatology, where combination therapy is only utilized in the severe complicated cases. The objective of this study is to compare the clinical efficacy and therapeutic outcomes between combination therapy of oral vancomycin 125 mg every six hours plus intravenous metronidazole 500 mg every eight hours (treatment group) versus monotherapy of oral vancomycin 125 mg every six hours (control group) in severe CDAD.
METHODS: This is a prospective, single center, randomized control study, examining patients with confirmed CDAD at the Kingsbrook Jewish Medical Center, NY. Patients demonstrating severe CDAD will be randomized into either the treatment group or the control group for a minimum of 10 days until symptom resolution. Baseline patient characteristics will be assessed using the Student's t-test. Precipitating factors (i.e. acid-suppression agents, exposure to broad-spectrum antibiotics,etc.) will be analyzed using linear regression with multivariate analysis. Primary outcomes include time to symptom resolution (i.e. decreasing bouts of diarrhea, de-escalation of serum creatinine and leukocyte count). Secondary outcomes include prolonged hospitalization as a result of CDAD and clinical worsening which requires escalation of treatment. Statistical analysis will be performed using SPSS (SPSS, Inc., Chicago, IL, version 19.0) statistical program.
RESULTS: This is an ongoing research with data prospectively collected since May 1st, 2014 until August 31st, 2014 to obtain a predicted 80% power (n = 59 per group). Preliminary data analysis was performed on 20 patients (n = 10 per group). Advanced age, nursing home resident, chronic proton-pump inhibitor use, recent exposure to broad-spectrum antibiotics, and history of CDAD were identified as independent risk factors for CDAD

($p<0.05$ for each factor). No statistical significance was detected in time to symptom resolution between treatment and control groups (8.8 days vs 12 days, respectively, p=0.56).
CONCLUSION: Combination therapy in severe CDAD does not provide additional therapeutic benefits over monotherapy.

313. The impact of updated initial antibiotic recommendations for patients with sepsis presenting to the Emergency Department. *David Allen, Pharm.D.*; Pharmacy Department, Cone Health, Greensboro, NC
PURPOSE: The aim of this study was to evaluate the effect of a revised electronic-sepsis order set on time to initial antibiotic dose in patients presenting to the emergency department (ED) with sepsis.
METHODS: The existing electronic-sepsis order set was updated in July of 2013 to include specific antibiotic recommendations based on suspected source of infection and all recommended antibiotics were included in automated dispensing cabinets. Patients diagnosed with and treated for severe sepsis in Cone Health emergency departments were identified through review of electronic medical records and separated into two groups based on date of diagnosis with Aug 2012-Dec 2012 representing the pre-updated order set and Aug 2013-Dec 2013 representing the updated order set. The primary outcome evaluated was mean time to initial antibiotic dose administrated after triage. Secondary outcomes include; the percentage of patients receiving antibiotics within 1 hour, appropriateness of initial antibiotics in patients with positive blood culture, and mortality.
RESULTS: A total of 155 patients were identified and included in the study. The mean time until the initial dose of antibiotics was significantly improved by the intervention with a 57 minute reduction from 174 to 117 minutes ($p\leq0.001$). This improvement was also reflected in the significant improvement in the percentage of patients receiving their 1st dose of antibiotics in under 1 hour; 3.6% compared to 16% for an improvement of 12.4% (p=0.041).
CONCLUSION: Order set optimization with integrated antibiotic recommendations and their inclusion in automated dispensing cabinets was an effective way of reducing the time until initial antibiotic administration for patients presenting to the ED with sepsis.

314. Risk factors for resistant pathogens in community-dwelling pneumonia patients from 2001 to 2010. *Braden Adamson, Pharm.D.*[1], Russell T. Attridge, Pharm.D., M.Sc., BCPS[2]; (1) Department of Pharmacy Practice, University of the Incarnate Word Feik School of Phamracy, San Antonio, TX; (2)South Texas Veterans Health Care System, Audie L. Murphy Division, San Antonio, TX
PURPOSE: The concept of healthcare-associated pneumonia has stimulated controversy regarding risk factors for resistant organisms in community-dwelling pneumonia patients. Our primary objective was to compare incidence, risk factors, and outcomes in hospitalized community-dwelling pneumonia patients with selected pathogens.
METHODS: We used the U.S. Centers for Disease Control and Prevention National Hospital Discharge Survey to extract community-dwelling pneumonia patients and compared baseline demographics, outcomes, and comorbidities to determine risk factors for *S. aureus* and *Pseudomonas* spp. pneumonias. Pneumonia was defined using primary and secondary ICD-9 discharge codes. We excluded patients <18 years and those admitted from a non-community setting. We used Chi-square and Wilcoxon Rank Sum tests to compare dichotomous variables and multivariable logistic regression to identify risk factors.
RESULTS: Approximately 11.1 million records of community-dwelling pneumonia patients were identified from 2001–2010. The most common pathogens were *S. aureus* (27.7%), *S. pneumoniae* (22.3%), and *Pseudomonas* spp. (14.6%). Compared to *S. pneumoniae* pneumonia patients, patients with *S. aureus* and *Pseudomonas* spp. were more likely to be admitted from a skilled nursing facility (SNF), receive enteral feeding, and have heart failure. Methicillin-resistance accounted for 78.9% of *S. aureus* isolates. Independent risk factors for *S. aureus* pneumonia included SNF admission (odds ratio, 95% confidence interval; 2.04, 2.02–2.07) and enteral feeding (2.72, 2.69–2.79), while SNF admission (1.47, 1.44–1.50), enteral feeding (1.68, 1.63–1.74), and chronic pulmonary disease (1.99, 1.98–2.01) were independent risk factors for *Pseudomonas* spp. pneumonias. Patients with *S. aureus* or *Pseudomonas* spp. pneumonia had increased in-hospital mortality (15.6% and 9.2%, respectively) and median length-of-stay (LOS, 10 and 9 days, respectively) compared to patients with *S. pneumoniae* pneumonia (6.3% in-hospital mortality and 5 day LOS).
CONCLUSION: Admit source from a SNF and enteral feeding may be important risk factors for *S. aureus* and *Pseudomonas* spp. pneumonias, which are associated with increased in-hospital mortality and LOS.

315. Empiric antibiotic appropriateness, combination therapy and clinical outcomes of critically-ill patients with *Pseudomonas aeruginosa* or *Acinetobacter* infections: a retrospective cohort analysis. *Jacob Beyer, Doctor of Pharmacy*; University of Colorado Hospital, Denver, CO
BACKGROUND: Early appropriate empiric antibiotic administration within septic patients is associated with improved clinical outcomes. The optimal regimen is debatable and related to risk factors for multi-drug resistant organisms as well as local susceptibility patterns.
PURPOSE: The primary objective was to assess the impact of early appropriate antibiotics and combination extended spectrum gram-negative antibiosis on clinical outcomes in ICU patients infected with *Pseudomonas aeruginosa* (PSA) or *Acinetobacter* (ACI) infection.
METHODS: This single center retrospective cohort included ICU patients with a positive culture for *PSA* or *ACI*. Appropriate empiric antibiosis was defined as administration of an antibiotic with *in vitro* activity within 24 hours of culture collection. Baseline characteristics and clinical outcomes were compared between appropriate and inappropriate groups as well as combination gram negative antibiosis versus monotherapy. The primary outcome was hospital mortality or discharge to hospice. Secondary outcomes included ICU and hospital length of stay.
RESULTS: Eighty-seven patients over an 18 month period were identified. Appropriate antibiotic therapy was administered to 53 (60.9%) patients. Within the inappropriate group 18 (52.9%) did not receive an antibiotic directed against *PSA* or *ACI*. The rate of hospital mortality or discharge to hospice was similar between groups (26.4% vs 26.5%, p=0.995). Both ICU (6 vs 21 days, p=0.008) and hospital length of stay (17 vs 36 days, p=0.01) were shorter in those who received appropriate empiric coverage. Combination antibiotics were used in 10 cases but did not increase the proportion of appropriate coverage or clinical outcomes.
CONCLUSION: Administration of appropriate empiric antibiotics was not associated with increased survival in patients infected with *PSA* or *ACI*. However, it was associated with decreased ICU and hospital length of stay. Combination empiric antibiotics were used infrequently in this cohort. Inappropriate spectrum of coverage was the driver of inappropriate empiric antibiosis.

Other

316. Iron deficiency anemia: assessing pharmacists' disease state knowledge, evaluation, and treatment options. *Jaclyn Viola, Pharm.D.*; St. John's University, Queens, NY
PURPOSE: Iron deficiency anemia (IDA) is a common condition, affecting over 7.5 million people in the United States, occurring secondary to a wide variety of medical conditions. Common conditions that can lead to IDA include chronic kidney disease, cancer, heavy menstrual bleeding, pregnancy, inflammatory bowel disease, and congestive heart failure. Untreated or insufficiently treated IDA can negatively impact disease prognosis and health outcomes. The purpose of this study is to assess pharmacists'

knowledge, evaluation, and treatment of iron deficiency anemia to ultimately optimize patient care.
METHODS: A 10 question voluntary, anonymous survey was distributed to practicing pharmacists from May 19th–June 9th, 2014. Pharmacists were asked questions about their knowledge and clinical practice involving iron deficiency anemia.
RESULTS: A total of 75 pharmacists participated. The survey indicated that pharmacists agree that iron deficiency anemia affects millions of Americans and that the incidence has been increasing steadily over the past 5 years. In practice, 84% would recommend that an iron panel be ordered if a patient's hemoglobin was low, but 64% agreed that an iron panel isn't routinely checked. Hemoglobin and serum ferritin are the most commonly used markers to diagnosis IDA but not conclusively. When asked about treatment options, the responses varied ranging from oral iron to intravenous iron to blood transfusions to not knowing appropriate therapy. Similarly, there was no agreement on patient monitoring and assessment for efficacy after treatment.
CONCLUSION: There is a general awareness of iron deficiency anemia and its prevalence, but there isn't a clear consensus on proper diagnosis and treatment. Pharmacists can play a vital role in improving patient outcomes by helping to identify patients with iron deficiency anemia, utilizing the proper diagnostic procedures, and by offering appropriate treatment options.

Pediatrics

317. Efficacy of nebulized fentanyl for the palliation of dyspnea in pediatric patients. *Titilola Afolabi, Pharm.D., BCPS*, Milap C. Nahata, M.S., Pharm.D., FCCP, Vinita Pai, Pharm.D.; Ohio State University College of Pharmacy, Columbus, OH
PURPOSE: Inhaled or nebulized opioids have been widely investigated as a pharmacological treatment of dyspnea. Nebulized fentanyl is highly lipophilic making it suitable for rapid relief of episodic breathlessness. Little is known about the efficacy and safety of nebulized fentanyl in children with only one case report published in a 17 year old child. This study was designed to assess the efficacy and safety of nebulized fentanyl in palliation of end-of-life dyspnea in children.
METHODS: This retrospective review of medical records evaluated pediatric patients ages newborns to 18 years with symptoms of dyspnea, shortness of breath or air hunger during end-of-life care who received more than 1 dose of nebulized fentanyl. The primary efficacy outcome measures consisted of heart rate, respiratory rate, and oxygen saturation. Other endpoints examined included blood gases, pulmonary function tests and Borg scores. Subjective outcome measures of improvement and adverse drug reactions (ADRs) reported by patients, caregivers or healthcare professionals were obtained from progress notes.
RESULTS: Thirty-four patients (16 males and 18 females; mean age: 8.4 years) met the inclusion criteria with 413 doses administered. Nebulized fentanyl doses ranged from 5 to 100 mcg and the number of doses per patient ranged from 2 to 63. The most frequent dose of fentanyl administered was 50 mcg (175 occurrences). Preliminary analysis showed a significant decrease in heart rate (76 exposures; p value=0.01), and a trend towards reduction of respiratory rate (53 exposures; p value=0.06) and increase in oxygen saturation (71 exposures; p value=0.1) after treatment. No ADRs were reported (76 exposures).
CONCLUSION: Nebulized fentanyl use was associated with the relief of end-of-life dyspnea in children as exhibited by a significant decrease in heart rate and a trend towards reduction of respiratory rate with an increase in oxygen saturation.

Pharmacogenomics/Pharmacogenetics

318. A CYP2C19 genotype guided dosing approach for optimizing voriconazole in patients with IFIs. *Issam Hamadeh, Pharm.D.*, S.Schmidt, Ph.D., N.Mangal, Ph.D. Candidate, J.Hiemenz, M.D., T.Langaee, Ph.D., C. Peloquin, Pharm.D., L.Wiggins, Pharm.D., C. Arp, Pharm.D., K. Kinkler, Pharm.D., J. Johnson, Pharm.D.; Pharmacotherapy and translational Research, University of Florida, Gainesville, FL
PURPOSE: Voriconazole is a first line agent for treatment of invasive fungal infections (IFIs). The clinical utility of its "one size fits all" weight based dosing regimen is being questioned due to presence of large inter-individual differences in its pharmacokinetics which have been attributed to polymorphisms in *CYP2C19*. The objective of our study is to determine whether a *CYP2C19* genotype-directed dosing strategy is superior to standard dosing strategy for achieving a therapeutic trough plasma concentration, particularly for ultra-rapid metabolizers (*CYP2C19*17*).
METHODS: Data collected for "The Clopidogrel-CYP2C19 Pilot Implementation Project" conducted at UF Health, were retrieved to estimate prevalence of *CYP2C19*17* variant in our patient population. In addition, a population pharmacokinetic model was developed in NONMEM version 7.2 based on literature data by scaling *in vitro* enzyme kinetic data to *in vivo* clearance for poor (PM), extensive (EM), and ultra-rapid (UM) metabolizers. Using developed population pharmacokinetic model, clinical simulation tests were performed to predict appropriate maintenance dose for UMs.
RESULTS: The prevalence of UM, EM, IM, and PM phenotypes were: 28%, 40%, 25%, and 7%, respectively. A two compartment model adequately described PK of voriconazole. Based on clinical simulation tests, optimal voriconazole doses for UMs and EMs were determined as shown in table.

CYP2C19 phenotype	Loading dose	Maintenance dose
Extensive metabolizers (EMs)	6 mg/kg every 12 hours	4 mg/kg every 12 hours
Ultrarapid metabolizers (UMs)	6 mg/kg every 12 hours	7 mg/kg every 12 hours

CONCLUSION: At the time of writing this abstract, only dosing recommendations have been developed. Subsequently, we will conduct a clinical study where simulated *CYP2C19* genotype guided dose will be prospectively compared with standard weight based dose as it relates to time needed to reach therapeutic range in patients with IFI. We anticipate starting enrollment in summer of 2014, and thus more updates will be provided.

Pharmacokinetics/Pharmacodynamics/Drug Metabolism/Drug Delivery

319. Levetiracetam pharmacokinetics in subarachnoid hemorrhage patients with augmented renal clearance: a Monte Carlo Simulation. *Casey May, Pharm.D.*, Shaily Arora, Pharm.D., Sara Parli, Pharm.D., Melissa Thompson Bastin, Pharm.D., Aaron Cook, Pharm.D.; Department of Pharmacy, University of Kentucky HealthCare, Lexington, KY
PURPOSE: Patients with subarachnoid hemorrhage (SAH) typically exhibit hyperdynamic cardiovascular hemodynamics, which may lead to increased medication clearance. The aim of this study was to evaluate the actual creatinine clearance ($CrCl_A$) in an aneurysmal SAH population and evaluate how this may impact renally cleared medications.
METHODS: This was a prospective, single-center study in a neurocritical care ICU at a university hospital. A total of 20 patients were consented and provided a 24-hour urine sample to measure the $CrCl_A$. If patients experienced cerebral vasospasm (CV), a 24-hour urine collection was repeated during vasospasm treatment. Serum concentration-time profiles were simulated for multiple IV doses of levetiracetam using Monte Carlo Simulation (MCS) to assess the probability of target attainment (PTA) for attaining levetiracetam trough concentrations of ≥6 mg/L based on the $CrCl_A$ values obtained in this population.
RESULTS: Among the 20 patients enrolled, the mean baseline $CrCl_A$ was 325.93 ± 135.20 mL/minute/1.73 m^2 and this differed significantly from the baseline estimated creatinine clearance ($CrCl_E$) 144.93 ± 42.82 mL/minute/1.73 m^2 ($p<0.001$). Four

patients developed CV; the mean CV $CrCl_A$ was 558.43 ± 356.12 mL/minute/1.73 m^2 and there was no significant difference when compared to the mean CV baseline $CrCl_A$ (246.91 ± 84.14 mL/minute/1.73 m^2, p=0.16). MCS suggested that levetiracetam dosing poorly achieved target attainment unless thrice daily dosing was utilized.
CONCLUSION: Augmented renal clearance appears to be present in patients with recent SAH. The degree of Augmented Renal Clearance (ARC) in SAH patients may impact the pharmacokinetics of commonly used agents. More frequent therapeutic drug monitoring for such agents like levetiracetam may be necessary in this population.

Psychiatry

320. The safety and efficacy of vortioxetine for acute treatment of major depressive disorder: a systematic review and meta-analysis. *Amanda Meeker, Pharm.D.*[1], Daniel Hartung, Pharm.D., MPH[2], Megan Herink, Pharm.D.[3], Dean Haxby, Pharm.D.[1]; (1)College of Pharmacy, Oregon State University, Portland, OR; (2)College of Pharmacy, Oregon State University, portland, OR; (3)College of Pharmacy, Oregon State University/Oregon Health & Science University, Portland, OR
PURPOSE: To systematically review efficacy studies of vortioxetine in adults with Major Depressive Disorder.
METHODS: A systematic literature search was conducted using Medline, Embase, Cochrane Central Register of Controlled Trials, ClinicalTrials.gov, Drugs@FDA, and the manufacturer. Randomized controlled trials investigating the safety and efficacy of vortioxetine for acute treatment of MDD compared to placebo or another antidepressant were included. Only studies that provided results on relevant clinical outcomes were included.
RESULTS: We identified 11 RCTs with 6145 participants meeting inclusion criteria (eight published and three unpublished). Vortioxetine response was significantly higher for 1 mg (RR = 1.91; 95% CI 1.36 to 2.69), 5 mg (RR = 1.33; 95% CI 1.10 to 1.61), 10 mg (RR = 1.42; 95% CI 1.21 to 1.67), and 20 mg dose (RR = 1.58; 95% CI 1.19 to 2.08) compared to placebo. Results also demonstrated a statistically significant difference in remission rates between the 10 mg group (RR 1.45; 95% CI 1.18 to 1.77) and the 20 mg group (RR 1.68; 95% CI 1.19 to 2.37) compared to placebo. Excess statistical heterogeneity was resolved by grouping studies by proportion of study participants who were non-White. In studies with 20% or fewer non-White participants, all doses resulted in a statistically significant increase in response compared to placebo. In studies with more than 20% non-White participants, only the 10 mg dose reached statistically significance (RR = 1.21; 95% CI 1.03 to 1.43). The most common adverse events were nausea and vomiting which increased in frequency with higher doses. Compared with an SNRI, vortioxetine response rates were no better and sometimes worse depending on dose.
CONCLUSION: Vortioxetine was significantly more effective than placebo for acute treatment of MDD. Although treatment effect estimates varied substantially between studies, a strong dose effect was not observed. Although heterogeneity was explained by the racial composition of study population, further research is needed to clarify this issue.

Transplant/Immunology

321. Evaluation of the cytomegalovirus prophylaxis regimen in high- and moderate-risk heart transplant recipients at Cleveland Clinic. *Sarah Petite, Pharm.D.*, Jodie Fink, Pharm.D., BCPS, Jennifer Sekeres, Pharm.D., BCPS (AQ-ID); Department of Pharmacy, Cleveland Clinic, Cleveland, OH
PURPOSE: To determine the incidence of CMV viremia in high- (D+/R-) and moderate-risk (D+/R+, D-/R+) heart transplant recipients receiving 1 month combined prophylaxis and preemptive strategy.
METHODS: Adult heart transplant recipients from January 1, 2008 to December 31, 2012 and high- or moderate-risk for CMV infection were included. Data was collected for 1 year post-transplant and included demographics, CMV episodes, and risk factors for CMV.
RESULTS: 193 patients were included in the study. 59 patients (30.6%) were high-risk and 134 patients were moderate-risk. 59 patients (30.6%) developed CMV viremia; 37 high-risk recipients and 22 moderate-risk recipients (62.7% vs 16.4%; p<0.001). Median peak viral loads for high- and moderate-risk recipients were 10,974 copies/mL vs 1938 copies/mL, respectively (p=0.005). Asymptomatic CMV viremia occurred in 18 high-risk and 16 moderate-risk recipients (30.5% vs 11.9%; p=0.002). CMV disease developed in 19 high-risk and 6 moderate-risk recipients (32.2% vs 4.5%; p<0.001). 9 (47.4%) high-risk and 3 (50%) moderate-risk patients that developed CMV disease required hospitalization for treatment. CMV viremia occurred <90 days post-transplant in approximately 50% of recipients in both groups. Exposure to risk factors (induction therapy, mechanical circulatory support prior to transplant and rejection) for CMV was similar between the two groups.
CONCLUSION: A combined prophylaxis and preemptive strategy has been used to decrease medication adverse effects. Similar to published literature, rates of CMV viremia were different between high- and moderate-risk recipients. High-risk recipients also had higher peak viral loads. However, many of the episodes were treated in the outpatient setting which may indicate low severity of disease. The risk versus benefit of rate of CMV viremia to medication adverse effects will be weighed when determining if modifications to the protocol will be made.

Women's Health

322. Prednisone pharmacokinetics in pregnancy. *Rachel Ryu, Pharm.D.*[1], Brooke Bennett, Undergraduate Student[1], Thomas Easterling, M.D.[2], Steve Caritis, M.D.[3], Raman Venkataramanan, Ph.D.[4], Jason Umans, M.D., Ph.D.[5,6], Menachem Miodovnik, M.D.[7], Mahmoud Ahmed, Ph.D.[8], Shannon Clark, M.D.[9], Ken Thummel, Ph.D.[10], Danny Shen, Ph.D.[10], Mary Hebert, Pharm.D., FCCP[1]; (1)Department of Pharmacy, University of Washington, Seattle, WA; (2)Department of Obstetrics & Gynecology, University of Washington, Seattle, WA; (3) Department of OB/GYN/RS – Maternal-Fetal Medicine Division & Department of Pediatrics, Magee-Women's Hospital & Magee-Women's Research Institute, Pittsburgh, PA; (4)Department of Pharmaceutical Sciences, University of Pittsburgh, Pittsburgh, PA; (5)MedStar Health Research Institute, Hyattsville, MD; (6) Georgetown-Howard Universities Center for Clinical and Translational Science, Washington, DC; (7)Georgetown University Medical Center, Washington, DC; (8)Laboratory of Maternal & Fetal Pharmacology, Department of Obstetrics & Gynecology, Departments of Pharmacology & Toxicology and Human Biological Chemistry & Genetics, University of Texas Medical Branch, Galveston, TX; (9)Department of Ob/Gyn, University of Texas Medical Branch, Galveston, TX; (10)Department of Pharmaceutics, University of Washington, Seattle, WA
PURPOSE: The purpose of this study was to evaluate steady-state pharmacokinetics (PK) of prednisone during pregnancy.
METHODS: Serial plasma concentrations of prednisone and prednisolone were measured over 1 dosing interval in 18 women treated with oral prednisone for therapeutic reasons. Concentrations were determined using an HPLC/MS assay. Non-compartmental PK parameters were estimated in early- (n = 3), mid- (n = 9) and late pregnancy (n = 13) as well as postpartum with (n = 2) and without (n = 5) lactation.
RESULTS: Prednisone doses were: 2 mg (n = 1), 3.5 mg (n = 1), 5 mg (n = 9), 7.5 mg (n = 1), 10 mg (n = 9), 15 mg (n = 1), 20 mg (n = 9), 40 mg (n = 1). During pregnancy, apparent oral clearance (CL/F) of prednisone significantly increased from 36 ± 13 L/hour (5 mg) to 68 ± 8 L/hour (20 mg, p<0.05). Similarly, prednisolone CL/F increased from 4.7 ± 0.3 L/hour (5 mg) to 10.1 ± 2.9 L/hour (20 mg, p<0.05). Prednisolone/prednisone AUC ratio was increased in pregnancy compared to previously published non-pregnant subjects at the 5 mg dose (8.1 ± 3.0 vs

4.70 ± 1.09, p<0.05). Prednisone half-life was unchanged compared to non-pregnant subjects, but prednisolone half-life was increased during pregnancy for the 5 mg dose (3.2 ± 0.5 vs 2.3 ± 0.3 hour, p<0.05).
CONCLUSION: We observed dose-dependent PK of prednisone and prednisolone in pregnancy, likely due to concentration-dependent plasma protein binding. Prednisone and prednisolone PK parameters following a 5 mg dose in pregnancy differed from previously published data in non-pregnant subjects.

Student Submissions
ADR/Drug Interactions

323. Comparison of three adverse drug reaction pharmacovigilance instruments to determine the causality of published case reports. *Nan Wang, Pharm.D. Candidate, B.S.*[1], Erin Resetar, Pharm.D. Candidate, B.S.[1], Lindsey Rihtarchik, Pharm.D. Candidate, B.S.[1], Maria Felton, B.S., Pharm.D. (Pending)[2], Sandra Kane-Gill, Pharm.D., M.S., FCCM, FCCP[1]; (1)University of Pittsburgh School of Pharmacy, Pittsburgh, PA; (2)School of Pharmacy, University of Pittsburgh, Pittsburgh, PA
PURPOSE: In the practice of pharmacovigilance, numerous instruments are available to improve clinician agreement of causality between event and drug. The most recent instrument, the Liverpool algorithm, was developed in 2011 and has not yet been compared to established instruments. The primary objective was to compare the causality determination of the Kramer, Naranjo, and Liverpool algorithms. The secondary objective was to determine evaluator preference for ease of use.
METHODS: A MEDLINE search using key words "drug-related side effects and adverse reactions" and limited to English, human, and "year published-last year" identified 1043 case reports. Ten percent (n = 104) were randomly selected using SPSS and evaluated by third year pharmacy students applying the three algorithms. Selected case reports were excluded and replaced if they were not drug related or accessible at our institution. If a report included multiple cases, the first case was evaluated.
RESULTS: The 104 case reports represented 79 unique journals. The ease of use was reported to be best for the Liverpool algorithm. The percentage of agreement on all levels of causality was 48.1% between the Liverpool and Naranjo algorithms, and 38.5% between the Liverpool and Kramer algorithms. Summative scoring for each instrument is presented in the Table.

Level of Causality	KRAMER	NARANJO	LIVERPOOL
Definite/highly probable	8.7% (9)	6.7% (7)	23.1% (24)
Probable	29.8% (31)	51.9% (54)	51.0% (53)
Possible	56.7% (59)	41.3% (43)	25.0% (26)
Remote/doubtful/ unlikely	4.8% (5)	0% (0)	1.0% (1)

CONCLUSION: The Liverpool algorithm only agrees with the established instruments in about 1/3 to 1/2 of case reports. Evaluators preferred the Liverpool algorithm for ease of use. More studies are needed to determine the best algorithm to use in practice.

324. Assessing the quality of published adverse drug reaction case reports using the Naranjo criteria. *Maria Felton, B.S., Pharm.D. (Pending)*[1], Lindsey Rihtarchik, Pharm.D. Candidate, B.S.[2], Erin Resetar, Pharm.D. Candidate, B.S.[2], Nan Wang, Pharm.D. Candidate, B.S.[2], Sandra Kane-Gill, Pharm.D., M.S., FCCM, FCCP[2]; (1)School of Pharmacy, University of Pittsburgh, Pittsburgh, PA; (2)University of Pittsburgh School of Pharmacy, Pittsburgh, PA
PURPOSE: The Naranjo causality instrument is the most common ADR assessment tool used in practice and for published case reports. It consists of 10 questions used to assess the causality of the suspected drug and the reaction. Questions address domains such as: alternative causes, dechallenge, and temporal relationship. The purpose of this evaluation was to assess the quality of published ADR case reports using the criteria in the Naranjo causality instrument as the standard.
METHODS: A Medline literature search was conducted using key terms case reports and drug-related side effects or adverse reactions and limited to English, human, and "year published-last year" to determine case reports to be reviewed. This search yielded 1043 case reports of which 20% (208 reports) were randomly selected using SPSS. Articles were excluded if they were not accessible at our institution or did not discuss a drug-related cause and then replacements (n = 18) were randomly selected. Each case report was reviewed to determine if the 10 criteria of Naranjo were discussed. Two reviewers independently evaluated each case report. A third reviewer reconciled any differences.
RESULTS: The 208 case reports from 79 unique journals were evaluated. The following criteria of the Naranjo were discussed in the case reports: previous 80.3% published cases of event, 59.1% alternative causes, 99.5% temporal relationship, 80.3% dechallenge, 34.1% rechallenge, 5.8% drug concentrations, 1.9% placebo administration, 11.5% response to dosing adjustment, 15.9% reaction to similar drug, and 99.0% signs/symptoms.
CONCLUSION: Case reports are sufficient in reporting temporal relationship and signs and symptoms relating to the event. However, there is opportunity for improvement in the quality of case reports regarding response to dosing adjustments and previous cases of event to obtain an objective external assessment.

325. Co-administration of oral tetracyclines and fluoroquinolones with multivalent cations; student submission. *Taylor Stone, Student*[1], Samantha Murrow, Student[2], P. Brandon Bookstaver, Pharm.D., BCPS (AQ-ID), AAHIVP[3]; (1)School of Pharmacy, South Carolina College of Pharmacy – USC Campus, Auburn, NH; (2)School of Pharmacy, South Carolina College of Pharmacy – USC Campus, Effingham, SC; (3)Department of Clinical Pharmacy & Outcomes Sciences, South Carolina College of Pharmacy, University of South Carolina, Columbia, SC
PURPOSE: The bioavailability of fluoroquinolones (FQs) and tetracyclines (TCNs) is significantly reduced when co-administered with multivalent cations (MVCs). The purpose of this study is to investigate the co-administration of oral TCNs and FQs with oral MVCs in hospitalized patients at an academic medical center.
METHODS: This is a retrospective, non-interventional study conducted at a single academic medical center. Hospitalized, adult patients over 18 years of age and receiving >24 hours of oral FQs or TCNs (between January 2013 and March 2013) will be screened for study inclusion. Study endpoints include the rate of co-administration with MVCs, risk factors for co-administration and potential impact on subsequent infections and antibiotic susceptibility rates. Co-administration will be classified as MVC administered within 2 hours of the antibiotic dose. The time frame was chosen to allow for follow-up on subsequent infections and potential resistance. Electronic medical records will be used to collect study data. Data collected during the index hospitalization will include patient demographics, admission location, antibiotic and MVC therapy details, time between administration, and time of administration. Patients will be divided into two groups for comparative analyses: MVC co-administration and no MVC co-administration. Student t-tests will compare continuous data between groups. Based on significant factors, regression analysis will be conducted to identify potential factors associated with co-administration.
RESULTS: Pending.
CONCLUSION: Pending.

326. Study based on FDA report of Metronidazole-Kaolin interaction. *Fadilah Aleanizy, Ph.D.*; King Saud Universiy, Riyadh
PURPOSE: The needs for safe, therapeutically effective antidiarrheal combination continuously lead to effective treatment. Met-

ronidazol used for treatment of anaerobic bacteria and kaolin, when administered simultaneously, Metronidazole–Kaolin interactions have been reported by FDA but not studied. This project is the first to study the effect of Metronidazole–Kaolin interactions on the antimicrobial activity of metronidazole. Agar diffusion method performed to test the antimicrobial activity of metronidazole–kaolin antidiarrheal combination from aqueous solutions at an in-vivo simulated pHs conditions that obtained at 37 + 0.5°C on anaerobic bacteria and aerobic bacteria and used as a control for the technique.
METHODS: The isolation of different bacteria were on a MacConkey agar medium, the McFarland standard 0.5 that represent 1.5×10^8 diluted to 1.5×10^5 with normal saline, For every microorganism there are four plates, two plates for alkaline media and two plates for acidic media using metronidazole and kaolin alone as control and combination of the drugs (1:1 and 1:2). Agar diffusion techniques were used.
RESULTS: The antimicrobial activity of metronidazole combination as 1:1 and 1:2 with kaolin was abolished in acidic media as no zones of inhibition shown compared to only metronidazole that used as a control. In alkaline media metronidazole combination as 1:1 and 1:2 with kaolin showed diminutive activity compared to the control. These results proved that the kaolin adsorb metronidazole and abolish its antimicrobial activity and such combination should be avoided.
CONCLUSION: Based on reports from FDA which review some cases of prolonged complicated diarrhea although patients were on an antidiarrheal combination therapy and also used kaolin, no progress in their cases. Results from this study, and as a reference for the FDA, we recommend to avoid using kaolin in combination with other antidiarrheal medication due to its high adsorbing capacity, as described in literature, such ability abolished the activity of any combined drugs.

327. Impact of co-administration of bortezomib and vitamin C on anti-myeloma activity and peripheral neuropathy in multiple myeloma patients. *Hyun Eun Chu, B.S.*[1], Myeong Gyu Kim, B.S.[1], Jung Mi Oh, Professor[2]; (1)College of Pharmacy, Seoul National University, Seoul, South Korea; (2)College of Pharmacy, Seoul National University, Soeul, South Korea
BACKGROUND: Bortezomib-based chemotherapy is a mainstay of multiple myeloma (MM) treatment. Previous studies have shown conflicting results that vitamin C reduces anti-myeloma activity of bortezomib or vitamin C protects bortezomib-induced peripheral neuropathy without interfering anti-myeloma activity.
PURPOSE: We investigated the impact of co-administration of bortezomib and vitamin C on anti-myeloma activity and peripheral neuropathy in MM patients.
METHODS: A retrospective study was conducted in MM patients who received bortezomib/dexamethasone from Jan 2005 to Dec 2011. Patients with peripheral neuropathic symptoms or medications before receiving bortezomib/dexamethasone regimen were excluded. Difference in achieving complete response (CR) or more than very good partial response (VGPR) after 2nd and 4th cycle and experiencing peripheral neuropathy between two groups (group A: vitamin C ≥ 1 g/day, group B: vitamin C <1 g/day or not received) were investigated.
RESULTS: 88 patients were included and baseline characteristics were not different between groups. Group A had a higher CR (25.7% vs 5.6%; p=0.105) and more than VGPR (27.1% vs 16.7%; p=0.543) rate than group B after second cycle but not significantly different. The proportion of patients achieved CR (42.3% vs 46.2%; p=0.877) or more than VGPR (44.2% vs 46.2% p=0.588) did not show significant differences between two groups after fourth cycle. Although the proportion of patients experienced peripheral neuropathy was lower in group A than that of group B, it was not statistically significant (55.6% vs 61.4%; p=0.650).
CONCLUSION: Co-administration of bortezomib and vitamin C could be avoided because vitamin C delays initial anti-myeloma activity of bortezomib without additional peripheral neuropathy protection. Further studies with larger sample size might be necessary to confirm our findings.

Adult Medicine

328. A retrospective cohort analysis of pharmacologic venous thromboembolism prophylaxis in hospitalized patients with chronic liver disease. *Kaitlyn J. Moorehead, B.S.*, Scott W. Mueller, Pharm.D.; University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO
PURPOSE: Chronic liver disease (CLD) is a common comorbidity in hospitalized patients. Coagulopathy resulting from CLD does not protect from venous thromboembolism (VTE), contributing to uncertainty regarding the appropriateness of VTE prophylaxis (ppx) in this population. We aim to describe patient characteristics associated with pharmacologic VTE ppx and determine the clinical impact of VTE ppx in patients with CLD.
METHODS: This retrospective cohort study evaluated patients with CLD, by ICD-9 code, with an international normalized ratio (INR) of at least 1.3, hospitalized for 72 hours or greater between November 2012 and October 2013. Baseline severity of liver disease, coagulopathy, risk factors for VTE and bleed were compared between patients given VTE ppx and not given ppx. Primary outcomes included the incidence of VTE and major bleeding events, defined as a fall in hemoglobin of ≥2 g/dL or transfusion of ≥2 units of packed red blood cells within 24 hours.
RESULTS: Of the 300 CLD patients included, 157 (52%) received pharmacologic VTE ppx. Characteristics associated with administration of ppx were lower baseline activated partial thromboplastin time, INR, total bilirubin, model for end-stage liver disease (MELD), and higher Padua score, hemoglobin, platelets, and antiplatelet agent use. In the ppx group, VTE and portal vein thrombosis (PVT) occurred in 12 (7.6%) and 8 (5.1%) patients versus 4 (2.8%) and 12 (8.4%) of the non-ppx, respectively (p=0.07 and 0.2, respectively). In the ppx group, major bleeding occurred in 47 (30%) versus 49 (34.3%) non-ppx (p=0.46). VTE ppx was not associated with VTE, VTE plus PVT, or bleed outcomes by multivariate regression.
CONCLUSION: Use of pharmacologic VTE ppx in CLD patients was not associated with a lower risk of VTE during hospitalization nor did it increase the risk of bleeding. Further studies examining the risks and benefits of VTE ppx in this population are necessary.

329. Evaluation of the appropriateness of dosing, indication and safety of rivaroxaban in a Community Hospital. *Sonalie Patel, Pharm.D. Candidate 2015*[1], Katie Buehler, Pharm.D.[1], Anastasia Armbruster, Pharm.D., BCPS[1], Michael Daly, Pharm.D., MSCI[2]; (1)St. Louis College of Pharmacy, Saint Louis, MO; (2)Saint Louis University Hospital, Saint Louis, MO
PURPOSE: For over 50 years, warfarin was one of the only oral anticoagulants approved in the United States until the Food and Drug Administration (FDA) approved rivaroxaban, a factor Xa inhibitor. Since its addition to the hospital formulary, rivaroxaban has served as an alternative to warfarin to minimize drug interactions and to avoid therapeutic drug monitoring. The objective of this study is to evaluate the appropriateness of rivaroxban dosing, indication, and safety in a community hospital and to identify potential areas for improvement in its use.
METHODS: This single-center, retrospective chart review evaluated patients that received at least one dose of rivaroxaban between November 2011 and July 2013. The primary outcome included appropriateness of the first day of therapy based on indication and renal function per FDA-approved dosing recommendations for stroke risk reduction in nonvalvular atrial fibrillation (NVAF) and for the treatment or prevention of venous thromboembolism (VTE). The secondary outcome included incidence of major bleeding (clinically overt bleeding resulting in hemoglobin decrease ≥2 g/dL, blood transfusion of ≥ 2 units, critical anatomical site involvement, or fatal outcome) or non-major clinically relevant bleeding (other bleeding that required medical care).
RESULTS: Of the 445 patients evaluated, 36.9% of patients treated for NVAF and 11.8% treated for VTE were on an inappropriate regimen. Major bleeding occurred in 2.7% of patients

treated for NVAF, 1.2% for VTE, and 0% for off-label indications with a similar trend for non-major clinically relevant bleeding (4.6%, 1.8%, and 0% respectively). The most common site of bleeding was the gastrointestinal tract for both NVAF (5.8%) and VTE (1.8%).
CONCLUSION: Though offering potential advantages over warfarin, the use of rivaroxaban should be monitored in order to increase appropriateness of therapy and improve patient safety. Therapeutic interchanges, pharmacist interventions, and other initiatives can be implemented to ensure appropriate use.

Ambulatory Care

330. Evaluation of pharmacy health literacy assessment in outpatient pharmacies. *Erik Henricksen, Pharm.D. Candidate 2016*, Karissa Kim, Pharm.D., CACP, BCPS; James L. Winkle College of Pharmacy, University of Cincinnati, Cincinnati, OH
PURPOSE: The Pharmacy Health Literacy Assessment (PHLA) tool is available through the Agency for Healthcare Research and Quality; this assessment is an important first step for quality improvement in organizations that serve individuals with limited health literacy (LHL). Second year (P2) pharmacy students at the University of Cincinnati Winkle College of Pharmacy are required to complete the PHLA as part of their Ambulatory Introductory Pharmacy Practice Experience. The purpose of this study was to retrospectively evaluate PHLA data collected by students to explore whether local pharmacies are meeting the needs of patients with LHL.
METHODS: P2 students completed the PHLA, specifically the pharmacy tour, at their experiential sites. This part of PHLA includes 19 questions that assess promotion of services, print materials, and clear verbal communication. Students rank questions using the following scale: 1–this is something the pharmacy does not appear to be doing; 2–the pharmacy is doing this but could make some improvements; 3–the pharmacy is doing this well; or not applicable. Data collected regarding print materials and communication for the 2012–2013 and 2013–2014 academic years were evaluated.
RESULTS: A total of 193 students completed the PHLA over 2 years at the following pharmacies: major chain (72), independent pharmacy (36), and other (55). Items that pharmacies weren't doing well included: use of informational posters and signs on the pharmacy walls in languages other than English, use of visual graphics or illustrations in prescription information leaflets that the pharmacist prints out, and availability of interpreters. Moreover, pharmacies could make improvement on all other questions regarding easy-to-read print materials and use of clear verbal communication.
CONCLUSION: This study identifies a need to improve print materials and use of clear communication in pharmacies and suggests that pharmacies may not be meeting the needs of patients with LHL.

Cardiovascular

331. Impact of pharmacists' interventions on readmission rate within 12 months after discharge in heart failure patients: a meta-analysis. *Dannielle Brown, Pharmacy Student*, David Ombengi, Pharm.D., Hua Ling, Pharm.D.; Department of Pharmacy Practice, Hampton University, Hampton, VA
PURPOSE: Heart failure (HF) is the leading cause of hospitalizations, readmissions and hospital costs in the United States. Although a significant improvement in the management of HF has been made by multidisciplinary teams in the past years, the impact of pharmacists' interventions has not been clearly established. The purpose of this meta-analysis was to investigate the effect of pharmacists' interventions on readmission rate after discharge in HF patients.
METHODS: A systematic search was conducted for English-language articles published from database inception to May 2014. We included randomized controlled trials that reported the pharmacists' interventions and readmission rate within 30 days to 12 months after discharge. The numbers of patients with readmissions were analyzed using MIX 2.0 (Version 2.0.1.4. BiostatXL, 2011).
RESULTS: Six studies met all criteria. Pharmacists' interventions include but not limited to medication reconciliation, medication initiation, dose titration, and patients education. One hundred and forty one patients were readmitted during follow-up period in the pharmacists' interventions group (n = 423), compared to one hundred and forty two patients in the usual care control group (n = 412). There was no statistically significant difference in the readmission rate between the pharmacists' intervention group and the usual care control group (OR = 0.84, 95% CI: 0.49–1.46; p=0.54). A random effects model was used as the heterogeneity between the studies was significant (Q = 13.58, df = 5; p=0.019; I2 = 63.18%).
CONCLUSION: The results of our meta-analysis indicate that pharmacists' interventions in the treatment of HF patients have no effect on readmission rate within 30 days to 12 months after discharge. The heterogeneity could be explained by differences in sample size, interventions, and treatment duration. Our results are consistent with HOOPS study that pharmacists' interventions do not improve clinical outcomes in HF patients.

Clinical Administration

332. Impact of nurse-initiated withholding of insulin doses on patient blood glucose levels in the acute care cardiology and cardiovascular surgery population. *Laura Stokes, Pharm.D. Candidate*, Jennifer A. Gass, Pharm.D., M.S., BCPS; Pharmacy Department, Memorial Hermann-Texas Medical Center, Houston, TX
PURPOSE: Bedside nurses are skilled in the rapid assessment of the patient and responding to changes in their condition, including clinical assessment of the appropriateness of medications. In recent years, there has been an increase in the frequency of medications, including insulin, that have been withheld based on the nurse's clinical assessment of the patient. This may have an impact on the patient's blood glucose levels and may result in additional interventions to manage blood glucose levels. The purpose of this study is to identify the difference in peak blood glucose levels among patients currently receiving scheduled insulin doses, with and without nurse-initiated withheld doses.
METHODS: This study is a single center, retrospective case-control study evaluating the difference in peak blood glucose levels in the acutely ill adult cardiovascular population admitted to Memorial Hermann Hospital – Texas Medical Center Heart and Vascular Institute from January 1, 2014 to June 30, 2014 in patients with scheduled insulin therapy. The study will have two arms; patients with scheduled insulin that is administered as ordered versus patients with scheduled insulin where nurses have initiated holding doses based on their clinical judgment. The primary outcome of this study is the difference in the peak blood glucose levels between these two groups. Secondary outcomes of this study include length of stay, mean blood glucose levels, and frequency of patients requiring interventions as a result of holding scheduled insulin doses.
RESULTS: IRB approval pending. Anticipated completion of data collection September 1, 2014.
CONCLUSION: Pending result.

Community Pharmacy Practice

333. Use of a modified drug therapy concerns scale in community pharmacy practice: experiences of patients and pharmacists. *Amanda Kernodle, Pharm.D. Candidate*[1], Stephanie Kleyman, Pharm.D.[1], Caitlin K. Frail, Pharm.D., M.S., BCACP[2], Karen Pater, Pharm.D., BCPS, CDE[3], Karen Hudmon, DrPH[1], Brad N. Doebbeling, M.D., M.Sc.[4], Margie E. Snyder, Pharm.D., MPH[5]; (1)Purdue University College of Pharmacy; (2)University of Minnesota College of Pharmacy; (3)University of Pittsburgh School of Pharmacy; (4)Indiana University Purdue University

Indianapolis School of Informatics and Computing; (5) Department of Pharmcy Practice, Purdue University College of Pharmacy, Indianapolis, IN
PURPOSE: To characterize patient and pharmacist experiences and decision-making when using and evaluating a medication risk assessment tool in community pharmacy practice.
METHODS: This study will enroll 300 patients across five outpatient community pharmacies associated with a local county hospital in Indianapolis, Indiana. Patients first complete a modified 9-item drug therapy concerns (DTC) scale designed to predict whether a patient is at risk for potential medication-related problems. The scale is scored by their pharmacist who then engages the patient in a discussion of medication-related concerns. After receiving counseling from a pharmacist, patients complete a brief 15-item questionnaire containing three open-ended items assessing sociodemographic factors and opinions pertaining to use of the modified DTC scale. Forty patients who express interest may participate in a semi-structured telephone interview to further explore their experiences with the DTC scale and their interaction with their pharmacist. This will provide additional qualitative data characterizing patients' perceptions of the DTC scale and its impact on patient care. All participating pharmacists will complete a semi-structured interview regarding their experiences using the DTC scale. Qualitative analysis using MaxQDA software will be applied to identify emergent themes in both patient and pharmacist responses.
RESULTS: To date, 45 patients have completed the modified DTC scale, reviewed their responses with their pharmacist, and completed the patient questionnaire; of these 20 patients have participated in a follow-up telephone interview. Currently, 60% of participants are female, 47% are African-American/Black, and the average age is 52 ± 10. Most patients' DTC scale scores (82%) categorized them as at risk for potential medication-related problems. Responses to open-ended items on the questionnaire revealed mostly positive reactions, and patients reported an increase self-awareness of their medications. Data collection and qualitative analysis of patient interviews are in progress.
CONCLUSION: Analysis is underway and will be presented at the ACCP annual meeting.

Critical Care

334. Institutional guideline compliance of initial antimicrobial doses in patients receiving continuous venovenous hemodialysis. *Tyler A. Vest, Pharm.D. Candidate 2016*[1], Erin M. Roach, Pharm.D., BCPS[2], Seth R. Bauer, Pharm.D., BCPS[2]; (1)University of Cincinnati James L. Winkle College of Pharmacy, Cincinnati, OH; (2)Department of Pharmacy, Cleveland Clinic, Cleveland, OH
PURPOSE: In addition to time to antimicrobial initiation, appropriate dosing is necessary to guarantee optimal therapy and patient outcomes in critically ill patients. A previous internal study demonstrated that initial antimicrobial orders were dosed in accordance with an institutional protocol only 74% of the time in patients treated with concomitant continuous venovenous hemodialysis (CVVHD). To assist pharmacists with identifying patients receiving CVVHD, a best practice alert (BPA) was created and implemented upon verification with a goal of improving guideline-concordant dosing frequency. This study seeks to evaluate the impact of instatement of a BPA in the electronic medical record at the time of pharmacist order verification for antibiotics in patients treated with concomitant CVVHD.
METHODS: This is a before-after, retrospective cohort study evaluating the impact of a BPA on antimicrobial dosing practices. The before group will be identified from a previous IRB-approved data set. Adults (18 years or older) admitted during the study period who are receiving CVVHD with a minimum 1 calendar day of concomitant therapy with one or more study antimicrobials given intravenously will be eligible for inclusion in the after group. The primary objective of this study is to compare the concordance of initial antimicrobial orders with institutional guidelines for patients treated with concomitant CVVHD before and after introduction of a BPA in the electronic medical record at the time of pharmacist order verification. The secondary objective of this study is to evaluate explanatory factors for antimicrobial dosages that are above and below the institutional guideline recommendation.
RESULTS: This study aims to include 161 total patients (23 patients in the before group and 138 patients in the after group). Data collection is currently in process.
CONCLUSIONS: Evaluation of the impact of a BPA on institutional guideline compliance with initial antimicrobial doses in patients receiving CVVHD is under investigation.

335. Risk factors for discharge on a new antipsychotic medication after admission to an intensive care unit. Rachel A. Curtis, Pharm.D. Candidate[1], *Leslie A. Hamilton, Pharm.D., BCPS*[2], Camellia R. Davis, Pharm.D. Candidate[1], Victoria W. Reynolds, Pharm.D. Candidate[1], Leslie N. Smith, Pharm.D.[3], Grayson K. Peek, Pharm.D.[4], A. Shaun Rowe, Pharm.D., BCPS[1]; (1)Department of Clinical Pharmacy, University of Tennessee Health Science Center, College of Pharmacy, Knoxville, TN; (2)The University of Tennessee Health Science Center, College of Pharmacy, Knoxville, TN; (3)Department of Pharmacy, Methodist University Hospital, Memphis, TN; (4)Department of Pharmacy, Duke University Hospital, Durham, NC
PURPOSE: To determine what factors influence new antipsychotic medications on discharge, following an intensive care unit admission.
METHODS: This was an Institutional Review Board-approved retrospective cohort study conducted at the University of Tennessee Medical Center. Patients were eligible for inclusion if admitted between July 1, 2011, and June 30, 2012, to either the Neurocritical Care Care (NCC) or Trauma Surgical Critical Care (TSICU) units. While in the intensive care unit, eligible patients received any of the following medications: quetiapine, olanzapine, haloperidol, risperidone, or ziprasidone. Patients were excluded if they were <18 years old, died before hospital discharge, or did not have complete documentation for all study variables in the medical record.
RESULTS: During the study period, 2230 unique admissions were recorded. A total of 447 records met our inclusion criteria, with 341 records included in the final analysis. A total of 82 patients were discharged on new antipsychotic medications. As compared to patients not discharged on an antipsychotic, patients discharged on an antipsychotic had a higher risk of mortality on admission (APACHE II 10.5 ± 9 vs 16 ± 11; $p<0.05$ and GCS 14 ± 8 vs 9 ± 11; $p<0.05$), longer ICU length of stay (4 ± 11 vs 14 ± 14, $p<0.05$), longer hospital length of stay (13 ± 18 vs 24 ± 22; $p<0.05$), received more morphine equivalents (198.5 ± 1094.0 vs 1254 ± 4410.5; $p<0.05$), had more benzodiazepine treatment days (3 ± 11 vs 14 ± 12; $p<0.05$) and had a longer duration of mechanical ventilation (0 ± 7 vs 11 ± 21; $p<0.05$). However, based on a step-wise logistic regression, only APACHE II Score (OR 1.069, 95%CI 1.030–1.110; $p<0.05$) and total days treated with benzodiazepines (OR 1.101, 95%CI 1.060–1.143; $p<0.05$) were independent predicators for being discharged on a new antipsychotic medication.
CONCLUSIONS: Our study suggests that patients admitted with higher APACHE II scores and those with increased benzodiazepines treatment days have higher odds of being discharged on a new antipsychotic.

336. Descriptive analysis of prescriber acceptance of pharmacist recommended interventions in a critical care unit at a Community Hospital. *Timothy Egbuka, Doctor of Pharmacy Candidate 2015*, YoonJung Lee, Doctor of Pharmacy Candidate 2015, Jordan Carmack, Pharm.D., William Cusick, Pharm.D., Lana Gettman, Pharm.D.; Pharmacy Practice, Harding University College of Pharmacy, Searcy, AR
PURPOSE: This project assessed the physician acceptance rate of pharmacist-recommended interventions in the critical care unit (CCU) at White County Medical Center (WCMC), a community

hospital providing service to a six-county area in Arkansas, during the 5-year period following implementation of a new clinical pharmacist service.
METHODS: A retrospective chart review of pharmacist-recommended clinical interventions occurring between August 1, 2008 and December 31, 2013 was conducted. Interventions implemented by the physician within 72 hours of pharmacist's recommendation were defined as accepted. Interventions were categorized by type and a descriptive analysis of data was performed.
RESULTS: During the study period 1275 interventions were documented and categorized (i) drug selection (n = 290), (ii) over or underdose (n = 278), (iii) monitoring (n = 86), (iv) compliance (n = 166), (v) undertreated (n = 392), (vi) education (n = 19), (vii) not classifiable (n = 39), (viii) toxicity/adverse drug reactions (n = 5). Seventy-five percent of total interventions consisted of three most common types of documented interventions (undertreated, drug selection, over or underdose). Acceptance rates were: toxicity/adverse drug reactions (100%), education (95%), monitoring (67%), not classifiable (62%), drug selection (61%), undertreated (57%), over or underdose (52%), compliance (40%). From 2008 to 2013, the physician acceptance rates were 41%, 45%, 52%, 61%, 63%, and 71% respectively. The average acceptance rate over the study period was 56%.
CONCLUSION: Over the 5-year period, physician acceptance rate of pharmacist's recommendations increased. Building rapport with the CCU nursing director and nursing personnel at WCMC helped to promote implementation of the recommendations. Patient outcomes may be improved through clinical pharmacist interventions.

337. Association between vancomycin dosage and acute kidney injury, pharmacodynamic target attainment and clinical response in critically ill surgical patients. *Elizabeth Lakatos, Doctor of Pharmacy*, Christopher Droege, Doctor of Pharmacy, Neil Ernst, Doctor of Pharmacy, Jon Hicks, Doctor of Pharmacy, Eric Mueller, Doctor of Pharmacy; University of Cincinnati Medical Center
PURPOSE: Altered vancomycin pharmacokinetics observed in critically ill surgical patients require higher dosages to achieve goal serum concentrations. Although daily vancomycin doses >4 g have been associated with acute kidney injury (AKI), it remains unclear whether this cutoff is relevant in critically ill surgical patients.
METHODS: Single center, retrospective cohort study of critically ill surgical patients who received IV vancomycin for at least 48 hours and 3 doses between November 2012 and August 2013. Patients without preexisting chronic kidney disease or AKI were divided into two groups: ≤4 grams/day (LD) or >4 g/day (HD). The primary outcome was incidence of AKI (increase of serum creatinine by 0.5 mg/dL or 50%, whichever greater, on two consecutive measurements). Secondary endpoints included frequency of vancomycin trough 15–20 mg/L and clinical response (leukocyte count 4000–10,000 cells/mcL and temperature 36–38°C). Univariate analysis and multivariate logistic regression were used to evaluate variable influence on AKI occurrence.
RESULTS: One hundred-twenty courses from 82 patients (LD = 43, HD = 39) were included. Demographics and infection characteristics were similar except HD patients were younger (53.4 v. 42.8 years; p<0.001) and had lower baseline serum creatinine (0.85 v. 0.7 mg/dL; p=0.005). There was no difference in weight between groups (83.5 v. 85.2 kg; p=0.637). Total daily vancomycin dosage was higher in the HD group (2762.5 v. 5020.8 mg/d; p<0.001), as was weight-based dosage (35.4 v. 63.2 mg/kg/d; p<0.001). There was no statistical difference between LD and HD groups in AKI incidence (15% v. 13.3%; p=0.718), attainment of goal trough (45% v. 55%; p=0.361) or clinical response (30% v. 21.7%; p=0.404). No independent variables were associated with AKI development.
CONCLUSION: Some critically ill surgical patients require vancomycin dosages above 4 g/day to attain goal troughs. There was no association with vancomycin dosage above 4 g/day and AKI in this population.

338. Safety and efficacy of insulin glargine versus insulin infusions in hyperglycemic intensive care unit (ICU) patients. *Benjamin Pullinger, Pharm.D. Candidate*, Marissa Casagrande, Pharm.D. Candidate, Kristen Schmerbeck, Pharm.D. Candidate, Christina Rose, Pharm.D. BCPS; Temple University School of Pharmacy, Philadelphia, PA
PURPOSE: This pilot study compared the relative safety and efficacy of insulin glargine (IG) with insulin infusion (II) for the treatment of hyperglycemia in the critical care setting.
METHODS: A retrospective cohort study was conducted in adult ICU patients at a single academic center being treated with >48 hours of either IG or II, between January 2010 and February 2014. Primary outcomes were the median of each patient's average blood glucose (BG), incidence of hypoglycemia (BG <60 mg/dL), percentage of BG readings within target range (70–180 mg/dL), and glucose variability, defined as the mean standard deviation (SD) for each patient's BG readings.
RESULTS: Seventeen patients in the infusion group and 28 patients in the glargine group were included. The median patient BG average was higher in the IG group (169 vs 151 mg/dL). Similarly, the mean of all BG readings was higher in the IG group (166 ± 60 vs 153 ± 64 mg/dL, p<0.001). The mean SD of BG readings was similar between the IG and II groups (49 vs 56 mg/dL, p=0.32). BG readings in the II group were more frequently in the goal range of 70–180 mg/dL compared to the IG group (75% vs 63%, p<0.001). A larger proportion of patients in the II group experienced a hypoglycemic episode (29% vs 14%), but this was not statistically significant.
CONCLUSION: Insulin infusions appear to maintain BG in the goal range more frequently than insulin glargine. In addition, insulin infusions may maintain BG at a lower level on average, but do not appear to decrease BG variability. Insulin infusions are likely to cause more hypoglycemia than insulin glargine. Further research in a larger population is needed to determine the relative efficacy and safety of insulin glargine with respect to insulin infusions.

339. Characterization of delirium in a medical ICU that emphasizes frequent delirium screening at a tertiary, academic medical center. *Nicholas Farina, B.S.*[1], Kevin Ordons, B.S.[1], Rachel Filiaggi, B.S.[1], Melissa Shook, B.S.[1], Csevolak Marissa, B.S.[1], Sandra Kane-Gill, Pharm.D., MS, FCCM, FCCP[2], Pamela L. Smithburger, Pharm.D., BCPS[3], Ryan Rivosecchi, Pharm.D.[4]; (1)School of Pharmacy, University of Pittsburgh, Pittsburgh, PA; (2)University of Pittsburgh School of Pharmacy, Pittsburgh, PA; (3)University of Pittsburgh Medical Center, Pittsburgh, PA; (4)University of Pittsburgh Medical Center – Presbyterian Hospital, Pittsburgh, PA
PURPOSE: Delirium in the intensive care unit (ICU) is a syndrome that waxes and wanes throughout a patient's ICU stay. The purpose of this project was to characterize ICU-associated delirium using frequent screening in a medical ICU at a tertiary, academic medical center.
METHODS: This was a prospective observational evaluation conducted during a 3 month period. Every patient that was admitted to the medical ICU was evaluated for delirium as part of the standard of care using the Intensive Care Delirium Screening Checklist (ICDSC); they were to be scored every four hours. As part of this evaluation, after a patient's first positive delirium score (ICDSC≥4), each of his or her ICDSC scores were followed until death, discharge, or transfer.
RESULTS: Delirium occurred in 15.7% (36/230) of patients. After the initial delirious episode ended (ICDSC<4 or unobtainable), delirium recurred during the remaining ICU stay in 36% (13/36) of patients; the recurrence occurred within 24 hours in 36% (8/21) of recurrent episodes. With respect to median duration of delirium episode and average ICDSC score at time of delirium, initial and recurrent delirium episodes did not differ statistically. Subsyndromal delirium (ICDSC = 1–3) was present in the 24 hours immediately prior to 56% (32/57) of delirious episodes.

CONCLUSION: The rates of delirium in this study were lower than what is cited in literature, possibly because of our existing sedation and mobility protocols. Despite being a disease that waxes and wanes, less than half of patients experienced a recurrence of delirium following the initial episode. Our data suggests the presence of subsyndromal delirium prior to a delirious episode that could indicate a stepwise progression from subsyndromal to clinically significant delirium. In addition, patients with delirium were seen to be at risk for recurrence of delirium within 24 hours of resolution of a delirious episode.

Drug Information

340. Understanding of off-label drug use among pharmacy students. *Lendy Le, Pharm.D. Candidate*[1], Tonna Farinha, Pharm.D.[2], Micheline Goldwire, Pharm.D., M.Sc., B.S.[3]; (1)School Of Pharmacy, Regis University School of Pharmacy, Denver, CO; (2)Regis, Regis University School of Pharmacy, Denver, CO; (3) School of Pharmacy, Regis University, Denver, CO
PURPOSE: Off-label drug use (OLDU) is a commonly misunderstood topic. Recent actions from the US court system has brought into question pharmaceutical representative's right to free speech. OLDU is introduced in the P1 year in Pharmacy and HealthCare and is otherwise not specifically taught in any one course. The objective of this study is to determine what pharmacy students know about OLDU and their preference of database to research OLDU.
METHODS: To determine knowledge of OLDU, a 6-item survey consisting of five questions on OLDU and one question on database preference and was distributed to all pharmacy students, P1 through P4. Data were stratified by year in pharmacy school. Chi-square was used to test for significance between groups.
RESULTS: The survey was completed by 233 students (85%). Most students (87.6%) knew healthcare providers could prescribe medications off-label, p=0.174. Most, 71%, responded that drug companies could not promote off-label drug use, $\chi^2 = 12.68$, $df = 3$, p=0.005. Responses were significantly different between P1 and P2 classes, χ^2=8.67, p=0.034, and P2 and P3 classes, χ^2=12.5, p=0.006. When each class was asked if they understood the relationship between OLDU and insurance reimbursement, 63.5% strongly agreed or agreed, χ^2=13.155, $df = 3$, p=0.004. Responses were significantly different between P1 and P3 classes, χ^2=9.05, $df = 3$, p=0.029, and P2 and P3 classes, χ^2=9.30, $df = 3$, p=0.026. The most commonly used database was Micromedex (34%), followed by no preference (24%), Lexicomp (17%), and Facts & Comparisons (16%). Ninety percent of all students would like to learn more about OLDU.
CONCLUSION: Most students understand that healthcare providers can prescribe off-label. Fewer students understand OLDU and the role of the pharmaceutical representative as well as the relationship between insurance reimbursement. Understanding of OLDU differs between classes, which provides opportunity for more consistent method of teaching.

341. Biologics, the new face of modern medicine in the management of psoriasis. *Jiny Jimmy, B.S., Pharm.D. Candidate*[1], Ngoc-Anh Chau, Pharm.D. Candidate[1], Deandra Romero, B.S., Pharm.D. Candidate[1], Priya Toolsie, B.S., M.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: This study examined biologics via their use in the treatment of moderate to severe psoriasis in order to understand (i) this form of biopharmaceuticals, (ii) their mechanisms of actions, and (iii) the reasons for their selection over conventional drugs in autoimmune disease therapy management.
METHODS: Articles from the timeframe of 1995 to the present were selected and reviewed. These sources originated from Access Pharmacy, Access Medicine, the National Psoriasis Foundation online website, the National Institutes of Health, Embase, independent government sources, and the most recently published drug package inserts. Databases were utilized by implementing a search criterion of keywords, such as psoriasis, and biologics, with a limitation of English literature.
RESULTS: Psoriasis is a T-lymphocyte-mediated inflammatory disease of the skin characterized by chronic inflammation with symptoms that go into cycles of remission and exacerbation. Biologics are derived from living organisms, recombinant DNA, or controlled gene expression methods. Biologics reviewed that impact various severities of psoriasis include: alefacept, etanercept, infliximab, adalimumab, and ustekinumab.
CONCLUSION: Biologics' role in autoimmune diseases, such as psoriasis, is to target specific receptors in the affected immune system area, not by treating the symptoms as seen with other treatment options. This strategy results in fewer side effects, which is a key reason for their preferential use over conventional drugs. Biologics can be utilized effectively in therapies for psoriasis and should be individualized based on the severity of the disease, treatment response, and tolerability to drug interventions. The results of this literature review support the usage of biologics in the treatment of psoriasis.

Education/Training

342. Effect of part-time employment on academic performance while completing the Pharm.D. curriculum. *Jenna Andrzejewski, Pharm.D. Candidate*[1], Lindsey Zawierucha, Pharm.D. Candidate, Mary Wilkie, MBA, Pharm.D. Candidate[1], Stephanie Brian, Pharm.D., BCPS[1], Nicole Cieri, Pharm.D., BCPS[1]; (1)D'Youville College School of Pharmacy
PURPOSE: The objective of this study was to describe student perceptions of the impact employment on academic performance.
METHODS: This study was conducted at D'Youville College School of Pharmacy, a small private college in Buffalo, New York. Approval for this study was granted by the D'Youville College IRB. Data was collected from a survey in which students in the first three professional years of pharmacy school were asked to recall their GPA, the average number of hours worked weekly, and the type of employment setting (pharmacy and/or non-pharmacy). A five point Likert scale was used (1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree, 5 = strongly disagree) to determine students' concurrence with various statements regarding the impact of employment on academic performance.
RESULTS: Out of a possible of 209 students, a total of 198 surveys (95% response rate) were returned and 183 were analyzed (89%) due to lack of completeness. Of the surveys analyzed, 27% of students felt that employment at a pharmacy and/or non-pharmacy job impaired their ability to study effectively. Eighty four percent of students surveyed felt that employment at a pharmacy and/or non-pharmacy job reinforced concepts learned in school. A small percentage (15%) of students felt that the PharmD curriculum should be treated as a "full time commitment" and that part time employment should be discouraged. No direct correlation was found ($r = -0.03$) between GPA and hours worked in either a pharmacy or non-pharmacy related job.
CONCLUSIONS: There was no consensus among students regarding the relationship between number of hours worked and GPA. This data suggests there would be no benefit to either encouraging or discouraging students from maintaining employment during didactic schooling.

343. Evaluation of a pre-pharmacy student mentoring program at the University of Cincinnati James L. Winkle College of Pharmacy. *Caitlin M. Delabar, Pharm.D. Candidate 2016*, Tyler A. Vest, Pharm.D. Candidate 2016, Karissa Y. Kim, Pharm.D., CACP, BCPS; University of Cincinnati James L. Winkle College of Pharmacy, Cincinnati, OH
PURPOSE: The University of Cincinnati American College of Clinical Pharmacy Student Chapter developed a pre-pharmacy student mentoring program. Students from Miami University and University of Cincinnati participated in this program. The purpose of this study was to evaluate this mentoring program on (i)

pre-pharmacy students' knowledge of pharmacy and the admission process and (ii) on mentors' leadership development.
METHODS: Pre-pharmacy students who participated in this mentoring program were invited to complete a pre- and post-experience survey; mentors were invited to complete a separate post-experience evaluation. The survey questions addressed specific aspects and details regarding pharmacy school admissions and resources using a 5-point Likert scale.
RESULTS: Seventeen of 38 (45%) pre-pharmacy students and 9 of 30 (30%) mentors completed the survey. After participating in the program, pre-pharmacy students acquired a better understanding of the process of applying to pharmacy school (Mean ± SD; pre- 3.9 ± 0.8 vs post- 4.5 ± 0.5 [p value=0.0046]), the admissions process (Mean ± SD; pre- 3.8 ± 0.6 vs post- 4.5 ± 0.6 [p=0.0001]), the interview process (Mean ± SD; pre- 3.6 ± 0.7 vs post- 4.4 ± 0.7 [p=0.0001]), and obtained adequate resources to answer questions about applying or specific details about pharmacy school (Mean ± SD; pre- 3.9 ± 0.7 vs post- 4.2 ± 0.5 [p=0.0612]). Pre-pharmacy students felt more prepared to apply to pharmacy school after completing the program (Mean ± SD; 4.4 ± 0.6). Mentors felt they were able to share their knowledge and were comfortable answering questions.
CONCLUSIONS: A mentoring program developed by pharmacy students appears to be beneficial to both pre-pharmacy students and pharmacy student mentors. The program provided students with the resources and information that were desired before entrance into a college of pharmacy.

344. Evaluation of student pharmacists' participation in an interactive event to educate teens about substance abuse. *Hoyi V. Chan, Pharm.D. Candidate*[1], Helen C. Pervanas, Pharm.D.[2]; (1) MCPHS University, Manchester, NH; (2)Pharmacy Practice Department, MCPHS University, Manchester, NH
PURPOSE: Substance abuse is one of many challenges among teenagers. Student pharmacists can play an active role to increase awareness of substance abuse. An interactive event presented by student pharmacists at the Boys and Girls Club was done to raise awareness of prescription drug and alcohol abuse among teenagers.
METHODS: Student pharmacists enrolled in the accelerated Doctor of Pharmacy program at MCPHS University implemented an interactive event that involved the creation of a video recorded skit depicting a substance abuse scenario, a breakout discussion session, and the use of interactive learning materials. Following the event an anonymous, online 9 questions survey was sent to students electronically. The survey was used to assess the perceptions of student pharmacists with regards to effectiveness of the event and materials used, the engagement of teens and appropriate training prior to the event. This project was approved by the MCPHS University Institutional Review Board.
RESULTS: A total of 24 student pharmacists participated in the event and 54% completed the online survey. The majority of the students were female (69%) and were in their first year of the pharmacy program (54%). When asked whether this activity raised awareness of substance abuse among teens, 62% responded agreed or strongly agreed. With regards to the training session, 23% of the students strongly agreed that the session well prepared them for the event and 38% responded neutrally. Sixty-two percent of participants strongly agreed that teenagers were engaged in the breakout sessions.
CONCLUSION: Student pharmacists reported that the teens were engaged during the session and that they felt that the use of the skit and breakout sessions allowed the teens to be engaged and understand the message. For future events additional training may be required so that all student pharmacists are comfortable with the information.

345. The impact of a Student College of Clinical Pharmacy-led United States Pharmacopeia <797> review on technician knowledge of aseptic technique. *Elizabeth Legros, Pharm.D. Candidate*, Megan Elavsky, Pharm.D. Candidate, Brenda Hoang, Pharm.D. Candidate, Ulyana Telyeten, Pharm.D. Candidate, Aleta Smithbauer, Pharm.D. Candidate, Leah Dunnells, Pharm.D. Candidate, Mate Soric, Pharm.D., BCPS, Patrick J. Gallegos, Pharm.D., BCPS; Northeast Ohio Medical University, Rootstown, OH
PURPOSE: The purpose of our research was to measure the effects of a student lead USP <797 > review session to hospital pharmacy technicians.
METHODS: 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 pharmacy technicians at a local teaching hospital. A pre- and post-test were administered to assess growth 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 total questions. Three questions were used to gauge the technicians' baseline opinion of their understanding of USP <797>. The other seven questions asked about specific content from USP <797> and the presentation review. Topics reviewed included proper personal protective equipment, stability, sterility, and beyond-use-dating. The students targeted the importance of using aseptic procedure when compounding patient's products. The team included six students and two faculty advisors.
RESULTS: The review was given on six separate occasions to a total of 28 technicians (of the 50 full and part time 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 (Δ = 29.7%). These results were statistically significant (p-value<0.001).
CONCLUSION: SCCP's partnership with a teaching hospital's pharmacy proved successful in reiterating the importance of aseptic technique to pharmacy technicians. 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 care and safety of patients, with specific areas for improvement to be further evaluated.

346. Promoting clinical pharmacy: the past, present, and future of the student College of Clinical Pharmacy Organization at Northeast Ohio Medical University. *Dustin Carneal, Pharm.D. Candidate*, Elizabeth Legros, Pharm.D. Candidate, Patrick J. Gallegos, Pharm.D., BCPS; Northeast Ohio Medical University, Rootstown, OH
PURPOSE: A review of the past, present, and future accomplishments and development of a Student College of Clinical Pharmacy (SCCP) organization.
METHODS: Northeast Ohio Medical University (NEOMED) students established an SCCP organization in 2010. Our bylaws and mission were designed to correlate with that of the Ohio College of Clinical Pharmacy (OCCP) and the American College of Clinical Pharmacy (ACCP). Our mission and bylaws have been utilized as a template for other schools to develop their student organization. Supported by OCCP since inception and officially recognized by ACCP in 2013, we are in our fifth year and have continued to develop with the guidance of two clinical pharmacy faculty advisors. We have completed various international service projects, community outreach projects, research projects, poster presentations, one podium presentation, and an American Association of Colleges of Pharmacy grant application. During the 2013–2014 academic year, we raised $1395 in funds through the sale of our pocket reference cards, t-shirts, and participation in the college of pharmacy golf outing.
RESULTS: Student members have impacted the pharmacy profession at local, state, and national levels. Currently, we have seventy active members and over fifty graduated alumni. The NEOMED SCCP organization has promoted continued involvement in both the Ohio and American College of Clinical Pharmacy with 41 of our alumni completing residency upon graduation.
CONCLUSION: This student driven clinical pharmacy organization has become a pipeline for student advocacy, community out-

reach, research, education, and dedication to patient care. Through active involvement SCCP allows students to network and succeed through placement in residency programs and clinical pharmacy positions throughout the nation. Our organization helps students develop a passion for leadership and pharmacy. The role of the pharmacist will continue to evolve and the future of clinical pharmacy may be enhanced by the continuous growth of SCCP organizations.

347. Optimal sleep pattern for academic success among student pharmacists. Megan Zeek, Pharm.D. Candidate 2015, Matthew Savoie, Pharm.D. Candidate 2015, *Matthew Song, Pharm.D. Candidate 2015*[2], Leanna Kennemur, Pharm.D. Candidate 2015, JingJing Qian, Ph.D., Paul Jungnickel, Ph.D., RPh., Salisa Westrick, Ph.D.; (1)Harrison School of Pharmacy, Auburn University Harrison School of Pharmacy, Auburn, AL

PURPOSE: Poor sleep health is a problem among the U.S. population. Sleep is a proven factor impacting optimal mental functioning. Little is known about student pharmacists' sleep habits and its impact on their academic performance.

METHODS: A cross-sectional anonymous questionnaire was administered to first, second, and third year student pharmacists in February 2014. The questionnaire consisted of a demographic section, questions adapted from the Sleep and Daytime Habits Questionnaire (S&DHQ), questions assessing the forms and prevalence of sleep compensation and self-reported student grades.

RESULTS: A response rate of 94.5% was obtained from 385 surveys distributed. A majority of respondents obtain <7 hours of sleep at night during a typical school week (54.7%) and the night prior to exams (81.7%). Students earning A's in courses slept 30 minutes longer than those earning B's, 45 minutes longer than those earning C's, and 1 hour longer than those earning D's the night prior to exams ($p<0.01$). A greater proportion of those who slept more than 7 hours the night prior to exams had above a 3.0 GPA when compared to their counterparts ($p=0.01$). The most prevalent forms of sleep compensation are caffeinated coffee (45.6%) and soda (52.5%).

CONCLUSION: A majority of student pharmacists obtain suboptimal durations of sleep, defined by Healthy People 2020 as fewer than 7 hours. Sleep obtained the night prior to exams is correlated with student course grades and semester GPAs. Educating student pharmacists on optimal sleep habits could potentially impact their academic success.

348. Sustainability of an acute care pharmacy developed, intern-led tetanus, diphtheria, and acellular pertussis (Tdap) vaccination cocooning program. *Azhin Qadir, Pharm.D. Candidate 2015*[1], Chelsey Hess, Pharm.D. Candidate 2016[1], Kristi Bronkan, Pharm.D., BCPS, Katherine Shihadeh, Pharm.D., Tara Vlasimsky, Pharm.D.; (1)Acute Care Pharmacy, Denver Health Medical Center, Denver, CO

PURPOSE: In an effort to provide newborns protection from pertussis by vaccinating those in closest contact with the infant (i.e. cocooning), visitors on the Mom/Baby Unit at Denver Health Medical Center (DHMC) are offered Tdap vaccination by immunization certified pharmacy interns. Since program inception in October 2012, pharmacy interns have provided 393 vaccinations and 108 Tdap vaccine histories to visitors. This project describes the development and implementation of a standardized training program by lead pharmacy interns. The goal of this project is to make the provision of Tdap vaccinations to visitors an integral function of pharmacy intern core responsibilities to improve the health and well-being of patients and visitors.

METHODS: Lead pharmacy interns developed a standardized training program to ensure a smooth transition when passing this program to incoming pharmacy interns. The training program provides pharmacy interns with the resources and training needed to initiate and maintain the project. Through increased involvement of organizational leaders and the pharmacy intern team, the program has become incorporated into standard workflow during weekend shifts, thus minimizing the likelihood of eliminating the Tdap vaccination cocooning program.

RESULTS: Sustainability of this program is now possible due to the development of a training manual to foster the transition to new interns. The program underwent its first successful transfer to new interns in June 2014. The newly developed training manual proved useful in proficiently training newly immunization certified interns on delivery of the vaccination along with newly hired interns, trained in the utilization of the DHMC immunization information system and the Colorado Immunization Information System (CIIS). The new lead intern was also trained on strategies to manage and grow the program.

CONCLUSION: The standardization of the pharmacy intern-led Tdap immunization program has resulted in successful maintenance and growth through the efforts of lead pharmacy interns.

350. Measuring professionalism in third year pharmacy students before and after a professionalism workshop. *Stella Basalilov, Pharm.D. Candidate*[1], Dimpa Choksi, Pharm.D. Candidate[1], Charmi Shah, Pharm.D. Candidate[1], Shareen El-Ibiary, Pharm.D., FCCP, BCPS, Samantha Karr, Pharm.D., BCPS, BCACP, BC-ADM; (1)Midwestern University College of Pharmacy – Glendale, Glendale, AZ

PURPOSE: Professionalism among pharmacy students is difficult to assess and has been measured in various ways throughout the years. Currently, it is not clear how pharmacy students view professionalism, nor are there any current best practices to incorporate professionalism training for future pharmacists. Pharmacy organizations (ACCP, ASHP, APhA) have developed position statements and tenets of professionalism. The objective of this study is to determine pharmacy student views on professional behavior, to assess the effect of a professionalism workshop on student views of professionalism, and to characterize student perceptions of professionalism tenets. In addition, this research is being undertaken as a means to evaluate a toolkit for future preceptors to help promote professionalism among pharmacy students

METHODS: Inclusion criteria includes all third year pharmacy students in their final didactic quarter of study. Five scenarios focusing on common professionalism issues were developed and video recorded. An anonymous, 16-item survey (approved by our institution's IRB Committee) was administered to participants before and after attending a professionalism workshop and reviewing video scenarios. Participants were asked to provide responses regarding demographic data and tenets of professionalism based on both the written descriptions of scenarios (pre-workshop), recorded video scenarios (post-workshop), and also asked to identify individual professionalism tenets that were violated based on the ACCP Student Commentary, "Tenets of Professionalism for Pharmacy Students." Qualtrics® software will be used to analyze the data results

RESULTS: Data collection and analysis are still in progress and will be complete in September 2014.

CONCLUSION: Study conclusions will be made after final analysis of the data.

351. Evaluating survey results following a medication brown bag events targeting the geriatric patient population in Southern Nevada. *David Kim, Pharm.D. Candidate*[1], Danielle Chipchura, Pharm.D. Candidate[1], Christina Madison, Pharm.D., BCACP[2], Renee Holder, Pharm.D., BCPS[1]; (1)Roseman University of Health Sciences; (2)Roseman Unviersity of Health Sciences, Henderson, NV

PURPOSE: The American College of Clinical Pharmacy Student Network (ACCPSN) chapter at Roseman University of Health Sciences was established in August of 2007 and was recognized as a national chapter in October 2013 promoting clinical pharmacy and community engagement. ACCPSN provides medication review services via brown bag events for senior residences in Southern Nevada. During which, participants from the community bring their prescription, over the counter, and herbal medications to a student pharmacist under the direction of a licensed Nevada pharmacist to be reviewed for appropriateness, duplica-

tion, adverse reactions, and drug-drug interactions. These events provide a much needed community services in addition to the opportunity to survey participants regarding other health care concerns for future education and training.
METHODS: After each meeting a survey is given asking the patients what disease states they would like to have addressed in the future. Patients indicate all applicable disease states on a list with the option of writing in a topic not given.
RESULTS: From 2011 to 2014, 66 patient surveys were collected over 6 events, with a mean participant age of 76.5 years. Topics that patients most commonly indicated that they would like to discuss in the future included: high blood pressure (39.4%), high cholesterol (31.8%), and pain management (25.8%). Additional responses included problems sleeping (18.1%), over the counter cold medications (19.7%), diabetes (19.7%), and constipation (13.6%).
CONCLUSION: Through medication brown bag events hosted by Roseman's chapter of ACCPSN, topics such as high blood pressure, high cholesterol and pain management were found to be of the most common concerns of the geriatric population of Southern Nevada. This information points to the need to emphasize these topics in future events to improve overall patient outcomes and decrease health literacy issues in this at risk patient population.

Emergency Medicine

352. Efficacy and safety of intravenous procainamide for the treatment of recent-onset atrial fibrillation. *Nicolle Steel, Pharm.D. Candidate*, Stephen Rolfe, Pharm.D., BCPS; University of New England, College of Pharmacy, Portland, ME
PURPOSE: The purpose of this study was to determine the efficacy and safety of procainamide for the treatment of recent-onset atrial fibrillation in the emergency department (ED).
METHODS: Medical records of patients who received intravenous procainamide in the ED at Maine Medical Center between January 1, 2009 and February 28, 2014 were reviewed. Eligible patients were >18 years of age and presented to the ED with recent-onset atrial fibrillation, defined as clear symptom onset within 48 hours of presentation. Patients with a history of permanent atrial fibrillation were excluded. The primary outcome was the rate of successful conversion to normal sinus rhythm before discharge from the ED. The secondary outcome was the rate of adverse effects secondary to procainamide administration.
RESULTS: Forty-one patients were ordered procainamide during the study timeframe, of which 31 were included for analysis. The mean patient age was 56, 61% were male and 61% had a history of atrial fibrillation. The chief complaint was palpitations in 74% of patients with a median symptom onset of 2 hours. After administration of procainamide, 48% converted to a normal sinus rhythm with a median time to conversion of 62 minutes. The mean dose of procainamide was 983.9 mg. Of those who failed procainamide, 88% were successfully electrically cardioverted to a normal sinus rhythm. Hypotension (systolic blood pressure <90 mmHg) and ventricular tachycardia occurred in 6.5% of patients. No long-term complications occurred as a result of these adverse effects. The median ED length of stay was 5.14 hours with no significant differences between patients who responded to procainamide and those who required electrical cardioversion.
CONCLUSION: Procainamide is a reasonable option for the management of recent-onset atrial fibrillation in the ED. Larger studies are needed to further delineate the role of procainamide in this patient population.

353. Integration of pharmacy interns in the discharge counseling of intranasal naloxone rescue kits in the Emergency Department. *Stephen Shaw, Pharm.D. Candidate*[1], Keyvan Nekouei, Pharm.D. Candidate[1], Kevin Kaucher, Pharm.D.[2]; (1)Acute Care Pharmacy, Denver Health Medical Center, Denver, CO; (2)Department of Pharmacy and Emergency Medicine, Denver Health Medical Center, Denver, CO
PURPOSE: Due to the dramatic rise in opioid overdose related deaths, regulatory agencies and health systems have been positioning themselves in the campaign to impede the progression of this epidemic. We describe the integration of pharmacy interns in the Intranasal Naloxone for High Risk Opioid Users program at our institution. There is currently a lack of data regarding the role of pharmacy interns in the emergency department discharge process.
METHODS: From 16:00 to 23:00 on weekdays, pharmacy interns are utilized in the identification of high risk users and the education of patients on the proper use of intranasal naloxone rescue kits. Identification of high risk patients occurs by prospectively monitoring emergency department tracking boards along with being consulted by the patient care team. All consults are documented in the pharmacy intervention database. A quantitative description of how many consults have been provided and the time spent at each teaching session will be presented. Data collection has been ongoing since the institution began prescribing intranasal naloxone rescue kits in July 2013.
RESULTS: Data from the pharmacy intervention system will be queried to quantify the number of patients educated by pharmacy interns since program inception in July 2013. The median time spent along with interquartile ranges will also be reported. Additionally, the number of patients presenting for rescue kit refills following overdose will be presented. Data collection is ongoing.
CONCLUSION: Pharmacy interns are able to teach patients presenting to the emergency department with opioid overdose symptoms who are given prescriptions for intranasal naloxone rescue kits. The implementation of pharmacy interns in the education process allows the clinical pharmacists to focus on other matters in the department. Utilizing pharmacy interns in bedside education and discharge counseling programs is feasible and has resulted in lay person usage of naloxone rescue kits.

354. Evaluation of the management of hypertensive crises in the Emergency Department at Memorial Hermann-Texas Medical Center. *Lilian Ooi, Pharm.D. Candidate*, Heather Hartman, Pharm.D., BCPS; Department of Pharmacy, Memorial Hermann-Texas Medical Center, Houston, TX
PURPOSE: Per the Seventh Report of the Joint National Committee (JNC 7), prompt evaluation and appropriate treatment of patients with hypertensive crises are critical in preventing permanent end-organ dysfunction. The initial goal for hypertensive emergencies is to reduce mean arterial pressure (MAP) by 20% to 25% within the first hour of diagnosis, then if stable, to 160/100–110 mmHg within the next 2–6 hours. This study is to evaluate the management of hypertensive crises within the emergency department (ED).
METHODS: This is a single center, retrospective cohort, descriptive study evaluating the management of hypertensive crises (SB p>180 and/or DB p>120) in adult patients admitted to the ED at Memorial Hermann-Texas Medical Center. Approximately 250 patients will be evaluated from January 1, 2014 through April 30, 2014. The primary objective is to determine the time to achieve target blood pressure goals. The secondary objectives are to determine factors contributing to the time to achieve target blood pressure goals such as classes of medications initiated, route of administration, patient home medications, and end-organ symptoms. Additional outcomes to be assessed are the number of hypertensive episodes per patient after blood pressure goal had been met, time to initiation of oral medications, time to discontinuation of continuous infusion antihypertensives if applicable, length of stay in the emergency department, and patient disposition.
RESULTS: IRB approval pending. Anticipated completion of data collection is September 1, 2014.
CONCLUSION: Pending data collection.

Endocrinology

355. The impact of a pharmacy-initiated inpatient diabetes patient education program. *Sean Hackett, Pharm.D. Candidate*, Jangus B. Whitner, Pharm.D. Candidate, Megan Gregory, Pharm.D. Candidate, Anita T. Ridner, Pharm.D., Julie A. Murphy,

Pharm.D., BCPS, FASHP, FCCP; University of Toledo College of Pharmacy, Toledo, OH

PURPOSE: In 2011, the University HealthSystem Consortium reported a 17.3% readmission rate for patients with diabetes. At the University of Toledo Medical Center (UTMC) the rate was 25.7% during 2011. As a result, in October of 2012, a pharmacy-driven Inpatient Diabetes Patient Education (IDPE) program was implemented. The purpose of this study was to evaluate the efficacy of an IDPE program on 30-day hospital readmission rates.

METHODS: This retrospective chart review was approved by the UTMC Institutional Review Board. Patients admitted between October 1, 2012 and September 30, 2013 were included if they were 18 years of age or older and had one of the following: (i) diagnosis of diabetes (per ICD-9 code), (ii) blood glucose value >200 mg/dL on admission, or (iii) hemoglobin A1C of >6.5% measured during admission. Patients admitted for 24-hour observation were excluded. Data was collected for patients who received IDPE from a pharmacist or student pharmacist (intervention group) and for patients who did not receive IDPE (control group). The primary outcome was to determine the difference in 30-day hospital readmission rates for patients who received IPDE compared to those who did not receive the education.

RESULTS: Data collection for October 2012 through April 2013 is complete. Of the 297 intervention patients, 46 patients were re-admitted within 30 days of discharge (15.5%). Of the 76 control patients, 24 patients were readmitted within 30 days of discharge (31.6%).

CONCLUSION: May 2013 through September 2013 data collection will be completed and full results will be available October 2014.

Family Medicine

356. Estimated statin treatment changes in adopting ACC/AHA guidelines in an employer based primary care clinic. *Marisa B Schauerhamer, Pharm.D.*[1], Holly Gurgle, Pharm.D.,BCACP, CDE[2], Peter Weir, M.D., MPH[2], Carrie McAdam-Marx, RPh., M.S., Ph.D.[3]; (1)Pharmacotherapy Outcomes Research Center, University of Utah, Salt Lake City, UT; (2)ARUP Family Health Clinic, ARUP Laboratories, Salt Lake City, UT; (3)Department of Pharmacotherapy & Pharmacotherapy Outcomes Research Center, University of Utah College of Pharmacy, Salt Lake City, UT

PURPOSE: The 2013 American College of Cardiology/American Heart Association guidelines (ACC/AHA) for treatment of cholesterol focused on treating per statin benefit groups versus LDL goals as in the 2004 Adult Treatment Panel III guidelines (ATPIII). This study describes the difference between ATPIII and ACC/AHA statin recommendations in a high-risk population.

METHODS: Patient health screenings (PHS) conducted between January and November 2013 (prior to the release of ACC/AHA) at an employer-based primary care clinic included a lipid panel and health survey. Included patients were either treated with a cholesterol medicine at the time of their 2013 PHS, age 65 or older, LDL above ATPIII goal, or had self-reported ASCVD or CHD risk equivalent. An electronic medical record review identified statin use after the PHS, comparing actual use to both ATPIII and ACC/AHA recommendations.

RESULTS: Of 3938 patients completing a 2013 PHS, 555 were included, of which 113 (20%) were treated with a statin at the time of the PHS. Per ATPIII, 29 (26%) of these patients were candidates for treatment intensification, and ACC/AHA recommended treatment with high intensity statin for 43 (38%), moderate-high intensity for 11 (10%) and moderate intensity statin for 23 (20%). Amongst 442 (80%) not treated with a statin, ATPIII recommended starting a statin in 172 (39%) and ACC/AHA recommended starting a statin in 200 (45%). Overall, treatment was in agreement with both guidelines for 151 (27%) patients, while 126 (23%) patients were identified for statin change under ACC/AHA. However, ACC/AHA made no recommendation for 278 (50%) patients.

CONCLUSIONS: Statin treatment recommendations per ATPIII and ACC/AHA differed when applied to high-risk patients in an employer-based primary care clinic. Increased opportunities for clinical pharmacist involvement in lipid management will result from application of ACC/AHA to ensure adherence and review high-risk patients that are not addressed in the guidelines.

Geriatrics

357. Change in anticholinergic use over a ten-year period in community dwelling elders. *Maria Felton, B.S., Pharm.D. (Pending)*[1], Zachary A. Marcum, Pharm.D., BCPS[2], Subashan Perera, Ph.D.[3], Joseph Hanlon, Pharm.D., M.S.[4]; (1)School of Pharmacy, University of Pittsburgh, Pittsburgh, PA; (2)University of Pittsburgh, Pittsburgh, PA; (3)Division of Geriatrics, UPITT School of Medicine, Pittsburgh, PA; (4)Division of Geriatrics, UPITT School of Medicine, Pittsburgh, PA

PURPOSE: As far back as the 1980s, concern has been raised about the use of prescription anticholinergic medications (AC) in older adults. While these medications may be indicated for treating conditions such as allergic rhinitis, or Parkinson's disease, their benefit may be offset by their adverse drug events that include delirium, mydriasis, flushing, dry mouth, constipation and urinary retention. Few studies have examined the longitudinal use of AC medications. Given this background, the objective of this study was to examine the use of prescription anticholinergic medications in an elderly population over a 10-year period.

METHODS: This was a longitudinal study of 3055 older adults who were participants in the Health, Aging, and Body Composition study from 1997 to 2007. Medication information was collected in-person using a "brown bag" method. Exposure was defined as the use of prescription medications listed as highly anticholinergic in the 2012 American Geriatrics Society Beers criteria for drugs-to-avoid in the elderly.

RESULTS: In 1997 the sample whose age was between 70 and 79 years consisted of 41.4% blacks, 51.5% females. At this baseline visit, AC use was 10.3% and rose to 11.7% at year 5 and to 13.2% at year 10. As determined by the use of a Generalized Estimating Equation model, this increase was statistically significant ($p=0.04$). The most common class of medications used at baseline was antidepressants (e.g., amitriptyline, paroxetine, doxepin). At the two other followup visits, the most common medication class used was bladder antispasmodics (e.g., tolterodine, oxybutynin).

CONCLUSION: The use of prescription anticholinergic medications continues to rise despite their potential risks outweighing their potential benefits in older adults. Pharmacists should become more aware of this problem and intervene to reduce potentially inappropriate AC use in this age group.

358. Impact of the inclusion of creatinine clearance on antibiotic order forms in a long-term care facility. *Elizabeth Sagan, Pharm.D. Candidate*, Stephanie Ring, Pharm.D., Amber McLendon, Pharm.D.; College of Pharmacy and Health Sciences, Campbell University, Buies Creek, NC

PURPOSE: Decreasing kidney function is a common occurrence with advancing age, and many medications require dose adjustments based on renal function (serum creatinine or creatinine clearance [ClCr]). This presents a challenge when dosing antibiotics in elderly patients, as it is critical to clear infections while avoiding an increased risk of side effects. Additionally, prescribers may be unaware of ClCr when ordering antibiotics. The objective of this study was to compare the percentage of inappropriately dosed antibiotics before and after the inclusion of ClCr on prescriber order forms at a long-term care facility (LTCF).

METHODS: A retrospective chart review of residents who were prescribed antibiotics over a 10 month period from August 2013 through May 2014 was conducted. In December 2014, protocol at the facility changed to include pharmacist-calculated ClCr on all prescriber order forms. The percentage of incorrectly dosed antibiotics before the protocol change was compared to that after

initiation. A student's t-test was used to compare results before and after the inclusion of ClCr.
RESULTS: Residents were prescribed a total of 66 antibiotics over the 10 month period; seven (10.6%) were incorrectly dosed. One antibiotic (3.1%) was incorrectly dosed after the inclusion of creatinine clearance on the order forms, whereas 6 (17.6%) were dosed incorrectly prior to the protocol change. The inclusion of ClCr on physician order forms resulted in a significant reduction ($p<0.05$) of incorrect antibiotic doses.
CONCLUSION: Assessing renal function in the geriatric population before initiating antibiotics is critical. Calculation of creatinine clearance by pharmacists and placement on physician order forms improved the number of antibiotic renal dose adjustments by prescribers.

Health Services Research

359. Hospital readmission: review of the evolving role of the pharmacists. *Quyen Bach, B.S.N., Pharm.D. Candidate*[1], Samuel K. Peasah, Ph.D., MBA, RPh.[2]; (1)College of Pharmacy, Mercer University, Atlanta, GA; (2)Department of Pharmacy Practice, Mercer University College of Pharmacy, Atlanta, GA
PURPOSE: Hospital readmission continues to be an ongoing problem. Most of these readmissions are preventable and research seeks to evaluate interventions to reduce the rate. Medication reconciliation and counseling are some interventions identified as important factors. Pharmacists, therefore, are in a unique position to contribute to reducing avoidable readmissions. Our study reviewed the impact of pharmacists' interventions on hospital readmission rates.
METHODS: We searched PUBMED and Google Scholar from January 1990 to January 2014 using key words "hospital readmission rate", and "pharmacist", or "pharmacy", or "medications." We summarized only original articles on the type of intervention, methodology used, findings, population studied, and the country of origin of the study.
RESULTS: Of the 16 original articles, 10 (61%) were conducted in the United States, 2 (12%) in the United Kingdom, 2 (12%) in Australia, 1 (5%) in Sweden and 1 (5%) in Spain. Interventions identified included postdischarge medication reconciliation, combination of medication reconciliation and discharge patient counseling, transition of care, discharge patient counseling, interdisciplinary teams approach, and multi-intervention analysis. Population studied included at-risk patients, patients discharged to skilled-nursing facilities or long term residential care facility, all patients in a network, emergency department, or inpatients. Fourteen out of the 16 studies (87.5%) found a reduction in rate or fewer unplanned readmissions. One study showed an increase in readmission rate with pharmacists' involvement in postdischarge medication reconciliation (6%) while one study (6%) showed that pharmacists' intervention had no impact on subsequent emergency room visits. Eight out of 16 studies (50%) were prospective studies, six (38%) were randomized controlled trials or randomized controlled pilot studies, and two (12%) were retrospective studies.
CONCLUSION: Studies on pharmacists' interventions in reducing readmission rates are scanty; however, our findings suggest that pharmacists can play a key role in reducing readmission rates.

360. Evaluation of pharmacist-provided women's health education seminars in the underserved female population. *Sarah Nguyen, Pharm.D. Candidate*[1], Jennifer Kohn, Pharm.D. Candidate[1], Laura Tsu, Pharm.D., BCPS, CGP[2], Kelsey Buckley, Pharm.D., BCACP[3]; (1)Midwestern University College of Pharmacy-Glendale, Glendale, AZ; (2)Department of Pharmacy Practice, Midwestern University-College of Pharmacy, Glendale, AZ; (3) Department of Pharmacy Practice, Midwestern University College of Pharmacy-Glendale, Glendale, AZ
PURPOSE: This study measures the impact pharmacists have in providing women's health care to the underserved population. Our goals are to evaluate the effects of health education seminars on the health knowledge of women residing at UMOM-Watkins crisis center. Additionally, this studies the effects of the presentations on their decision to seek out pharmacists for education on different topics.
METHODS: This study's pre- and post- intervention surveys measure educational monthly seminars' outcomes between January 2014 and January 2015. Some health topics presented include: yeast/urinary tract infection, menopause, bone health, natural remedies, diabetes/foot care, and low-sodium diets. Unpaired pre- and post-surveys are excluded. The outcomes are measured by a shift in patients' knowledge on the health topics and willingness to utilize pharmacy services in the future. Surveys compare pre- and post-educational knowledge and perceptions based on a rating scale of 1 to 4, with 1 correlating to "strongly disagree" and 4 correlating to "strongly agree".
RESULTS: 26 surveys are completed as of June 5, 2014, where the average age surveyed is 47 years (23–63). 57.6% of women surveyed strongly agreed or agreed with being "knowledgeable" about the topic before the presentation, increasing to 96.2% post-intervention. 100% of patients strongly agreed or agreed to seek future advice from pharmacists on the presented topics. This demonstrates a 66.7% increase from those who sought pharmacist advice pre-intervention.
CONCLUSION: Our study demonstrates that pharmacists play a significant role in providing education and encouraging homeless women to increase pharmacist utilization for future healthcare advice. Increasing pharmacists' roles in the underserved population will provide additional resources for this high-risk population. Upon completion of the study, data collected will be reviewed to direct future research in health-related problems and improve services pharmacists can provide to this underserved female population. Further results are pending.

Hematology/Anticoagulation

361. Evaluating current recommended dose of enoxaparin in renally impaired and morbidly obese patients by monitoring anti-factor Xa levels. *Austin Ballew, B.S.*, Young Lee, Pharm.D., Jose Vega, Pharm.D., Hanh-Nhi Duong, Pharm.D.; Texas Tech University Health Science Center School of Pharmacy, Abilene, TX
PURPOSE: This study observes anti-factor Xa concentration trends in renal insufficient and morbidly obese patients by comparing peak steady state anti-factor Xa levels to target therapeutic, subtherapeutic, and supratherapeutic ranges in order to evaluate current dosing recommendations.
METHODS: Medical records of patients monitored for anti-factor Xa concentrations from April 2009 through January 2014 were evaluated using a reference range of 0.5–1.1 units/mL. Included patients were morbidly obese (BMI >40 kg/m2 or weight >150 kg) and/or renally impaired adults (CrCl <30 mL/minute) who received at least three treatment doses of enoxaparin. Patients that were pregnant, on hemodialysis, received modified enoxaparin doses, or had contraindications to enoxaparin were excluded. Patient's age, height, weight, BMI,, serum creatinine, calculated creatinine clearance, anti-factor Xa level, and bleeding events were recorded.[YL1] Fisher's exact test and Chi-square ($p=0.0183$) were performed for categorical data and ANOVA or Student's[JV2][JV3] t test for continuous data.
RESULTS: Enoxaparin therapy was monitored using anti-factor Xa levels in 243 patients. In the obesity group (n = 140), 40.7% of the patients were within therapeutic, 46.2% within supratherapeutic, and 13.1% within subtherapeutic ranges. In the renal dysfunction group (n = 103), 57.3% patients were within therapeutic, 15.5% within supratherapeutic, and 27.2% within subtherapeutic ranges. Two post-surgical patients with therapeutic anti-factor Xa concentrations experienced a bleeding event.
CONCLUSIONS: Elevated anti-factor Xa levels confirm the need for close monitoring of enoxaparin therapy in morbidly obese patients. Low anti-factor Xa levels found in patients with renal impairment suggests that the current recommended renally adjusted dose for enoxaparin therapy may not adequately treat

renally impaired patients. More studies looking at venous thromboembolism and bleeding events are needed to identify the appropriate dose of enoxaparin in these special populations and validate therapeutic anti-factor Xa ranges. [YL1]If word allows, add all data collection items. [JV2]I think S should be capitalized. [JV3R2]

362. Review of anticoagulant and antiplatelet therapy in an outpatient setting. *Kyle Carlisle, AA, Pharm.D. Candidate*[1], Katherine Vogel Anderson, Pharm.D., BCACP[2]; (1)Colleges of Pharmacy and Medicine, 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
PURPOSE: It is known that warfarin and antiplatelet combination therapy is reserved for specific indications. The primary objective of this study is to evaluate the appropriateness of anticoagulant and antiplatelet therapy use in an outpatient setting. Secondary objectives include determining time in therapeutic range (TTR) and clinical outcomes (hospitalization, bleeding, and thrombosis).
METHODS: A retrospective chart review was conducted. Eligible patients had a primary care assignment at the University of Florida Health Internal Medicine (UFHIM) Outpatient Clinic, were enrolled in the UFHIM pharmacist-managed anticoagulation clinic, and were prescribed warfarin between March 2013 and March 2014. The following data was collected: patient demographics, indication for anticoagulation therapy, comorbidities, medications (prescription and over-the-counter), hospitalizations, incidence of thromboembolic and/or bleeding events, and INR values. The Rosendaal method was used to calculate TTR. This study met criteria for approval by the UF Institutional Review Board.
RESULTS: 99 patients met study criteria. The average patient age was 62.65 years and the average number of comorbid conditions was 11.2 (with hypertension being the most common). 36 of 99 (36.36%) patients were concomitantly prescribed warfarin and an antiplatelet agent. Of these 36 patients, only 9 patients (25%) had a clear indication for combination therapy. There were 20 hospitalizations for a thromboembolic event and zero hospitalizations for bleeding. The TTR for all patients was 66.51%. TTR for patients on warfarin was 67.46%, while the TTR for patients on warfarin and antiplatelet combination therapy was 62.28%.
CONCLUSION: The results of this retrospective chart review indicate that aspirin is often prescribed with warfarin without a clear indication. There were zero hospitalizations for bleeding and 20 hospitalizations for thromboembolic events. The calculated TTR of 66.51% for all clinic patients indicates that anticoagulation management in the UFHIM pharmacist-managed anticoagulation clinic meets the Food and Drug Administration requirement for ÒskillfulÓ anticoagulation management.

363. Comparative analysis of major bleeding associated with the use of new oral anticoagulants as compared to warfarin at a critical access hospital. *Janelle Rychlick, MBA*; School of Pharmacy, Pacific University School of Pharmacy, Sherwood, OR
PURPOSE: For many years warfarin has been the mainstay of anticoagulation therapy, until the introduction of new oral anticoagulants onto the market. Patients often request the new oral anticoagulants due to the lack of INR monitoring needed, however, it is important to understand the safety and risk profile of these drugs. The primary objective is to determine the percentage of patients who were admitted to the hospital secondary to a major bleeding event associated with their anticoagulation therapy. Secondary objectives include analysis of the types of bleeding, evaluation of possible contributing factors to bleeding and to perform a cost-benefit analysis associated with bleeding admission.
METHODS: A retrospective analysis will be conducted on patients admitted from January 1, 2014 to June 30, 2014 with an International Classification of Disease Ninth Revision (ICD-9) code for a bleeding event. The electronic medical record system will be used to collect the following information: if the patient was receiving an anticoagulant (apixaban, dabigatran, rivaroxaban, or warfarin) prior to admission, anticoagulant dose at time of admission, hemorrhagic characteristics, demographics, pertinent laboratory values, concomitant antiplatelet medications, length of stay, patient outcomes, time to readmission, and the cost per admission or readmission. The study population will be divided into two groups: those who were taking a new oral anticoagulant, and those who were taking warfarin. Further clinical evaluation will be done for each group to determine the appropriateness of each patient's anticoagulation therapy.
RESULTS: To be completed August 2014.
CONCLUSION: To be completed August 2014.

HIV/AIDS

364. Effects of renal disease on medication errors in an HIV-infected population in the southeastern United States. *Hana Rac, Pharm.D. Candidate*[1], P. Brandon Bookstaver, Pharm.D., BCPS (AQ-ID), AAHIVP[2], Celeste Caulder, Pharm.D.; (1)South Carolina College of Pharmacy, SC; (2)Department of Clinical Pharmacy & Outcomes Sciences, South Carolina College of Pharmacy, University of South Carolina, Columbia, SC
PURPOSE: Chronic renal disease has been associated with higher rates of medication errors in HIV-infected patients. The purpose of this study is to determine how the severity of the renal disease impacts the prevalence of medication errors in this population.
METHODS: This IRB-approved, retrospective, single-center, non-interventional study evaluated HIV-infected patients 18 years of age or older enrolled at the USC Immunology Clinic between 2009 and 2014. Patients were included if they had a GFR <60 mL/minute as determined by the Cockcroft-Gault equation and were receiving at least one Nucleoside Reverse Transcriptase Inhibitor. Data were collected from electronic medical records, both outpatient and inpatient, and patients were followed for up to 2 years. The primary outcome investigated was the rate and type of medication errors based on degree of renal disease. Additional outcomes include risk factors for medication errors specifically investigating transitions of care, medication adherence, and virologic outcomes.
RESULTS: Data collection is ongoing.
CONCLUSION: This study will highlight the risk of medication errors in antiretroviral regimens in patients with varying degrees of renal disease.

365. *Moringa oleifera* in HIV/AIDS patients. *Zaritza Cajigas, 2015 Pharm.D. Candidate*[1], Angelica Borrero, Pharm.D. Candidate[2], Gladiany Ramos, Pharm.D. Candidate[2]; (1)School of Pharmacy, Nova Southeastern University Puerto Rico Campus, San Juan, PR; (2)School of Pharmacy, Nova Southeastern University Puerto Rico Campus, San Juan
PURPOSE: Patients with chronic conditions, including HIV/AIDS patients are attracted to the use of complementary and alternative medicine to feel control over their disease states as well as to manage side effects of prescription drugs. *Moringa oleifera* is a herbal supplement that has been used by HIV/AIDS patients for its attributes as an immune booster and for its antiretroviral activity. Although *Moringa oleifera* is popularly used as a supplement, little is known about its effect when used in conjunction with other drugs such as antiretroviral therapy (ART).
OBJECTIVE: To assess the impact of *Moringa oleifera*among HIV/AIDS patients.
METHODS: A literature search of published articles from 2002 to present was conducted to evaluate *Moringa oleifera*in HIV patients. Databases utilized were PubMed, Embase, Natural Medicine Comprehensive Database, Science Direct, and Natural Standard. Search keywords included: moringa oleifera, moringa and HIV, moringa and immunosupression, moringa and AIDS, moringa and antiretroviral therapy. Two in-vitro articles met the inclusion criteria.

RESULTS: Nworu et al. (2013) utilized a viral vector assay technique to assess antiretroviral activity of three different solvent extracts of *Moringa oleifera*. Results showed inhibitory activity of viral entry in the replication process by the different *Moringa oleifera* extracts. Monera et.al. (2008) investigated the effects of different *Moringa oleifera* extracts in the CYP3A4 metabolic activity through the 6β-hydroxylation of testosterone process. Based on their results *Moringa oleifera* extract showed CYP3A4 inhibitory activity.
CONCLUSION: The use of *Moringa oleifera* along antiretroviral therapy represents an increased risk of drug-herb interactions which could increase the risk of ADRs. This could compromise patient's adherence to therapy, increasing the risk of lower CD4 cell counts and increase viral load. Further studies assessing *Moringa oleifera* along antiretroviral therapy are necessary for a better understanding of the herbal-drug effect. The use of *Moringa oleifera* should not be recommended in patients with HIV/AIDS.

366. Incidence of antiretroviral prescribing errors among admitted patients. *Josh Beavers, Pharm.D. Candidate*[1], Lisa Blanchette, Pharm.D., BCPS[2], Rachel Justus, Pharm.D., BCPS[2]; (1)Wingate University School of Pharmacy, Winston-Salem, NC; (2) Department of Pharmacy, Novant Health Presbyterian Medical Center, Charlotte, NC
PURPOSE: The aim of this study was to determine the incidence of antiretroviral therapy (ART) prescribing errors for HIV positive patients admitted to a large community hospital. We sought to evaluate the existing pharmacy review process for ART and identify opportunities to further decrease errors related to inpatient continuation of home ART.
METHODS: Patients were identified retrospectively using the institution's electronic medical record. All adult patients with home or inpatient orders for antiretrovirals admitted to Novant Health Presbyterian Medical Center October 5, 2013 to April 1, 2014 were included. Only unique patient encounter were included. Patients were excluded if antiretroviral medications were for non-HIV indications. The primary endpoint was to assess to overall error rate in inpatient prescribing and continuation of home ART.
RESULTS: Of the 103 patients included in this study, 38 (37%) were identified as having prescribing errors. Analysis of those patients revealed an average of 1.8 errors per patient with the most common errors being wrong frequency/schedule (31%), over-dose (24%), and omission (19%). Targeted pharmacist review for ART prescribing errors occurred in 89% of the overall study population. In the 38 ART regimens identified as having a prescribing error, 92% had received targeted pharmacist review. All errors identified by a pharmacist through targeted review were followed up with a recommendation to the prescriber for correction of the error. Pharmacists recommendations related to ART prescribing errors had a 94% prescriber acceptance rate.
CONCLUSION: ART prescribing errors are common among admitted patients. Medication errors in ART regimens can significantly impact the efficacy and toxicity of these regimens. Our results show that pharmacists are well positioned to effectively identify and assist in correction of ART prescribing errors in the inpatient setting and the role of the pharmacist in this capacity should be expanded at our institution to reach a greater number of patients.

367. Pharmacist provided medication therapy management pilot program at a unique setting for a medically complex and aging human immunodeficiency virus positive population. *Charles Patrick Callahan, III, Pharm.D. Candidate*[1], Cheryl Abel, Pharm.D.[2], Cheryl R. Durand, Pharm.D.[3], Lillye Ramos-Spooner, B.S.[4], Linda Spooner, Pharm.D., BCPS[5]; (1)School of Pharmacy, MCPHS University – Worcester/Manchester, Manchester, NH; (2) Pharmacy Practice, Massachusetts College of Pharmacy and Health Sciences, Manchester, NH; (3)Massachusetts College of Pharmacy and Health Sciences, Manchester, NH; (4)Greater Manchester AIDS Project, Manchester, NH; (5)School of Pharmacy-Worcester/Manchester, Massachusetts College of Pharmacy and Health Sciences University, Worcester, MA
PURPOSE: The primary purpose was to determine the impact of pharmacist provided medication therapy management (MTM) services for medically complex, aging patients with HIV/AIDS at a relatively unique setting on quality of life (QOL). The secondary purpose was to assist the medical case managers at this setting in defining their protocol for medical home visits, a mandate from their funding organizations.
METHODS: Participants were eligible if they met the following criteria: taking ≥ 5 medications, having ≥ 1 diagnosed medical condition, having ≥ 1 medication prescriber. Patients who self-reported as non-adherent to therapy were excluded. Patients enrolled in this study met with a pharmacist and pharmacy intern twice during the study period for an MTM session and follow-up. Patients met with the pharmacy intern as needed throughout the study for additional support. Meetings were held at the Greater Manchester AIDS Project (GMAP), a social service agency that is highly accessible and familiar to participating patients. Pharmacy medication records were also obtained for each patient. The validated Medical Outcomes Study-HIV Health Survey (MOS-HIV) was used to assess general QOL endpoints. QOL was assessed at baseline (enrollment), 6 months (mid-point) and 11 months (study completion). Using statistical analysis of mean and, or median averages data on demographics, medication-related information and differences in QOL were assessed. The associated university granted IRB approval.
RESULTS: In progress, data analysis to be completed by 1 August, 2014.
CONCLUSIONS: In progress.

368. Evaluation of viral suppression in re-incarcerated HIV prisoners followed in a telemedicine clinic. *Jeffrey Neal, Pharm.D. Candidate*[1], Mahesh Patel, M.D.[2], Jeremy Young, M.D., MPH[2], Pyrai Vaughn, M.A.[2], Melissa E. Badowski, Pharm.D.; (1) Department of Pharmacy Practice, College of Pharmacy, University of Illinois at Chicago, Chicago, IL; (2)College of Medicine, University of Illinois at Chicago, Chicago, IL; (3) College of Pharmacy, University of Illinois at Chicago, Chicago, IL
PURPOSE: Approximately 1.25% incarcerated in the prison system are infected with HIV. While incarcerated, many initiate antiretroviral therapy (ART). Social and economic barriers to ART and adherence are minimized in the correctional setting due to a structured environment. However, data has shown that only 30% of HIV-positive prisoners fill their ART within 60 days of release. Additionally, it is unknown what percent of these individuals engage in follow-up medical care. Interruption of ART has been associated with drug resistance, morbidity, mortality, and transmission.
METHODS: This retrospective study evaluated HIV patients seen in a multidisciplinary subspecialty telemedicine clinic in the State of Illinois prior to release and upon re-incarceration from 7/10/10 until 3/1/14. Those included were >18 years old with CD4, and viral load data at release and upon re-incarceration. Our primary and secondary objectives were to compare viral load and CD4 count at release and re-incarceration as well as determine the number of patients who received follow-up medical care.
RESULTS: During our study period, 193 individuals met inclusion criteria. Our study population consisted of 84% males where 87% were Black with a mean age of 41 years. One hundred and sixty-nine re-incarcerated patients took ART and 73% achieved an undetectable viral load prior to release. One hundred and twenty-one patients engaged in follow-up care upon release where 51% had an undetectable viral load upon re-incarceration. There were 72 patients that did not engage in medical care post release. Of those, 49% had an undetectable viral load at re-incarceration. The mean CD4 at release for those receiving care in our telemedicine program was 513.0 + 254.8 and upon re-incarceration was 484.3 + 259.0.
CONCLUSION: Despite virologic suppression in the correctional setting through telemedicine, increased linkage and retention to medical care is needed for those being released from corrections.

369. The rise in polypharmacy and prescribed medications among persons living with HIV (PLWH). *Heather Moore, B.S., Pharm.D. Candidate*[1], Christine Oramasionwu, Pharm.D., Ph.D., BCPS[1], Lu Mao, M.S., Ph.D. Candidate[2]; (1)UNC Eshelman School of Pharmacy, University of North Carolina, Chapel Hill, NC; (2) UNC Gillings School of Global Public Health, University of North Carolina, Chapel Hill, NC

PURPOSE: Polypharmacy is defined as taking ≥5 concomitant medications. Potential concerns associated with polypharmacy include duplication of therapy, drug-drug interactions, and rising treatment-related costs. Persons living with HIV (PLWH) may be at increased risk for polypharmacy due to antiretroviral therapy (ARV) use, in addition to other medications. Our study objective was to determine the number of medications prescribed to PLWH in outpatient clinics across the United States.

METHODS: Cross-sectional data from 2006 to 2010 National Hospital Ambulatory Medical Care Survey (NHAMCS) were used to quantify the number of outpatient medications prescribed to PLWH. Visits were identified using HIV ICD9-CM codes 042, V08, and 079.53. Patients <18 years of age were excluded. Relevant demographics included sex, age, race/ethnicity, and insurance status, while comorbid conditions included hypertension, diabetes, and hyperlipidemia. Demographics were compared by age groups (18–29 years, 30–49 years, and ≥50 years) using chi-square tests.

RESULTS: ~7,361,000 weighted visits met study criteria (13% aged 18–29 years; 55% aged 30–49 years; 32% aged ≥50 years). The greatest proportions of males were noted in the older age groups (51%; 69%; 74%; $p<0.0001$), whereas the greatest proportions of black/African-Americans were noted in the younger age groups, however this was not statistically significant (64%; 49%; 48%; $p=0.2$). Comorbidities increased significantly as age increased ($p<0.01$ for all comparisons). The proportion of PLWH prescribed ≥5 medications increased across study years (33% in 2006, 61% in 2010). Conversely, the proportion of PLWH prescribed 0 medications decreased (14% in 2006, 8% in 2010). In age-stratified analysis, the burden of multiple prescribed medications was greatest in PLWH ≥50y of age.

CONCLUSION: Polypharmacy is a growing concern for PLWH, particularly among older patients. As the population of PLWH continues to age due to life-extending ARVs, further efforts are needed to manage age-associated comorbidities and to evaluate treatment regimens for appropriateness for these patients.

445. The prevalence of HIV testing in pregnant women. Emily Mantovani, B.S.[1], *Rebecca Webb, B.S.*[1], Elizabeth Price, B.S.[1], Michael Jiroutek, DrPH, M.S.[2], Melissa Johnson, Pharm.D., MHS, AAHIVP[2]; (1)College of Pharmacy & Health Sciences, Campbell University, Buies Creek, NC; (2)Department of Clinical Research, Campbell University, Buies Creek, NC

PURPOSE: This study assessed the rates of HIV testing in pregnant women in reference to the revised 2006 CDC recommendations to (i) determine if differences exist between the rates of pre-guideline HIV testing and the rates of post-guideline HIV testing, and (ii) identify potential barriers to routine HIV testing.

METHODS: Two datasets from the National Survey of Family Growth (NSFG) were utilized to compare survey responses of approximately 750 subjects from 2002 with approximately 1200 subjects from years 2006 to 2010. Subjects were female respondents that had completed a pregnancy within the last 12 months of participating in the NSFG survey. Subjects who did not provide a definitive response when asked if they had received HIV testing during prenatal care were excluded from data analysis, as well as those subjects reporting a date of conception after July 2006 or had pregnancies ending in induced abortion.

RESULTS: No significant difference existed between the proportions of pregnant women tested for HIV in 2002 versus 2006–2010. Preliminary data analysis suggest an increased likelihood for prenatal HIV testing in black women versus other races (OR = 1.78), women who did not complete high school versus those that completed 4 or more years of college (OR = 2.08), women on state or government funded health plans versus those covered by private insurance (OR = 2.59), and women below the poverty line versus those above (OR = 1.89). Final results are in progress.

CONCLUSIONS: The number of pregnant women undergoing prenatal HIV testing does not appear to be increasing despite the 2006 CDC recommendations for HIV testing to be incorporated into the routine battery of prenatal testing. This lack of improvement may be explained by further data analysis of demographics, socioeconomic characteristics, education, religion, sexual history, insurance type, and HIV risk behaviors.

Infectious Diseases

370. Vancomycin combined with clindamycin for the treatment of acute bacterial skin and skin structure infections. *Erin McCreary, Pharm.D. Candidate*[1], Kurt Wargo, Pharm.D.[2]; (1)Auburn University Harrison School of Pharmacy, AL; (2)Auburn University Harrrison School of Pharmacy, AL

PURPOSE: Acute bacterial skin and skin structure infections (ABSSI) are common infections that range from uncomplicated cellulitis and erysipelas to complicated infections such as abscesses. *Streptococcus pyogenes* and *Staphylococcus aureus* cause the majority of ABSSIs, with *S. aureus* more commonly seen in abscesses. Due to resistance, empiric therapy for the treatment of ABSSIs should include coverage of methicillin-resistant *S. aureus* (MRSA). While newer antibiotics are emerging to treat MRSA ABSSIs, vancomycin remains the cornerstone of therapy. Clindamycin is reserved until culture results demonstrate sensitivity, due to an inducible resistance that can occur. A lesser-known phenomenon called the *Eagle,* or *inoculum effect*, is one that suggests the combination of these two agents may result in faster infection resolution. This effect occurs in infections where bacterial growth has slowed and the organisms are no longer actively dividing; rather, they only produce toxins. Studies have examined this phenomenon and have found mixed results with respect to improved morbidity. Therefore, the purpose of this study is to evaluate the hospital length of stay (LOS) for patients treated for ABSSIS with either vancomycin monotherapy, or vancomycin combined with clindamycin.

METHODS: This is an IRB approved retrospective analysis of the records of patients admitted with ABSSIs between January 2010-December 2013 to an 881-bed tertiary care hospital in North Alabama. Patients <19 years of age, those who received <48 hours of antibiotic(s), or those with a diagnosis other than ABSSI will be excluded. Data collected upon inclusion into the study will comprise dosing and duration of the study drugs, hospital LOS, basic metabolic panel, organism(s) cultured, status of incision and debridement, and infection biomarkers.

RESULTS: Pending data collection and analysis.

CONCLUSIONS: Likely completed September 2014.

371. Modifying the risk factors associated with hospital-onset Clostridium difficile infections. *Olivia Adams, Pharm.D. Candidate*[1], Kurt Wargo, Pharm.D.[2]; (1)Auburn University Harrison School of Pharmacy, Hartselle, AL; (2)Auburn University Harrrison School of Pharmacy, AL

PURPOSE: Clostridium difficile infection (CDI) places a major burden on patients and healthcare expenditures. CDI is, in fact, the leading cause of infectious diarrhea in healthcare settings. Traditionally, CDI has been thought to be the result of prior exposure to antimicrobial therapy, due to alterations in the normal gastrointestinal flora. There are, however, other factors that can contribute to the development of CDI, including use of acid suppressing agents, and residence in a long-term care facility, to name a couple. At our institution, a recent increasing trend of hospital-onset CDI (HOCDI) has been observed. Therefore, in conjunction with Infection Control, the purpose of this study is to investigate risk factors associated with these cases, in an attempt to put into place measures that will help decrease this incidence.

METHODS: This is an institutional review board approved retrospective analysis of the medical records of patients diagnosed

with HOCDI, between January 2014 and June 2014, in an 881-bed tertiary care hospital in North Alabama. Patients <19 years of age and those who were diagnosed with CDI within 48 hours of admission will be excluded. Data collected upon inclusion into the study will include age, gender, race, metabolic panel, complete blood count, hospital length of stay, severity of CDI, risk factors for CDI, NAP1 positivity, treatment utilized, and readmissions within 90 days for CDI.
RESULTS: Pending data collection and analysis.
CONCLUSIONS: Pending data collection and analysis.

372. The role of Mdr1 in azole resistance in clinical isolates of Candida parapsilosis. *Kayihura Manigaba, B.S.*, Elizabeth Berkov, M.S., P. David Rogers, Pharm.D., Ph.D.; University of Tennessee College of Pharmacy, Memphis, TN
PURPOSE: *C. parapsilosis* is often reported as the 2nd most commonly isolated *Candida* species. It is known for persisting and spreading through hospitals by hand carriage and is the predominant fungal pathogen recovered from neonatal ICUs. The mechanisms by which *Candida* species develop resistance to antifungal drugs has been well studied in *C. albicans* but little is known surrounding such resistance mechanisms in *C. parapsilosis*. The aim of this study is to explore the role of the major facilitator efflux pump CpMdr1 in azole resistance in clinical isolates of *C. parapsilosis*.
METHODS: Thirty-nine clinical isolates were initially evaluated. Species identification was confirmed by growth on prepared CHROMagar *Candida* plates and fluconazole susceptibilities were performed by broth microdilution according to CLSI guidelines. Quantitative RT-PCR was performed to examine the expression levels of *CpMDR1* among isolates. The *SAT1*-flipper method was used to disrupt *CpMDR1* and *CpMRR1*in strains of interest, as well as for targeted allelic replacement. Sequence analysis of select genes was performed and compared to the published sequence from the Candida Genome Database.
RESULTS: Three isolates - 29, 30, and 36 - displayed an increase in *CpMDR1* expression of at least 20-fold and each exhibited an MIC of at least 64 μg/mL. These isolates were chosen for further evaluation. Disruption of *CpMDR1* in individual strains resulted in an increased susceptibility to fluconazole. Upon sequence analysis of the transcriptional regulator, *CpMRR1*, it was determined that each isolate contained an amino acid substitution in the predicted protein, as compared to the database strain.
CONCLUSION: As has been observed in *C. albicans*, overexpression of the major facilitator CpMdr1 contributes to fluconazole resistance in clinical isolates of *C. parapsilosis*. This study is the first to analyze the direct contribution of this mechanism to azole resistance in this emerging species of *Candida*.

373. Incidence of sternal wound infections and the implementation of a topical antibiotic paste protocol in cardiothoracic surgery patients. *Eric Betka, Pharm.D. Candidate*[1], Jennifer Lee, Pharm.D., BCPS[2], Julie A. Murphy, Pharm.D., BCPS, FASHP, FCCP[3], Vincent Mauro, Pharm.D., FCCP[3], Todd E. Gundrum, Pharm.D., BCPS[1], Jessica Pakulski, Pharm.D., BCPS[1], Mark Bonnell, M.D.[4]; (1)Department of Pharmacy Services, University of Toledo Medical Center, Toledo, OH; (2)St. Vincent Hospital, Worcester, MA; (3)University of Toledo College of Pharmacy, Toledo, OH; (4)Department of Cardiothoracic Surgery, University of Toledo Medical Center, Toledo, OH
PURPOSE: In June 2012, the University of Toledo Medical Center (UTMC) implemented a topical antibiotic paste protocol for use during cardiothoracic surgeries requiring median sternotomy. Patients receive a paste of 4 grams of vancomycin plus 4 grams of cefepime or 4 grams of vancomycin plus 4 grams of aztreonam. The purpose of this study was to evaluate the incidence of sternal wound infections, confirmed by symptomology and microbiological cultures, in cardiothoracic surgery patients requiring median sternotomy before and after the implementation of an antibiotic paste protocol.
METHODS: This retrospective chart review was approved by the UTMC Institutional Review Board. Data was collected for patients who underwent cardiothoracic surgery at UTMC from January 2011 to June 2012 (control group) and July 2012 to December 2013 (intervention group). Patients included were at least 18 years old and did not have a documented allergic reaction to vancomycin. The primary outcome was the number of patients diagnosed with a sternal wound infection post cardiothoracic surgery. Secondary outcomes included time to readmission and the time to the signs and symptoms of a sternal wound infection.
RESULTS: Control group data collection is complete. Intervention group data collection for July 2012 to June 2013 is complete. Of the 193 control patients, 10 patients developed a sternal wound infection (5.2%). Of the 137 intervention patients reviewed to date, four cases of sternal wound infection have been confirmed (2.9%). Time to readmission was 12.4 and 12 days for the control and intervention group, respectively. Time to signs and symptoms of a sternal wound infection was 21.1 and 23.3 days for the control and intervention group, respectively.
CONCLUSION: July 2013 to December 2013 data collection will be completed and full results will be available October 2014.

374. Inappropriate spectrum of empiric antibiotics in critically-ill patients with *Pseudomonas aeruginosa* infections. *Philip Leong, Pharm.D. Candidate*[1], Jacob Beyer, Doctor of Pharmacy[2], Scott W. Mueller, Pharm.D.[3]; (1)School of Pharmacy, Skaggs School of Pharmacy and Pharmaceutical Sciences, University of Colorado Anschutz Medical Campus, Aurora, CO; (2)University of Colorado Hospital, Denver, CO; (3)University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences, Aurora, CO
PURPOSE: A recent unpublished retrospective cohort study found that 18 out of 87 intensive care unit (ICU) patients with *Pseudomonas aeruginosa* (PSA) or *Acinetobacter*(ACI) infections received an empiric antimicrobial regimen without an anti-pseudomonal agent. This follow-up evaluation assessed the unacknowledged risk factors for multidrug resistant (MDR) pathogens or PSA in these 18 patients.
METHODS: Electronic health records of patients from a single center admitted to an ICU between September 2011 and February 2013 with positive cultures for PSA or ACI who did not receive an appropriate empiric spectrum of antibacterials within 24 hours of culture were reviewed. The primary outcome was the frequency of patients with at least one major risk factor for MDR bacterial or PSA infections. These risk factors included recent antimicrobial use, mechanical ventilation, extended stay at a healthcare facility, and immunosuppressive therapy.
RESULTS: The most common site of infection was respiratory 9 (50%) followed by urinary 5 (28%). Of the 18 patients, 15 (83%) had at least one major risk factor for MDR infections, while 13 (72%) were found to have at least two major risk factors. The most frequently occurring risk factors among these patients were current hospital stay of 5 days or more and invasive mechanical ventilation. Two patients suffered fatal complications during hospitalization.
CONCLUSION: Unaddressed risk factors for MDR pathogens including PSA led to the selection of an inappropriate empiric spectrum of antimicrobials in the majority of the patients in this cohort. Continuing education and empiric antibiotic selection pathways may improve empiric regimen selection. Further, methods identifying pathogens such as PSA in real time may improve empiric antibiotic selection.

375. Health disparities by race among hospitalized adults with *Clostridium difficile* infections in the United States, 2001–2010. *Jacqueline Argamany, Pharm.D. Student*[1], Kelly Reveles, Pharm.D. Ph.D.[2]; (1)College of Pharmacy, The University of Texas at Austin, San Antonio, TX; (2)College of Pharmacy, The University of Texas at Austin, TX
PURPOSE: *Clostridium difficile* infection (CDI) incidence is increasing in U.S. hospitals. Recognition of health disparities in CDI can lead to more targeted resource utilization and improved

patient health. This study identified health disparities by race among hospitalized adults with CDI over a 10-year period.
METHODS: This was a retrospective analysis of the U.S. National Hospital Discharge Surveys from 2001 to 2010. Eligible cases included adults ≥18 years old with an ICD-9-CM code for CDI (008.45). Patients with missing race or "other race" were excluded. The primary outcome, CDI incidence, was calculated as CDI discharges per 1000 total discharges. Data weights were used to determine national estimates. Secondary outcomes included: in-hospital mortality, hospital length of stay (LOS), and severe CDI. Severe CDI was defined as any occurrence of sepsis, shock, acute renal failure, megacolon, ileus, perforated intestine, or colectomy. Demographics and outcomes were compared by race using bivariable analyses. Race was assessed as an independent risk factor for CDI outcomes using a multivariable logistic regression model.
RESULTS: These data depict 1.7 million CDI discharges, where 89.6% of patients were white and 10.4% were black. Blacks significantly differed from whites with respect to age, sex, geographic region, hospital size and ownership, principal payment source, and admission type and source ($p<0.0001$ for all). CDI incidence was significantly higher in whites (7.7/1000 discharges) compared to blacks (4.9/1000 discharges). Blacks had greater mortality (7.4% vs 7.2%, $p<0.0001$), LOS >7 days (57% vs 52%, $p<0.0001$), and severe CDI (24% vs 19%, $p<0.0001$). In multivariable analyses, black race was an independent risk factor for mortality (OR 1.06, 95% CI 1.03–1.09), LOS >7 days (OR 1.26, 95% CI 1.24–1.28), and severe CDI (OR 1.08, 95% CI 1.07–1.09).
CONCLUSION: CDI incidence in U.S. hospitals was higher for white patients; however, black race was an independent risk factor for worse health outcomes.

376. Clinical efficacy of linezolid in the treatment of urinary tract infections caused by vancomycin-resistant enterococci species: a retrospective study. *Rebecca Kim, Pharm.D. Candidate Class of 2015*[1], Pouria Khan, Pharm.D. Candidate Class of 2015[2], Farzad Hatanian, Pharm.D. Candidate Class of 2015[1], Diane Rhee, Pharm.D.[1]; (1)Roseman University of Health Sciences; (2)College of Pharmacy, Roseman University of Health Sciences, Henderson, NV
PURPOSE: Linezolid is as effective as comparator antibiotics in achieving clinical cure in urinary tract infections caused by vancomycin-resistant enterococci (VRE). Enterococcus faecalis and faecium are both involved in nosocomial infections of which urinary tract infections (UTI) are common. Enterococci species are developing resistance, particularly to vancomycin, known as vancomycin-resistant enterococci. The acquisition of this resistance has affected UTI treatment. Newer antibiotics such as linezolid with activity against VRE have addressed this issue in therapy, however, majority of linezolid undergoes non-renal clearance and it is unclear whether 30% renal clearance is adequate for clinical cure for UTI. Our primary outcome is to determine if linezolid is equally efficacious to that of comparator antibiotics in treating VRE urinary tract infections thereby resulting in a clinical cure.
METHODS: Retrospective data collection conducted from January 1, 2009–December 30, 2012. Antibiotic use was reviewed at 4 Valley Health Systems Hospitals. Patients identified with VRE in urine cultures were reviewed and those treated with linezolid and comparator antibiotics (daptomycin, nitrofurantoin, ampicillin) were included. Inclusion criteria included, age ≥ 18 years old, urinalysis WBC >5, diagnosed with a UTI and no other sources of infection identified. Exclusion criteria were, urinalysis WBC <5, vancomycin- sensitive enterococci and other concurrent infections. Clinical cure rates of UTI in patients treated with linezolid versus comparator antibiotics will be performed. Continuous variables will be reported as means and standard deviations and categorical variables will be reported as percentages. Continuous variables will be compared using t-tests, and categorical variables using Fisher's exact test. A two-tailed $p \leq 0.05$ will be considered significant.
RESULTS: Anticipated completion: August 1, 2014.
CONCLUSION: Anticipated completion: August 1, 2014.

377. Literature review for aerosolized antimicrobials in the management of multi-drug resistant gram-negative hospital-acquired pneumonia. *Lena Romaya, B.S.*, Diana Park, B.A., Sukhjit Kang, B.S., Fatima M. Ali, Pharm.D., BCPS; College of Pharmacy, Roosevelt University, Schaumburg, IL
PURPOSE: Aerosolized antimicrobials such as amikacin, aztreonam, colistin, gentamicin, and tobramycin may have a beneficial role in the management of multi-drug resistant (MDR) hospital-acquired pneumonia (HAP). Aerosolized therapy may have decreased incidence of systemic toxicity while providing adequate concentrations directly to the site of infection. This review compiled the current literature to evaluate the safety and efficacy of aerosolized antimicrobials for the management of MDR gram-negative HAP.
METHODS: PubMed searches through 6/5/14 utilizing MeSH terms and keywords were performed. The searches generated 720 results of which fourteen are included in this literature review. The remaining 706 were excluded for the following reasons: indications other than HAP, commentary, administration, review, animal and/or pediatrics.
RESULTS: All fourteen studies evaluated aerosolized antimicrobials as adjunctive therapy but two also evaluated as monotherapy. Clinical outcomes evaluated included: clinical cure/success in fourteen studies, microbiological cure/success and safety in nine, and resistance in one study. Seven of fourteen reported p-values, five of these showed statistical significance for clinical cure/success. Only two of nine studies achieved statistical significance for microbiological cure/success. Of the nine that evaluated safety, six assessed respiratory function and only one reported an increased incidence of bronchoconstriction. The study that evaluated resistance reported a decreased incidence for developing resistance with aerosolized therapy.
CONCLUSIONS: Per IDSA guidelines, the current management of HAP indicates that aerosolized antimicrobials may be utilized as adjunctive last-line therapy for MDR gram-negative HAP in patients not responding to systemic therapy alone. This literature review also suggests that aerosolized antimicrobials may have a beneficial effect in the management of HAP. The results regarding improvement in mortality, length of stay, ventilator days, eradication of the pathogen and resistance are inconclusive due to study design limitations. Randomized clinical trials are needed to establish whether aerosolized antimicrobials are beneficial in the treatment of MDR gram-negative HAP.

378. Declining incidence of diabetic foot infections among hospitalized adults in the U.S. from 1996 to 2010 Encore. Bryson Duhon, Pharm.D., Elizabeth Hand, Pharm.D., *Crystal Howell,*, Kelly Reveles, Pharm.D., Ph.D.; College of Pharmacy, The University of Texas at Austin, TX
PURPOSE: Diabetic foot infections (DFI) represent a significant clinical and economic concern in the United States (U.S.). The prevalence of diabetes has increased over the past two decades; however, the national incidence of DFI in the U.S. is unknown. We sought to determine national trends in DFI among hospitalized adults in the U.S. over a 15-year period.
METHODS: This was a retrospective study of the U.S. National Hospital Discharge Surveys (NHDS) from 1996 to 2010. Patient eligibility included: (i) age ≥18 years, (ii) principal discharge diagnosis of foot infection (gangrene, osteomyelitis, cellulitis/abscess of the foot, cellulitis/abscess of the toe, paronychia), and (iii) secondary diagnosis of diabetes. Diagnoses were identified by ICD-9-CM codes. Incidence was defined as DFI per 100 diabetes discharges. Lower extremity amputations (LEA), in-hospital mortality, and hospital length of stay (LOS) were presented descriptively. Independent risk factors for DFI were identified using multivariable logistic regression.
RESULTS: These data represent 1,059,552 DFI discharges over the study period. Patients had a median (IQR) age of 67 (56–76) years, and were predominately male (58%) and white (75%). The incidence of DFI decreased from 1996 (2.3 DFI/100 diabetes discharges) to 2010 (1.1 DFI/100 diabetes discharges), driven by an increase in diabetes discharges. Overall, 21.6% of DFI resulted in

LEA. The proportion of patients experiencing LEA declined from 33.2% in 1996 to 17.1% in 2010. All-cause, in-hospital mortality was 1.1% and patients were hospitalized a median (IQR) of 5 (3–9) days. Peripheral vascular disease (OR 2.89; 95% CI 2.87–2.91), peripheral neuropathy (OR 2.62; 95% CI 2.60–2.64), and male sex (OR 1.67; 95% CI 1.66–1.68) were the leading independent risk factors for DFI among diabetics.
CONCLUSION: The incidence of DFI among hospitalized adults in the U.S. declined by more than half from 1996 to 2010.

379. Ceftaroline and daptomycin combinations demonstrates synergistic and bactericidal activity against methicillin-resistant Staphylococcus aureus (MRSA) from a patient who failed daptomycin. *Iffat Shafiq, Pharm.D. Candidate*[1], Kari Mergenhagen, Pharm.D.[2], Sarah Spitznogle, Pharm.D. Candidate[1], Zackery Bulman, Pharm.D. Candidate[1], John Diep, Pharm.D. Candidate[1], Alan Lesse, M.D.[2], Brian T. Tsuji, Pharm.D.[1]; (1) University at Buffalo School of Pharmacy and Pharmaceutical Sciences, Buffalo, NY; (2)VA Western New York Healthcare System, Buffalo, NY
PURPOSE: There is an urgent need to develop optimal therapeutic options in patients with MRSA bacteremia who have failed conventional therapy. We evaluated the pharmacodynamic activity of ceftaroline and daptomycin combinations against a clinical MRSA isolate from a patient who failed daptomycin therapy.MethodsThe clinical isolate was obtained from a 68 year old male allergic to vancomycin with septic shock due to persistent MRSA bacteremia and displayed daptomycin non-susceptibility. Monotherapy and combinations of ceftaroline (fC_{max} = 15.2 mg/L) and daptomycin (fC_{max} = 11.3 mg/L) were evaluated versus 10^8 CFU/mL. Bacterial killing was measured at 0, 1, 2, 4, 6, 8, 24, 28, 32, and 48 hours. Population analysis profiles (PAPs) were performed using daptomycin plates at 0.5, 1, 2, 4, 6, 8, and 16.0 mg/L. Pharmacodynamics were compared using area under the CFU curve ($AUCCFU_{0–48}$).
RESULTS: Ceftaroline monotherapy therapy achieved 1.96 and 3.22 $\log_{10}$ reduction from baseline at 8 and 48 hours, respectively. Daptomycin monotherapy achieved an initial $\log_{10}$ reduction of 3.27 at 8 hours with complete regrowth by 24 hours. However, the combination of daptomycin with ceftaroline resulted in marked synergistic and bactericidal activity with $\log_{10}$ reduction from baseline of 4.69 and 6.41 at 4 and 8 hours, respectively, with complete eradication (>8 $\log_{10}$ reduction) after 32 hours which was sustained until 48 hours. Compared to the most active agent, the combination displayed marked synergistic $\log_{10}$ reductions of 1.5 at 2 hours, 4.45 at 8 hours, 3.84 at 24 hours, and 5.9 at 48 hours. The pharmacodynamics using the log ratio $AUCCFU_{0–48}$ for ceftaroline was −1.82, daptomycin was −0.35, while the combination demonstrated significantly greater killing at −2.38. PAPs revealed a heteroresistant daptomycin profile with daptomycin non-susceptible subpopulations growing on daptomycin plates up to 8.0 mg/L.
CONCLUSION: Daptomycin and ceftaroline combinations may be promising in patients with persistent MRSA bacteremia when conventional therapy is not an option.

380. Polymyxin combinations to combat polymyxin resistant KPC-producing *Klebsiella pneumoniae*. *John Diep, Pharm.D. Candidate*[1], Cely S. Abboud, M.D.[2], Brenda Yu, Pharm.D. Candidate[1], David Jacobs, Pharm.D.[1], Patricia N. Holden, B.S.[1], Alan Forrest, Pharm.D.[1], Brian T. Tsuji, Pharm.D.[1], Gauri Rao, Pharm.D.[1]; (1)University at Buffalo School of Pharmacy and Pharmaceutical Sciences, Buffalo, NY; (2)Infection Control Department, Instituto Dante Pazzanese de Cardiologia, Sao Paulo, Brazil
PURPOSE: The emergence of *Klebsiella pneumoniae* carbapenemase (KPC)-producing *K. pneumoniae* resistant to the last line of defense, agents like polymyxins, demands the optimization of combinations. We assessed the activity of polymyxin B (PB) and meropenem (MER) alone and in combination against PB-resistant KPC-producing *K. pneumoniae*.
METHODS: The clinical isolate was obtained from a hospital in São Paulo (BRKP33). Time kill experiments evaluated the activity of PB (1, 2, 4, 8, 16, 128 mg/L) and MER (15, 30, 60, 120 mg/L) alone and in combination versus BRKP33 (MIC_{PB}: 128 mg/L, MIC_{MER}: 8 mg/L) at 10^6 and 10^8colony forming units (CFU/mL). Bacterial counts were determined at 0, 1, 2, 4, 6, 8, 24, 28, 32, and 48 hours. Log reduction in CFU/mL compared to growth control (GC) was used to characterize pharmacodynamic effect.
RESULTS: Low inoculum: PB monotherapy performed similar to GC, while PB128 revealed a 4.63 $\log_{10}$ reduction by 8 hours followed by regrowth. MER monotherapy resulted in >3 $\log_{10}$ reduction by 4 hours followed by regrowth beyond 8 hours except for MER120 that demonstrated 99.9% sustained killing activity beyond 4 hours. MER15 and MER60 in combination with PB1,2,4, and 16 demonstrated bactericidal activity by 4 hours, whereas MER120 in combination with PB1,2,4, and 16 resulted in >3 $\log_{10}$reduction sustained up to 8 hours. All combinations regrew similar to GC by 24 hours. High inoculum: PB monotherapy resulted in ~1 $\log_{10}$ reduction by 8 hours followed by complete regrowth. MER monotherapy with 15,30,60, and 120 resulted in 0.161, 0.249, 0.435 and 2.97 $\log_{10}$ reduction followed by regrowth beyond 4 hours. MER15,60, and 120 in combination with PB2 and MER120 with PB16 revealed $\log_{10}$reductions of 0.45, 1.32, 1.72, and 1.88 respectively by 4 hours followed by regrowth.
CONCLUSION: Although polymyxin combinations demonstrated early bactericidal activity against the low inoculum, they could not sustain this trend demonstrating marked regrowth by 48 hours. Given the lack of new viable agents, combination therapy with novel agents should be explored against such resistant strains.

381. Evaluation of infectious diseases pharmacists' interventions for patients receiving outpatient parenteral antimicrobial therapy after discharge from a large teaching hospital. *Aaron Devanathan, Pharm.D. Candidate 2016*[1], Kathleen Sheridan, DO[2], Ryan Shields, Pharm.D., M.S.[2], Bonnie Falcione, Pharm.D., BCPS (AQ-ID)[3]; (1)University of Pittsburgh School of Pharmacy, Pittsburgh, PA; (2)UPMC Presbyterian Hospital, University of Pittsburgh School of Medicine, Pittsburgh, PA; (3)UPMC Presbyterian Hospital, University of Pittsburgh School of Pharmacy, University of Pittsburgh School of Medicine, Pittsburgh, PA
PURPOSE: Patients who are treated for infections as inpatients may require being discharged on intravenous (IV) antimicrobial therapy (outpatient parenteral antimicrobial therapy, OPAT). OPAT programs often involve a team including infectious diseases (ID) physicians, nurses, pharmacists, and home infusion companies. Guidelines for OPAT and monitoring have been published. The objective of this project is to evaluate a new pharmacist monitoring program within an existing ID clinic's OPAT program to identify areas of improvement that could ultimately improve patient outcomes.
METHODS: This study is a retrospective evaluation of documented ID pharmacists' interventions and related electronic health records (discharge summaries, notes, office visits) for ID OPAT clinic patients discharged from a large, tertiary academic medical center between December 1, 2013 and May 31, 2014. Patient demographics, including age, gender, and indication for OPAT will be recorded. Additionally, IV antimicrobial regimen information pre, during and post OPAT (drug, dose, frequency, lab/test monitoring, duration, drug levels) will also be collected. Patient setting for OPAT (home, nursing home), follow-up and 30-day readmission will also be determined. This project has been submitted for approval by our institution's Quality Improvement committee.
RESULTS: Analysis of the data will include attainment of therapeutic drug concentrations, progress notes and pharmacist interventions to patient ratios, and time lapsed until pharmacist lab review. Data collection and analysis will be completed by the time of the presentation by the student.

CONCLUSION: Data collection and analysis are pending at the time of submission deadline, however the importance of pharmacist involvement in an OPAT program has been documented in the literature; opportunities for improvement warrant evaluation.

382. Antifungal therapeutic drug monitoring in hematopoietic stem cell transplant patients: real world comparison of the time to therapeutic levels of posaconazole and voriconazole. *Sarah S. Kim, Pharm.D. Candidate*, Stacey Chung, Pharm.D. Candidate, Lovitta Jiwanmall, Pharm.D. Candidate, Connor Luczak, Pharm.D. Candidate, Peggy Carver, Pharm.D.; College of Pharmacy, University of Michigan, Ann Arbor, MI

PURPOSE: Performing antifungal therapeutic drug monitoring (TDM), while controversial, may increase the probability of successful outcomes and prevent drug-related toxicity.[1] Data comparing the Time to Therapeutic Levels (TTL) of posaconazole (POSA) and voriconazole (VORI) in "real world" settings in HSCT patients are lacking. Guidelines at our institution recommend obtaining the first (preferably trough) level of VORI or POSA at the end of the first week of therapy, with follow-up levels performed 1–2 times monthly. Goal levels for prophylaxis are 0.5–5.5 μg/mL for VORI and 500–1500 ng/mL for POSA.

METHODS: This retrospective cohort study evaluated patients administered prophylactic POSA (n = 103) or VORI (n = 138) while undergoing HSCT January 2008 - December 2013. We hypothesize that TTLs for VORI > POSA, due to the greater variability of VORI pharmacokinetics. Our primary outcome was the TTL for POSA or VORI; secondary outcomes evaluated adherence to guidelines, including the number of patients in whom levels were obtained, or who developed an invasive fungal infection. Upon completion of data analysis for VORI, the TTLs of POSA and VORI will be compared by a two-tailed students' t-test.

RESULTS:

	POSA	VORI
Number of patients evaluated	103	138
# (%) of patients with ≥1 levels	24 (23.3)	98 (71.0)
Duration of therapy in days (range)	17 (1–219)	19 (2–198)
In patients in whom a level was obtained		
# (%) of patients achieving a therapeutic level	16 (66.7)	87 (88.8)
Median TTL in days (range)	15 (3–219)	TBD
Frequency of levels (days)	6.1	10.2

CONCLUSIONS: At completion of the study, we expect that TTLs for VORI > POSA in patients undergoing HSCT. Further investigation of POSA and VORI TTLs may help optimize antifungal therapy in HSCT patients. References: 1. Ashbee HR, et al. Therapeutic drug monitoring (TDM) of antifungal agents: guidelines from the British Society for Medical Mycology. J Antimicrob. Chemother. 2014;69(5):1162–76.

383. Antibiotic polytherapy against multidrug-resistant, *Klebsiella pneumoniae* carbapenemase (KPC)-producing Enterobacteriaceae infections: case series and systematic review. *Heeyoung Byun, Pharm.D. Candidate*[1], Cely S. Abboud, M.D.[2], John Diep, Pharm.D. Candidate[1], Brenda Yu, Pharm.D. Candidate[1], Gauri G. Rao, Pharm.D.[1], David M. Jacobs, Pharm.D.[1]; (1)University at Buffalo School of Pharmacy and Pharmaceutical Sciences, Buffalo, NY; (2)Infection Control Department, Instituto Dante Pazzanese de Cardiologia, Sao Paulo, Brazil

PURPOSE: Multidrug resistant Gram-negative (MRGN) bacteria, especially KPC-producing, are becoming increasingly prevalent. Our objective was to review the clinical outcomes of patients with KPC infections and perform a systematic review to assess polytherapy (≥3 antibiotics) against resistant bacteria.

METHODS: The clinical course of twelve patients from a hospital in Brazil on polytherapy for KPC-producing infections were reviewed and compared with published literature. A comprehensive literature search was conducted using PubMed. Search terms included "triple antibiotic combination", "*K. pneumoniae* carbapenemase", "multidrug resistant Gram-negative", and "polymyxin-resistant." Article reference lists were reviewed. Review articles, studies with <3 concurrent antibiotics, *in vitro* studies, and literature omitting outcomes were excluded. Descriptive analysis was performed to assess the outcomes of antibiotic polytherapy.

RESULTS: All 12 patients were admitted for cardiac surgery and developed post-operative infections including mediastinitis (6/12) and deep sternal wounds (5/12). *Enterobacter* spp. was isolated from all patients, which tested positive for bla_{KPC-2}. Ten (83%) patients were infected by polymyxin resistant (MIC, ≥4 μg/mL) strains and all strains were resistant to meropenem (MIC, ≥16 μg/mL). For targeted therapy, 5 (42%) patients were treated with triple coverage and 7 (58%) were prescribed four or more antibiotics. The average length of treatment was 27 ± 15 days with a 60 day mortality of 33%. The search methodology identified 63 articles; following all exclusions, 12 articles were included (75 patients). KPC-producing *K. pneumoniae* was the most common offending pathogen. Seventy (93%) patients were treated with 3-drug and 5 (7%) with 4-drug therapy, and polymyxin was the backbone of all combinations. Overall, 77% of patients achieved clinical success with a mortality rate of 19%.

CONCLUSION: The recent upsurge in clinically challenging MRGN infections has led to the increased utilization of polytherapy. Hence, future studies investigating the optimization of combination therapy with multiple antibiotics is necessary for ensuring clinical success.

384. Evaluation of a vancomycin dosing protocol in adult patients in a multicenter, community hospital setting. *Brian Fox, Pharm.D. Candidate 2015*, Lisa Costanigro, Pharm.D., BCPS; Poudre Valley Hospital, University of Colorado Health System – North, Fort Collins, CO

PURPOSE: An updated pharmacy vancomycin dosing protocol was implemented in January 2010 at two community hospitals in northern Colorado, Poudre Valley Hospital (PVH) and Medical Center of the Rockies (MCR), based off of the latest vancomycin guidelines from the Infectious Diseases Society of America. This study evaluates the protocol to determine if patients: received optimal initial vancomycin dosing regimens, attained therapeutic levels (10–20 mg/L), maintained therapeutic levels throughout treatment, and determine the average number of levels drawn per patient.

METHODS: This was a retrospective review of patients with a pharmacy consult to dose vancomycin. All adult patients from April 2010 to October 2010 with a vancomycin level were included. Patients with poor renal function, rapidly changing renal function, or who received renal replacement therapy were dosed following a random dosing strategy, and were analyzed separately.

RESULTS: A total of 214 patients were reviewed. The average loading dose was 24 ± 3.0 mg/kg and maintenance dose was 16.9 ± 2.9 mg/kg. A trough level was measured in 85 patients and 48% (n = 56) at PVH and 52% (n = 29) at MCR were therapeutic. For those who had a second trough drawn, 14% (n = 7) remained therapeutic. The average first random level was 19.5 ± 10.6 mg/L and was drawn 16.5 ± 11.9 hours after receiving vancomycin. A total of 372 vancomycin levels were drawn, which is equivalent to 1.7 levels drawn per patient.

CONCLUSION: Overall, implementation of a new vancomycin pharmacy protocol resulted in optimal doses with approximately 50% of patients initially reaching therapeutic troughs. Results were consistent between both hospitals.

385. Increasing patient influenza vaccination rates in a County Health Department Tuberculosis Clinic. *Danielle Chipchura, Pharm.D. Candidate*[1], Melissa Smith, Pharm.D. Candidate[1], Nightingale Meyou, Pharm.D. Candidate[1], Elliott Asarch, Pharm.D. Candidate[1], Christina M. Madison, Pharm.D., BCACP,

AAHIVP[2]; (1)Roseman University of Health Sciences; (2) Roseman Unviersity of Health Sciences, Henderson, NV
PURPOSE: Vaccination rates in Nevada have been improving steadily over the past 5 years. Despite improvements, significant health disparities still exist in certain at risk patient populations. Tuberculosis patients have risk factors such as: homelessness, incarceration, HIV infection, diabetes, and substance abuse, which are associated with non-compliance. It is imperative that health care providers emphasize the importance of administering the influenza vaccine in this population to prevent respiratory exacerbations and decrease complications associated with tuberculosis disease. The objective of this study is to determine the factors that assist with increasing the influenza vaccination rate of tuberculosis patients in a county public health department.
METHODS: This study is a retrospective, observational study that will examine patient health records at the Southern Nevada Health District from 2009 to 2013. The influenza vaccination rate will be examined in tuberculosis patients and compared to the non-tuberculosis patients. Patient demographic information will be recorded to further examine if these factors contributed to a higher rate of influenza vaccination.
RESULTS: We hypothesize that the influenza vaccination rate of tuberculosis patients to be less than the rate of non-tuberculosis patients in Nevada. We anticipate that the rate will be 10% less than the influenza vaccination rate in the general population based on the number of patients hospitalized for a respiratory illness during flu season while being treated for tuberculosis. Data collection is currently ongoing, but IRB approval is in process to allow chart review.
CONCLUSION: Based on the final results, the hypothesis that the vaccination rate of tuberculosis patients will be less than the rate of non-tuberculosis patients in Nevada will either be accepted or rejected. These results will help pinpoint factors that contribute to influenza vaccination rates in tuberculosis patients and can be utilized by health care providers to identify at risk patients.

386. Infusion-related reactions secondary to polymyxin B in pediatric cystic fibrosis patients: a retrospective case series. *Michelle Pasciolla, Pharm.D. Candidate*[1], Kristin Bunt, Pharm.D. Candidate[1], Julie Ann Justo, Pharm.D, MS, BCPS, AAHIVP[1], Rob Daniels, Pharm.D.[2], Shadi Al-Jureidini, Pharm.D.[2], P. Brandon Bookstaver, Pharm.D., BCPS (AQ-ID), AAHIVP[3]; (1)South Carolina College of Pharmacy, University of South Carolina, Columbia, SC; (2)Palmetto Health Hospital – Richland Campus, Columbia, SC; (3)Department of Clinical Pharmacy & Outcomes Sciences, South Carolina College of Pharmacy, University of South Carolina, Columbia, SC
PURPOSE: Based on a favorable pharmacokinetic and toxicity profile, our institution changed protocol use of polymyxin products from colistimethate sodium (CMS) to polymyxin B (PB). We describe a series of infusion-related reactions occurring after intravenous (IV) PB administration in pediatric patients admitted for cystic fibrosis exacerbations, following the protocol change.
METHODS: Cases were identified by the pediatric antimicrobial stewardship pharmacist. Data were collected through retrospective chart review.ResultsThree patients receiving IV PB administration were identified, all reporting infusion-related reactions. Case 1: 17-year old boy was initiated on piperacillin/tazobactam and PB 595,000 units (15,000 units/kg) IV q12h over 1 hour. On first dose he experienced pain with tingling at the infusion site, tongue, and extremities. PB was discontinued and diphenhydramine administered. CMS 100 mg colistin base activity (CBA) (2.5 mg/kg) IV q8h was initiated. The symptoms resolved without recurrence. Case 2: 10-year old girl was initiated on meropenem, vancomycin and PB 400,000 units (15,000 units/kg) IV q12h over 1 hour. On the initial infusion, she reported a stinging sensation at the infusion site and tongue. PB was discontinued and CMS 60 mg CBA (2.5 mg/kg) IV q8h plus inhaled CMS was initiated. No infusion reaction was seen while on CMS. Due to nephrotoxicity with CMS, she was rechallenged with IV PB. Thirty minutes after the start of the PB infusion, she began to shake and smack her lips with tongue thrusts. The infusion was stopped and symptoms resolved. Case 3: 12-year old boy started on sulfamethoxazole/trimethoprim, piperacillin/tazobactam and PB 500,000 units (15,000 units/kg) IV q12h over 1 hour. After the second dose of PB, he reported perioral paresthesias. All antibiotics were discontinued and symptoms resolved.
CONCLUSION: Pediatric patients may be at risk of infusion-related toxicity secondary to IV PB. These findings should be considered in polymyxin formulary selection.

Medication Safety

387. Pharmacists' active interventions as a means to identify medication misadventure in pediatrics. *Hesty Ramadaniati, M.Clin.Pharm*, Ya Lee, Ph.D., Jeff Hughes, Ph.D.; School of Pharmacy, Curtin Health Innovation Research Institute, Curtin University, Perth, Australia
PURPOSE: This study retrospectively analyzed the documentation of pharmacists' active interventions in order to (i) determine the reliability of researchers' and independent panelists' judgement regarding identification, classification and outcome severity of medication misadventure detected through pharmacists' interventions, and (ii) determine the pattern and the severity of medication error
METHODS: The researchers and three independent panelists assessed randomly selected pharmacists' active interventions. The reviewers identified the presence of medication misadventures and classified them by type (adverse drug events/ADEs, adverse drug reactions/ADRs, medication errors/MEs). Medication errors were then classified by type and rated for their severity using the National Coordinating Council on Medication Error Reporting and Prevention index. Inter-rater reliabilities were calculated using the kappa statistics (κ) statistics. As the consensus cannot be reached, the researchers' assessment was used as the final rating.
RESULTS: Agreement between all reviewers regarding the presence of medication misadventure was "fair ($\kappa = 0.302$) and "slight" ($\kappa = 0.115$) for the type of the misadventure. "Moderate" agreement ($\kappa = 0.477$) was noted when classifying the type of medication error, but "slight" for the error severity ($\kappa = 0.044$). Based on the researchers' consensus, approximately three quarters of the selected samples (33/43) of pharmacists' active interventions addressed medication misadventures, with around 91% of the misadventure involving MEs and the remaining ADRs. Overall the most common type of medication errors were related to inappropriate doses. Approximately 39% of medication errors were corrected before they could harm the patient, whilst more than 60% of the non-intercepted errors resulted in either additional monitoring or temporary patient harm.
CONCLUSION: This study showed the clear role clinical pharmacists play in reducing medication misadventure in the pediatric setting, particularly through identifying and resolving medication errors.

388. Assessment of vincristine safe preparation and administration in Riyadh hospitals. *Mariyam Alfagih, Pharmacy Student*[1], Razan AlGhunaim, Pharmacy student[1], Nahla Alageel, M.Sc.[2], Nagwa Ibrahim, Pharm.D.[3]; (1)King Saud University, Riyadh, Saudi Arabia; (2)Clinical pharmacy department, King Saud University, Riyadh, Saudi Arabia; (3)Prince sultan military medical city, Riyadh, Saudi Arabia
PURPOSE: To evaluate the current practice of safe preparation and administration of vincristine in Riyadh hospitals through (i) Assessment of nurses, pharmacists and pharmacy technicians awareness about the safe administration and preparation of IV vincristine (ii) Identifying the current policies and procedures practiced in hospitals to prevent accidental intrathecal administration of vincristine. (iii) Comparing the current local practice to the international recommendations for safe vincristine administration and preparation .
METHODS: We designed a descriptive survey to be distributed to pharmacists, pharmacy technicians and nurses working in hos-

pitals where chemotherapy is provided in Riyadh city. A descriptive analysis using SPSS Program will be conducted to calculate the Percentage of respondents and the adoption of each of the survey items.
RESULTS: The project is not finished yet. It will be finished before October 2014 (before the date of presentation)
CONCLUSION: N/A.

389. Barriers to effective medication reconciliation: pharmacists' perspective in Riyadh hospitals, Saudi Arabia. *Waad Alghamdi, Pharm.D. Candidate*[1], Hana Alalshaykh, Pharm.D. Candidate[1], Weaam Aljassim, RPh., MHI In charge, Pharmacy Informatics, Ghada Bawazeer, M.Sc., Pharm.D, BCPS; (1)King Saud University
PURPOSE: The purpose of this study is to identify barriers to effective implementation of Medication Reconciliation to help decision makers in Saudi Arabia in developing a strategic planning for effective Medication Reconciliation process. Medication Reconciliation is defined by the joint commission as" the process of comparing medications a patient is taking (and should be taking) with newly ordered medications".
METHODS: Using Q-methodology, we aim to measure pharmacists' subjectivity toward barriers of effective Medication Reconciliation. The method will be carried out first by defining the concourse, which is a collection of opinions that are related to Medication Reconciliation. The concourse statements will be gathered from the literature and through brainstorming session. These statements will then be given to pharmacists from different hospitals in Riyadh area to sort from mostly agree to mostly disagree. Analysis will be carried out using PCQ; software specifically developed for Q-Methodology.
RESULTS: n/a. This is an ongoing research; the final results will not be available for presentation at the annual meeting October 2014.
CONCLUSION: Results of this study will help decision makers in strategic planning for redesigning the workflow and improve medication reconciliation process.

Nephrology

390. Analysis of drug related problems and evaluation of clinical pharmacist's intervention on chronic kidney disease patients. *Seung Hee Han, B.S.*, Ga Hyeon Lee, M.S., Na Young Han, M.S., Jung Mi Oh, Pharm.D.; Clinical Pharmacy, College of Pharmacy, Seoul National University, Seoul, South Korea
PURPOSE: Patients with chronic kidney disease (CKD) which is characterized many complications and comorbidities have a high risk of drug-related problems (DRPs), so the identification and solution of DRPs are the core processes of pharmaceutical care for these patients. Although several studies analyzed impacts of clinical pharmacist's role in CKD patients, there are no studies that analyze the characteristics of DRPs in CKD patients. Therefore, this study aims to analyze of drug related interventions (DRIs) on DRPs which were detected by clinical pharmacists, divided into CKD-complications and comorbidities, and evaluate the significance of DRIs in CKD.
METHODS: In the division of nephrology at Seoul National University Hospital, clinical pharmacists have participated in multidisciplinary team care service and documented DRIs prospectively using PCNE (Pharmaceutical Care Network Europe) classification system from January 2009 to December 2012. We collected the DRIs related to CKD-complications and comorbid diseases and analyzed the cause categories combined with problem categories according to PCNE classification. The clinical significance of the intervention was assessed using the scale proposed by Overhage.
RESULTS: Total 3908 DRIs were performed, and the number of DRIs per patient was 0.95. In both of the CKD-complications and comorbidities, the most common type of problems in DRPs were treatment effectiveness, adverse reactions, and treatment costs in order of prevalence, and the most common cause was drug selection. DRIs for CKD-complications and comorbidities were most part in CKD-mineral bone disorder (28.0%). "Very significant" DRIs were more likely to be accepted than "somewhat significant", or "significant" DRIs. There was statistically significant difference in significance of DRIs between CKD-complication and comorbidities ($p<0.001$).
CONCLUSION: We characterized the clinically significance of DRIs in each CKD-complication and co-morbidities and it may be based of the development of pharmacists' evidence-based DRI service protocols and guidelines in CKD patients.

Neurology

391. Assessing the incidence of inappropriate medication use in hospitalized patients with Parkinson's disease. *Nicholas Cox, Pharm.D. Candidate*[1], Jessica Louie, Pharm.D.[1], Rishi Deka, Ph.D. Candidate, M.Sc.[2], Rodolfo Savica, M.D., M.S.[3], Benson Sederholm, Pharm.D., BCPS[1]; (1)Department of Pharmacy Services, University of Utah Hospitals and Clinics, Salt Lake City, UT; (2)Department of Pharmacotherapy, University of Utah, Salt Lake City, UT; (3)Department of Neurology, University of Utah Hospitals and Clinics, Salt Lake City, UT
PURPOSE: This study assessed the rate at which potentially inappropriate medications were ordered for patients with Parkinson's disease (PD) at an academic medical center in order to assess the association between inappropriate medication use and patient duration of stay. Secondary objectives included collecting baseline data for future comparisons in order to optimize technological alert systems designed to minimize inappropriate medication use.
METHODS: A retrospective review was used to identify all adult patients with ICD-9 codes for PD from 2010 to 2013. Patients were screened for any administrations of potentially inappropriate medications (metoclopramide, promethazine, prochlorperazine, droperidol, chlorpromazine, clozapine, cyclizine, chlorpheniramine, haloperidol, perphenazine, fluphenazine, thioridazine, thiothixene, trifluoperazine, loxapine, pimozide, risperidone, paliperidone, olanzapine, ziprasidone, aripiprazole, lurasidone, asenapine, iloperidone, lithium, valproate, meperidine) and potentially appropriate medications used for comparison (quetiapine, trimethobenzamide).
RESULTS: There were 1736 patients who met inclusion criteria with 175 documented administrations of potentially inappropriate medications to 77 patients. Patients who received potentially inappropriate medications had a longer mean duration of stay than the baseline population of PD patients (3.25 days vs 1.91 days, $p<0.001$). No statistically significant difference in mean duration of stay was found between patients who received potentially inappropriate anti-psychotics compared to patients who received quetiapine (7.00 days vs 6.20 days, $p=0.867$), nor between patients who received potentially inappropriate antiemetics compared to patients who received trimethobenzamide (2.60 days vs 2.11 days, $p=0.237$).
CONCLUSION: Despite recommendations to avoid certain medications in patients with PD, a substantial number of administrations still occurred. The use of these medications can have clinical implications and our findings demonstrate increased duration of stay. The findings from this study will assist in developing technological alerts to reduce inappropriate prescribing. Larger studies are warranted to further investigate the administration of inappropriate medications in hospitalized patients with PD.

Nutrition

392. Prevention of bile acid-induced apoptosis with omega-3 long-chain polyunsaturated fatty acids in a cholestatic liver disease model. *Timothy J. Howze, Pharm.D. Candidate*[1], Brent McGlaughlin, B.S. Candidate[2], Peihong Guan, B.S.[1], Richard A. Helms, Pharm.D.[1], Emma M. Tillman, Pharm.D., Ph.D.[1]; (1) University of Tennessee Health Science Center College of Pharmacy, Memphis, TN; (2)Christian Brothers University, Memphis, TN

PURPOSE: Parenteral nutrition (PN)-associated liver disease (PNALD) is a life-threatening complication of long-term PN. Studies have shown reversal of PNALD with fish oil containing omega-3 long-chain polyunsaturated fatty acids (ω3PUFA). Treatment with ω3PUFA has anti-apoptotic effects in a hepatocyte model of PNALD; however, prevention of hepatocellular apoptosis has not been studied. The purpose of this study was to examine the preventative and protective effects of pretreatment with ω3PUFA on bile acid-induced apoptosis in comparison to continuous treatment.
METHODS: Human hepatocytes (HepG2) were cultured with ω3PUFA (0.01–10 μmol/L) for 24–72 hours. Dose- and time-dependent cell viability was assessed via trypan blue exclusion tests. To evaluate preventative effects of pretreatment versus continuous treatment with ω3PUFA, hepatocytes were treated with ω3PUFA for 24 hours, and then exposed to cheondeoxycholic acid (CDCA) (200 μmol/L) (pretreatment group) or CDCA plus ω3PUFA (continuous group) for an additional 12 hours. Apoptosis was evaluated by caspase 3/7. Finally, to examine cell cycle induction, hepatocytes were cultured in ω3PUFA for 48 hours, and 5-bromo-2′-deoxyuridine (BrdU) was measured.
RESULTS: Cell viability was highest with exposure to 0.1 μmol/L ω3PUFA for 24 hours (p=0.004). Apoptosis was induced by CDCA alone and significantly attenuated in both pretreatment and continuous treatment groups. Interestingly, continuous treatment with ω3PUFA resulted in 34% (p=0.005) greater attenuation of bile acid-induced apoptosis in comparison to pretreatment alone. Lastly, cell proliferation was increased by 23% (p<0.001) in hepatocytes cultured in 0.1 μmol/L ω3PUFA.
CONCLUSION: Bile acid-induced hepatocellular apoptosis was reduced with both pretreatment and continuous exposure to ω3PUFA. Cell proliferation was increased by ω3PUFA, suggesting that this may be a potential protective mechanism. These data provide a basis for future translational studies to determine the benefits of early fish oil supplementation for the prevention of PNALD.

393. Quantitative analysis of caffeine content in popular energy drinks. *Keyvan Nekouei, Pharm.D. Candidate*[1], Farid Torabi, Pharm.D. Candidate 2015[2], Matthew Fete, Ph.D.[2], Leticia Shea, Pharm.D.[2]; (1)Acute Care Pharmacy, Denver Health Medical Center, Denver, CO; (2)Regis University School of Pharmacy
PURPOSE: Energy drinks have become one of the most popular products available in the American population with an anticipated sales estimate of $21.5 billion for 2017. With the ever growing list of products and limited regulations, a developing issue concerning the reported content of certain ingredients versus the actual amount found in the product arises. The primary objective of this project is to quantitatively determine the caffeine content in 11 energy drinks.
METHODS: Using High Performance Liquid Chromatography (HPLC), the caffeine content of 11 popular energy drinks was determined using an ultra-violet visual spectrum (UV-Vis) detector and applying the Beer Lambert Law (A = εcl), which states, absorbance is directly proportional to concentration. Caffeine concentrations were determined by quantifying the area under the curve (AUC) for the correct peak on the liquid chromatogram and comparing against a standard caffeine calibration curve.
RESULTS: Our analysis indicates that 9 out of 11(>81%) formulations tested contain higher caffeine amounts than listed on the product label. A T-test was conducted to identify significance of results, which identified 8 out of 11 energy drinks had a statistically significant difference in caffeine compared to reported label values.
CONCLUSION: The growing popularity of energy drinks raises concerns about the actual quantity of ingredients in energy drinks, which consumers have the right to know. Ingredients such as caffeine can have unwanted physical outcomes if high volumes are consumed. Further studies are being conducted to determine the quantitative content of other ingredients within these energy drinks.

Oncology

394. Improvement in access to oral chemotherapeutic agents at a Tertiary Care Hospital through the use of medication assistance pharmacy specialists. *Taylor White, B.S., Pharm.D. Candidate*[1], Tippu Khan, Pharm.D., BCOP, CPP[2], Henry Burgess, Pharm.D., MBA[2], Lindsey Poppe, Pharm.D., MS, BCPS[2], Benyam Muluneh, Pharm.D., BCOP, CPP[2]; (1)University of North Carolina Eshelman School of Pharmacy, Chapel Hill, NC; (2)UNC Healthcare, Chapel Hill, NC
PURPOSE: Access to oral chemotherapy is challenging for cancer patients due to cost and timeliness of insurance approval. The North Carolina Cancer Hospital (NCCH) utilizes medication assistance program specialists (MAPs) to improve medication access. This study was conducted to evaluate access to oral chemotherapy and the ability of MAPs to assist patients in acquiring therapy.
METHODS: This study was a retrospective evaluation of patients with various malignancies at NCCH for whom an oral chemotherapy Medication Assistance Request Form (MARF) was submitted between March 1, 2012 and February 28, 2013. The primary goal of this study was to evaluate what percentage of patients had an oral chemotherapy MARF approved at an affordable copay (defined as $100 or less, unless otherwise specified) and in a timely manner (defined as 3 days or less from MARF submission to approval). Meeting both metrics was defined as a "favorable outcome."
RESULTS: 191 MARF submissions were received for 185 patients. 24% (45/185) of patients did not have third party prescription drug coverage. Median time to medication access was 7 days (range 0–134 days). 27% (52/191) of MARFs were approved within 3 days, 57% (109/191) were approved after more than 3 days, and 16% (30/191) were never approved. Copay information was available for 105 submissions. 73% (77/105) of patients had a medication copay of $100 or less, 12% (13/105) had a copay of $101 to $1000, and 14% (15/105) had a copay of >$1000. Only 30% (31/105) of patients met the "favorable outcome" criteria with a copay ≤$100 and approval within 3 days.
CONCLUSION: The majority of patients in this study received oral chemotherapy, but only after navigating a lengthy approval process. This study highlights the challenges that patients face in accessing oral chemotherapy and the value of MAPs serving as patient advocates.

395. Screening for hepatitis B virus (HBV) prior to rituximab chemotherapy. *Alyson N. Leonard, Pharm.D. Candidate*, Bryan L. Love, Pharm.D., BCPS, LeAnn B. Norris, Pharm.D., BCPS, BCOP; South Carolina College of Pharmacy, Columbia, SC
PURPOSE: In 2008, the CDC released guidelines recommending screening of all patients undergoing treatment with rituximab to identify patients at risk of HBV reactivation. This study sought to evaluate the implementation of this recommendation in veterans, who are at increased risk of HBV, and to determine characteristics of those screened.
METHODS: Medical records of veterans receiving rituximab between January 2006 and December 2012 were retrospectively reviewed and stratified into two groups: 2006–2008 (Period 1, pre-guidelines) and 2009–2012 (Period 2, post-guidelines). Patient demographics, chemotherapy regimen (protocol, dose, duration), treatment indication, risk factors for HBV infection (substance abuse, homelessness, HCV, HIV), and HBV screening status were documented. Appropriate screening was defined as hepatitis B surface antigen testing within 180 days before or 60 days after the first rituximab dose. Baseline characteristics were compared using Pearsons chi-squared and students t-test. Logistic regression was used to model the odds of HBV screening by patient and treatment factors. A p-value of<0.05 was used to determine statistical significance.
RESULTS: During the study period, 102 patients were treated with rituximab (49 in Period 1 and 53 in Period 2). Patient demographics, indications, and treatment factors were not significantly different between groups. Most were males (97%), Caucasian

(69%), and received rituximab for lymphoma (90%). During period 1, 11 of 49 (22%) patients were screened compared with 17 of 53 (32%) patients during period 2 (p=0.28). In both unadjusted and adjusted regression models, the only significant predictor of HBV screening was treatment during 2009 (adjusted OR = 6.51; 95% CI 1.49–28.4).
CONCLUSION: There was no significant increase in the proportion of veterans screened for HBV in this sample despite recent guideline recommendations. This presents an opportunity for pharmacists to improve the quality of care.

396. Atypical presentation of heart failure in a patient receiving anthracyclines for acute lymphoblastic leukemia. *Laura A. Fuller, Pharm.D. Candidate*[1], Jessica Parra, Pharm.D., BCPS[2], Leslie A. Hamilton, Pharm.D., BCPS[3]; (1)University of Tennessee Health Science Center College of Pharmacy, Memphis, TN; (2)Methodist University Hospital, Memphis, TN; (3)The University of Tennessee Health Science Center, College of Pharmacy, Knoxville, TN
PURPOSE: Anthracycline-induced cardiotoxicity has been well established in patients receiving cumulative doses of >550 mg/m^2 and is irreversible in most cases. This case report presents a patient with anthracycline-induced cardiomyopathy who received a cumulative dose <300 mg/m^2. This patient's left ventricular ejection fraction declined to 35–40% and then recovered after treatment with carvedilol and digoxin.
METHODS: A 40-year-old Indian female presented with mild dyspnea, lower extremity edema, and tachycardia upon receiving her third dose of an anthracycline as part of her chemotherapy regimen for the treatment of acute lymphoblastic leukemia. A transthoracic echocardiogram revealed an estimated left ventricular ejection fraction of 35–40%, down from 60 to 65% before initiation of chemotherapy, confirming new onset systolic heart failure. She was subsequently started on carvedilol and digoxin to manage her symptoms. Prior to receiving cycle 4A of chemotherapy, a multigated acquisition scan revealed an EF of 55%. Over the course of 5 months, the patient received a total of 271 mg/m^2 doxorubicin equivalents before the onset of symptomatic heart failure. As of October 2013, the patient remains on carvedilol 6.25 mg twice daily and digoxin 0.125 mg once daily for symptom management.
RESULTS: In this case report the patient was young, healthy, had no previous reported risk factors, and was not receiving any concurrent cardiotoxic medications. Using the Naranjo adverse drug reaction probability scale, a score of 6 was determined showing a probable association between the development of heart failure and utilization of anthracycline therapy.
CONCLUSION: Clinicians should be aware that doses <300 mg/m^2 in relatively healthy patients not receiving mediastinal radiation can precipitate the development of irreversible or reversible anthracycline-induced cardiomyopathy, and are advised to consider the use of liposomal formulations of doxorubicin due to the decreased incidence of cardiomyocyte destruction.

397. Significance of clinical pharmacists' drug-related interventions for patients with hematologic malignancies. *Hyun Eun Chu, B.S.*[1], Chae Reen Jeong, M.S.[2], Myeong Gyu Kim, B.S.[1], Jae Hyun Kim, B.S.[3], Na Young Han, M.S.[4], Jung Mi Oh, Pharm.D.[4]; (1)College of Pharmacy, Seoul National University, Seoul, South Korea; (2) Department of Pharmacy, Asan Medical Center, Seoul, South Korea; (3)College of Pharmacy, Seoul National University, Seoul, South Korea; (4)Clinical Pharmacy, College of Pharmacy, Seoul National University, Seoul, South Korea
BACKGROUND: Patients with hematologic malignancies are given intricate medication therapy, resulting increase the risk of drug-related problems (DRPs). For this reason, pharmacists have implemented drug-related intervention (DRI) services to resolve DRPs. However, no study has been performed about the significance of DRI by clinical pharmacists.
PURPOSE: The purpose of this study was to evaluate the number of DRI service performed by clinical pharmacist and clinical significance of DRIs was presented to evaluate the value of service for patients with hematologic malignancies.
METHODS: DRIs, performed by clinical pharmacists since May 2008 until August 2013, were classified according to Pharamceutical Care Network Europe classification, and the frequencies were analyzed using the WHO/ATC codes as follows: antineoplastic agents and supportive care agents including antiemetics, constipation medicines, antibacterials, antifungals, antivirals, and analgesics. Clinical significance of DRI was evaluated by 3 pharmacists using six-point scale and proportion of reflection was classified by medication class.
RESULTS: Among 1159 DRIs performed during the study period, 91(6.5%) was related to antineoplastic agents and 823 (59.2%) to for supportive care medications. The "Treatment effectiveness" was the most part (53.2%) and the most frequent problem/cause category was "Effect of drug treatment not optimal"/"Inappropriate timing of administration and/or dosing interval". Most interventions were shown to be significant (79.4%) and 31.9% of antineoplastic agents DRIs were very significant. Therefore, overall acceptance rate of DRI was 84.5% and proportion of reflection in all medication classes was generally higher.
CONCLUSION: Clinical pharmacists implemented various DRIs concerning effectiveness, safety and costs, highly related to medications for supportive care. It is demonstrated the possibility of clinical pharmacists' interventions to improve clinical and economic outcomes. The result of this study can contribute to improve quality and process of pharmaceutical care services for patients with hematologic malignancies.

Other

398. Assessment of osteoporosis and treatment in the Chinese immigrant community in Chicago's Chinatown neighborhood: a pilot study. *Bernice Man, Pharm.D. Candidate 2015*[1], Kristine Manlimos, Pharm.D. Candidate 2016[1], Cindy Arocena Roberson, Pharm.D., BCACP[2]; (1)Chicago State University College of Pharmacy, Chicago, IL; (2)Department of Pharmacy Practice, Chicago State University College of Pharmacy, Chicago, IL
PURPOSE: Osteoporosis, characterized by increased bone loss due to advancing age and menopause, affects millions of Americans and results in approximately $17 billion dollars in U.S. health care costs. There is vast data suggesting that treatment disparities exist in osteoporosis management among African Americans, but little is known about treatment disparities in the U.S. Chinese immigrant population. This study seeks to determine whether Chinese immigrants who have low bone mineral density (BMD) have been previously identified as osteopenic/osteoporotic and if they are currently being treated.
METHODS: BMD measurements were obtained at Midwest Asian Health Association's monthly health fair in Chicago's Chinatown using the Lunar Achilles™ Quantitative Ultrasound System in January 2014. Based on T-score and a two-part survey, each individual's FRAX® score was calculated in addition to assessing other factors to determine bone density awareness and osteopenia/osteoporosis treatment incidence.
RESULTS: Thirty-five participants between the ages of 36 and 67 years of age were included. Twenty-three (65.7%) had T-scores ≥−1.0 (normal), 12 (34.3%) between −1.0 and −2.5 (osteopenia), and 0 (0%) ≤−2.5 (osteoporosis). FRAX®scores were calculated for the osteopenic patients, all of whom had a 10-year probability of hip fracture <0.6%. Ten-year major osteoporosis-related fracture probabilities ranged from 1.4% to 7.9%. Of these osteopenic participants, 7 (58.3%) were told by a doctor to take calcium and/or vitamin D supplements, and 2 (16.7%) were prescribed medication for their bones.
CONCLUSION: In this pilot study, Chinese immigrants in Chinatown were being undertreated for osteopenia as demonstrated by the low percentage of patients who were recommended bone supplements or prescribed medication by their doctor. As pharmacists, we need to increase awareness of bone health among Chinese immigrants, and potentially patients of other ethnicities,

through patient education. Expected completion date of the entire study is May 2015.

399. Awareness of an American College of Clinical Pharmacy state affiliate chapter. Tyler A. Vest, Pharm.D. Candidate 2016[1], Caitlin M. Delabar, Pharm.D. Candidate 2016[1], *Craig J. Furnish, Pharm.D. Candidate 2017*[1], Karissa Y. Kim, Pharm.D., CACP, BCPS[1], Patrick J. Gallegos, Pharm.D., BCPS[2], Kenneth M. Komorny, Pharm.D., BCPS[3], Andrea M. Pallotta, Pharm.D., BCPS, AAHIVP[4]; (1)University of Cincinnati James L. Winkle College of Pharmacy, Cincinnati, OH; (2)Northeast Ohio Medical University, Rootstown, OH; (3)Department of Pharmacy, UF Health Shands Hospital, Gainesville, FL; (4)Department of Pharmacy, Cleveland Clinic, Cleveland, OH
PURPOSE: The University of Cincinnati College of Pharmacy American College of Clinical Pharmacy Student Chapter partnered with the Ohio College of Clinical Pharmacy (OCCP) to assess awareness of OCCP. Many American College of Clinical Pharmacy (ACCP) members live in Ohio but are not active OCCP members. This study explored reasons why members of ACCP in Ohio are not engaged with the state chapter of the organization.
METHODS: A descriptive, cross-sectional web-based survey (SurveyMonkey) was used. All ACCP members in the state of Ohio were invited to participate in this survey. The survey included 13 questions that assessed factors influencing OCCP membership and directions that OCCP should take to expand membership.
RESULTS: Of the 556 participants invited, 167 (30%) completed the survey. While 70% of participants indicated awareness of OCCP, only 40% were members. Participants responded that the top reasons for joining OCCP included networking opportunities, affordable membership/meeting fees, continuing education, and advocacy for clinical pharmacy. In contrast, the distance to meetings and the organization being predominantly in Northeast Ohio were barriers to joining. Participants chose 1-day meetings, clinically focused topics, and close proximity as the most valuable in terms of meeting preferences.
CONCLUSIONS: Although most ACCP members in Ohio are aware of OCCP, less than half are members. There are potential opportunities for OCCP to increase awareness of OCCP and membership of the organization.

400. Evaluation of botulinum toxin utilization in the oregon medicaid program. *Andrew Sowles, Pharm.D.*[1], Lincoln Alexander, B.S.[1], Megan Herink, Pharm.D.[1], Kathleen Ketchum, M.P.A. H.A.[2]; (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: The goal of this study was to evaluate for unsubstantiated use of botulinum toxin (BoNT) in the Oregon Medicaid population. This study was prompted by the expanding off-label indications for BoNT, as well as the significant use for the prevention of chronic migraine in which the clinical benefit is minimal.
METHODS: This descriptive, observational study included all patients with 1 or more paid fee for service (FFS) or encounter drug, professional or outpatient claim for BoNT in the calendar year 2013. Patients were excluded if they were also enrolled in Medicare Part D or if eligible <75% of days during the calendar year. Patient claims were categorized based on the level of evidence to support each diagnosis. Patient profiles categorized as "evidence-supported" for second-line use and "unclear benefit" were reviewed manually.
RESULTS: A total of 272 patients were included in this study. The majority of patients using BoNT (73.2%) had a diagnosis with strong supporting evidence; 20.2% had a diagnosis with unclear benefit, no benefit, or used BoNT inappropriately for secondary treatments. The two most common second line conditions included migraine (16.9%) and overactive bladder (3.3%). After manual review of the migraine profiles, 69.4% did not meet the criteria for guideline recommended use.
CONCLUSION: Overall the majority of patients in this study had diagnoses with supporting evidence; however, a significant portion did not. This was predominantly driven by use for prevention of chronic migraine, where the clinical benefit is debatable. Currently, prior authorization use for BoNT in chronic migraine and other conditions are required in many other state Medicaid programs and could help curb unsupported use in the Oregon Medicaid population.

401. Pharmacy literacy and navigation (PLAN): an interprofessional approach to conducting a needs assessment of Bexar County seniors and pharmacy staff Encore. *Crystal Howell,*[1], Steven Lee,[1], Stephanie Mandujano, MPH[2], Meikwan Ralston,[1], Linda Yang,[1], Veronica Young, Pharm.D., MPH[1]; (1) College of Pharmacy, The University of Texas at Austin, TX; (2) School of Public Health San Antonio Regional Campus, The University of Texas Health Science Center at Houston, TX
PURPOSE: Two community-based organizations identified a need to develop population-oriented pharmacy literacy and navigation tools for Bexar County seniors aged 50 years and older. This interprofessional community service learning project aims to assess the perspectives of pharmacy staff and seniors on the pharmacy literacy and navigation needs of seniors to guide the development of educational tools.
METHODS: Pharmacy staff in different quadrants of Bexar County were surveyed by trained students using an interview questionnaire. Seniors' perspectives were collected through focus groups and community surveys. Quantitative and qualitative data were analyzed and categorized into frequency distribution and themes, respectively.
RESULTS: We conducted 32 pharmacy staff surveys, two focus groups (n = 17), and 37 individual surveys with seniors. Both groups confirmed seniors are unaware of medication therapy management and lack understanding of pharmacy terminology. Only 13% of pharmacy staff felt seniors understand pharmacy terminology well. While 63% of pharmacy staff stated insurance is important to address, more seniors reported concerns with "long lines", price, medical terms, and unapproachable pharmacy staff. An analysis of the focus group data identified the following themes: pharmacy navigation barriers, unfamiliarity with the pharmacists' responsibilities, and lack of awareness of pharmacy services.
CONCLUSIONS: Conducting an assessment with pharmacy staff and seniors provided a balanced perspective on the pharmacy literacy and navigation needs of Bexar County seniors. Challenges encountered included uneven distribution of voluntary pharmacy staff participation and formation of focus groups due to limited resources and unforeseen circumstances. These findings will guide the development of educational tools.

402. Development and validation of patient decision aid for depressed patients. *Heba Alshammari, Bachelor*[1], Kholoud Alaamer, Bachelor[1], Mashael Albassam, Bachelor[1], Khalaf Aljumah, M.Sc.[2]; (1)School of Pharmacy, King Saud University, Riyadh; (2)Ministry Of Health, Riyadh
PURPOSE: Decision aids (DAs) are designed to help patients understand possible treatment option and encourage them to participate in shared decision-making (SDM) processes. This study is aimed to develop and validate a DA for Arabic depressed patients.
METHODS: A six-page DA booklet published by Agency for Health Care Research and Quality (AHRQ) was adapted and translated to Arabic using Brisling's back translation model and the work of Al-Muhtaseb and Mellish was followed to produce a natural Arabic text. Validation was carried out by 24 experts based on International Patient Decision Aid Standards (IPDAS) checklist.
RESULTS: Experts strongly agree that the DA will increase patient's recognition, knowledge and understanding of their con-

dition and options. Based on IPDAS, 83% of experts agreed that DA provides information about options in sufficient detail for decision making, 68% present probabilities of outcomes is an unbiased and understandable way, 85% clarifying and expressing patients values and 87% for structure guidance in deliberation and communication with a total of 81% for the whole content criteria. Secondly, the development process has 63% positive feedback. Particularly, 83% agreed that the information are present in balanced manner, 65% for having a systematic development process, 71% for using a scientific evidence data, 69% for using plain language. Finally, the sum of expected effectiveness criteria got a very high percentage (93%).
CONCLUSION: We have developed an Arabic DA by a well-structured methodology and validated the DA based on IPDAS checklist for depressed patients. Further research is needed to evaluate the impact of DA on decision quality, and patients outcomes.

403. The impact of decision aid on depressed patients' involvement in shared decision making: a Pilot randomized controlled double-blinded study. *Heba Alshammari, Bachelor*[1], Kholoud Alaamer, Bachelor[1], Mashael Albassam, Bachelor[1], Khalaf Aljumah, M.Sc.[2]; (1)School of Pharmacy, King Saud University, Riyadh; (2)Ministry Of Health, Riyadh
PURPOSE: Shared decision-making (SDM) utilization has increased in the recent years with a noted increase in the effectiveness of treatment. Many studies confirmed that decision aids (DAs) improve participation in SDM more than standard counseling. This study is aimed to evaluate a DA that support depressed patients in decision-making regarding using antidepressant treatment and improve the quality of decision by increasing patients' involvement in SDM.
METHODS: A pilot randomized controlled double-blinded study was conducted at Al-Amal Complex for Mental Health in Riyadh City, Saudi Arabia between March and May, 2014. The impact of the developed DA on patients' involvement was assessed using observing patient involvement in decision-making (OPTION Scale) during counseling session conducted by trained clinical pharmacist and an assistant researcher. Data are analyzed using the Statistical Package for Social Sciences version 17.
RESULTS: A total of 44 patients diagnosed with major depressive disorder were participants in this study and distributed equally according to sex, a 13% difference was noted between the controlled group and intervention group with a score of 66% and 79% of involvement, respectively. There is a significant improvement in the involvement of patient in the intervention group ($p<0.05$) in comparison with the controlled group. Also, there is a statistically significant difference at level ($p<0.01$) in the elicitation of the patient's preferred level of involvement in decision-making in favor of intervention group.
CONCLUSION: The Arabic DA showed an evidence of improving patients' participation in SDM process which was assessed by OPTION-Scale. The patient strongly accepted using DA and became more involved in SDM. Further research is needed to evaluate the DA's impact on patients' adherence and on long-term patients' outcomes.

Pain Management/Analgesia

404. Evaluation of postoperative pain management system of patients after laparoscopic cholecystectomy in surgical wards of Bahawal Victoria Hospital. *Ahsan Saleem, Pharm.D.*; Department of Pharmacy, The Islamia University of Bahawalpur, Bahawalpur, Pakistan
PURPOSE: This study was performed in a major teaching hospital named Bahawal Victoria Hospital (BVH), Bahawalpur Pakistan. Objective of this study was to observe and evaluate the prevalence of disease, cholecystectomy methods adopted, postoperative pain complaints of patients and their management after undergoing laparoscopic cholecystectomy in surgical wards of BVH.
METHODS: All of the pre-diagnosed patients with symptomatic Cholelithiasis or gallstone complaints, admitted in the hospital for the purpose of undergoing laparoscopic cholecystectomy during this study period were included. A number of research articles were explored and data was extracted and self-rated by us for summarizing treatment options and comparing them with the treatment trends being practiced in BVH.
RESULTS: During this study period of 5 months a total of 1131 inpatient surgeries were performed in Bahawal Victoria Hospital, out of them just 127 were cholecystectomies (126 were Laparoscopic cholecystectomies while remaining 1 was converted to open cholecystectomy). Out of 127 patients about 100 were females while 27 were males. It reflected high prevalence and burden of disease in female population as compared to male population. After observing and documenting the pain complaints of patients within first 24 hours, it was calculated that 13% of patients had mild to moderate headache while 48% suffered from fatigue, 91% from upper abdominal pain, 61% from incisional pain and 69% of patients suffered from unexpected right shoulder pain in initial postoperative hours.
CONCLUSION: All complaints are arising because of no proper multidisciplinary pain management team in Bahawal Victoria Hospital. Even Pain management team lacked a qualified pharmacists that can improve pain management system by making proper and cost effective interventions. None of the pain measuring scales and pain documentation system found in BVH. Pain was being controlled by hit and trial methods by providing symptomatic relief to patients due to misdiagnosis.

405. Continuous infusion ketorolac for post-operative pain after total knee arthroplasty. *Amy Schwinghammer, Pharm.D. Candidate*[1], Sarah A. Nisly, Pharm.D.[2], Alex Isaacs, Pharm.D., BCPS[3], Kellie Knight, Pharm.D., BCPS[4], Dan Sage, Pharm.D. Candidate[5]; (1)College of Pharmacy and Health Sciences, Butler University, Indianapolis, IN; (2)Butler University College of Pharmacy and Health Sciences & Indiana University Health, Indianapolis, IN; (3)Department of Pharmacy Practice, Purdue University College of Pharmacy, Indianapolis, IN; (4)Department of Pharmacy, IU Health Methodist Hospital, Indianapolis, IN; (5)College of Pharmacy, Purdue University, West Lafayette, IN
PURPOSE: To quantify opioid consumption in patients receiving continuous infusion ketorolac following elective unilateral total knee arthroplasty (TKA).
METHODS: Four hundred and twenty-two patients undergoing a TKA between May 1, 2011 and December 31, 2013 were eligible for inclusion in this retrospective chart review. Patients were divided into two groups: those who received primary pain control with continuous infusion (CI) intravenous ketorolac ($n = 218$) and those who received a tiered opioid pain management system ($n = 224$). The primary endpoint was morphine equivalent unit (MEUs) use in the first 48 hours after TKA. Secondary endpoints include pain scores in the first 48 hours and incidence of adverse effects in both arms.
RESULTS: Baseline characteristics were similar between the groups. Preliminary review demonstrates the average age was 65 and 60 years in the CI ketorolac and tiered opioid groups, respectively. Gender was also similar at 56% female in the CI ketorolac and 70% female in the tiered opioid group. The following data has been collected for 157 patients who received the tiered opioid pain management system. Average daily home opioid use was 80 oral MEUs (range 0–4430 MEU). Oral MEUs consumed were 64 (range 0–1055 MEU) during the first 24 hours post-operatively and 118 (0–4400 MEU) between 24 and 48 hours. Seventy-five patients (47.8%) had patient-controlled analgesia available for post-operative pain control. Respiratory depression occurred at least once in 25 patients (15.9%). Eleven patients (7%) received at least one dose of naloxone during the first 48 hours after surgery.
CONCLUSION: Preliminary data reveals average oral MEUs during the first 48 hours after surgery was 182 (0–4420 MEU) among patients who received tiered opioid pain management. Final comparison of the two study groups will be presented at the ACCP 2014 Annual Meeting.

406. Systematic literature review of randomized controlled trials to evaluate the efficacy of medical marijuana for analgesia. *Shiny Parsai, M.S., Pharm.D. Candidate*[1], Ronald Herman, Ph.D.[2], Sarah Johnson, BCPS-AQ ID[3]; (1)University of Iowa College of Pharmacy, Iowa City, IA; (2)Applied Clinical Sciences, University of Iowa College of Pharmacy, Iowa City, IA; (3)patient Care Unit Pharmacists, The University of Iowa Healthcare, IA
PURPOSE: Medical marijuana has had an evolving and controversial role for the treatment of pain. This review summarizes and evaluates the current evidence from randomized controlled trials to examine the efficacy of medical marijuana as an analgesic.
METHODS: A systematic literature review was conducted using PubMed, IDIS, IPA, and CINAHL databases. Articles were included if analgesia was a measured outcome in humans, the intervention involved tetrahydrocannabinol (THC) or derivative, was a randomized controlled trial, and was in English. Two authors did an initial screen of the abstracts to eliminate irrelevant articles and then a detailed review of the full text to identify the articles to be included in the evidence tables. The third author reconciled differences if there was not a consensus. Data extraction included author name, date, type of pain, sample size, study design, intervention, efficacy, and adverse effects. Evidence was organized and analyzed in separate evidence tables by type of intervention: inhaled cannabis, oral cannabis extracts, dronabinol, THC+CBD spray, and synthetic analogs.
RESULTS: The initial literature search produced 133 unique articles. Systematic review of abstracts, yielded 66 for full text review and 67 were excluded. Full text review resulted in 48 articles to be included in the evidence tables.
CONCLUSION: Across each intervention type at least half of the studies showed a reduction in pain scores when compared to placebo. There were 11 of 48 studies that indicated no difference from placebo for analgesia, with at least one study in each intervention type. There were 6 studies that compared the THC compound to another analgesic. It was not different from ibuprofen in one study, diphenhydramine in another study, and it was equivalent to codeine in two studies. It was inferior to dihydrocodeine and to morphine in separate studies. Adverse events were a concern in some of the studies.

407. Medication use evaluation of intravenous acetaminophen at an academic medical center. *Andrew Decker, Pharm.D. Candidate 2015*[1], Christopher Miller, Pharm.D., BCPS[2]; (1)Wegmans School of Pharmacy, St. John Fisher College, Rochester, NY; (2)SUNY Upstate Medical University Hospital, Syracuse, NY
PURPOSE: The project reviewed the use of intravenous acetaminophen (Ofirmev®) as it relates to a standing institutional policy. The current policy allows for IV acetaminophen use only in patients who are NPO/NPR and the length of therapy is limited to 24 hours.
METHODS: A Pyxis® report was generated to capture Ofirmev® use between April 22 and May 22, 2014. A random sample of patients was chosen and their electronic medical records reviewed. Patients recent medical and surgical history, concurrent opioid and oral medications, NPO status, number of doses and duration of Ofirmev® were reviewed.
RESULTS: Intravenous acetaminophen was prescribed for 371 patients with a total of 937 doses administered. A random sample of 90 patients was selected. In this selection of patients, a total of 275 doses were administered, with 42 patients receiving a one time dose (46.7%). The most common service prescribing was surgery/orthopedics with 87.8%, followed by general medicine at 7.8%. The average number of doses per patient was 3.11 with the maximum of 34; the average duration of the order was under 24 hours (97.8%). Seven patients had strict NPO orders; of the remaining 83 patients, 60 (67%) were receiving oral medications within 8 hours after IV acetaminophen administration. Opioid use was common, with 91.1% of patients receiving a narcotic within 8 hours of acetaminophen administration.
CONCLUSION: The MUE results show that IV acetaminophen is not being prescribed according to institutional guidelines and opportunity exists to improve prescribing patterns relative to hospital policy.

408. Pain management prescribing by race/ethnicity in a level 1 Trauma Emergency Department. *Darren C. Riley, B.Sc., Pharm.D. Candidate*, Kendrea Bryant Burkes, Pharm.D., Sara Aldahir, Pharm.D.; Xavier University College of Pharmacy, Xavier University College of Pharmacy, New Orleans, LA
PURPOSE: Primary outcome is ED opioid administration and discharge prescription of opioids/analgesics. Secondary outcome is to determine whether opioid/analgesic prescribing in ED varies among race/ethnicity in comparison to non-Hispanic white patients.
METHODS: Patient charts were reviewed dating from January 2010-December 2011. Documentation of pain medication prescribed at visit and discharge alongside severity of patient's pain was collected. Covariates such as patient age, sex, insurance status, and race/ethnicity were recorded. Primary Predictor of Race (white, black, Asian/Pacific Islander, Native American, Other, Unknown) and ethnicity (Hispanic or non-Hispanic) was analyzed using non-Hispanic white patients as the control group in this experiment. Types of analgesia were recorded at initial presentation and discharge as non-opioid or opioid (acetaminophen, NSAID (e.g. Ibuprofen, hydrocodone, oxycodone, hydromorphone, morphine, fentanyl, and schedule II medication/ other). Inclusion Criteria consisted of any patient 18 years or older discharged from the hospital from January 2010 to December 2011. Exclusion criteria included any patient presenting with documentation of no pain or pain score 0; patient refusal of pain medications; sexual assault; alcohol intoxication, withdrawal or dependence; illicit drug withdrawal or dependence; Glasgow Coma Score ≤ 8; direct admits to surgery; and pain secondary to acute coronary syndromes.
RESULTS: Results prove that there is variance in pain management prescribing regarding race/ethnicity and no noticeable difference in prescribing for patients receiving emergency department analgesia, emergency department opioid, or discharge prescriptions (general). There were significant differences noticed in prescribing for patients receiving discharge opioid prescriptions. Although patients received the same management regarding general discharged prescriptions, African Americans are less likely to receive an actual discharge prescription containing opioids as compared to Non-Hispanic Whites.
CONCLUSION: Research still in progress.

Pediatrics

409. Pharmacists' active interventions in a children's hospital: an Australian context. *Hesty Ramadaniati, M.Clin.Pharm.*, Ya Lee, Ph.D., Jeff Hughes, Ph.D.; School of Pharmacy, Curtin Health Innovation Research Institute, Curtin University, Perth, WA, Australia
PURPOSE: This study documented pharmacists' active interventions leading to changes in drug therapy in order to (i) compare the nature of clinical pharmacists' active interventions made in different practice settings within a children's hospital, and (ii) identify the predictors for physician acceptance of the interventions.
METHODS: The primary investigator observed and documented all clinical interventions performed by clinical pharmacists for between 35–37 days on five study wards. The rates and types of pharmacists' interventions on the different wards were then compared. Multivariate logistic regression analysis using SPSS version 22.0 was performed to identify the predictors of physician acceptance of the interventions.
RESULTS: The Hematology-Oncology Ward had a higher rate of active interventions (2.43 interventions per 100 medication orders) compared to general medical settings and general surgical setting. Active interventions contributed for less than a quarter of all interventions on the general medical and surgical wards compared to nearly half (46.2%, $p<0.001$) on the specialty Hematol-

ogy-Oncology Ward. Dose adjustment was the most frequent active interventions in the general settings, whilst drug addition constituted the most common active interventions on the Hematology-Oncology Ward. The degree of acceptance of pharmacists' intervention by physicians was high (90% for active interventions). There were three variables significantly predicting the intervention acceptance, namely patients' age (OR = 0.893; 95% CI 0.813, 0.981), non high-risk medication category (OR = 2.801; 95% CI 1.094, 7.169), and pharmacists' experience (OR = 1.114; 95% CI 1.033, 1.200).
CONCLUSIONS: The rate of pharmacists' active interventions documented on Hematology-Oncology Ward was higher than the general medical and surgical wards. The pattern of the interventions documented on Hematology-Oncology Ward was also different compared to that of other wards. The interventions involving younger patients, addressing non high-risk medication related problems, being recommended by more experienced pharmacists were associated with increased likelihood of acceptance by physicians.

410. Evaluation of preoperative antimicrobial prophylaxis in select neonatal intensive care unit surgeries. *Ashley Byrne, Pharm.D. Candidate 2015*[1], Mary Petrea Cober, Pharm.D., BCNSP[2]; (1) College of Pharmacy, Northeast Ohio Medical University, Rootstown, OH; (2)Akron Children's Hospital, Akron, OH
PURPOSE: The objective of this study is to evaluate the use of preoperative antimicrobials within a neonatal intensive care unit (NICU) and compare these results to current guidelines developed by the American Society of Health System Pharmacists in conjunction with Infectious Diseases Society of America (IDSA), Surgical Infection Society (SIS), and the Society for Healthcare Epidemiology (SHEA).
METHODS: Medical records of 97 surgical procedures performed on NICU patients between April 1, 2012 and November 30, 2013 were reviewed. Each patient's weight, age, serum creatinine, surgical procedure, date of surgery, attending surgeon, surgical service, antimicrobial agent and dose used, and number of doses continued postoperatively was documented. Only patients receiving ventricular-peritoneal (VP) shunt placement, ventricular access device (VAD) placement, VP shunt revisions, gastromy-tube placement, necrotizing enterocolitis(NEC)/bowel resection, patent ductus areteriosus (PDA) ligation, and congenital heart repairs were included in this study.
RESULTS: Ninety-seven surgeries were performed and evaluated: general surgery (65.3%), cardiothoracic surgery (21.7%), and neurosurgery (13%). Correct antimicrobial prophylaxis was provided in 23.7% of these cases: 15 out of 43 general surgeries (35%), 5 out of 37 cardiothoracic surgeries (14%), and 3 out of 18 neurosurgeries (18%). Within cardiothoracic surgeries, the remaining 86% were prophylaxed with cefepime, a fourth generation cephalosporin.
CONCLUSIONS: Cardiothoracic surgery has established set guidelines for prophylaxis for their patients in the operating room. However, they are using too broad of an antimicrobial agent in many procedures. General surgery and neurosurgery are not providing adequate prophylaxis according to either previous or current guidelines or an established institution protocol. Institution guidelines and order protocols, as well as computerized physician order entry order sets, for each surgical service need to be developed to ensure proper antimicrobial prophylaxis is occurring before operative procedures in the NICU.

411. Possible drug-induced pancreatitis in a complicated adolescent patient post-traumatic injury. *Susan E. Dickey, B.A., Pharm.D. Candidate*[1], Leslie A. Hamilton, Pharm.D., BCPS[2], Katie J. Suda, Pharm.D., MS[3]; (1)The University of Tennessee Health Science Center, College of Pharmacy, Memphis, TN; (2)Department of Clinical Pharmacy, The University of Tennessee Health Science Center, College of Pharmacy, Knoxville, TN; (3)University of Tennessee Health Science Center, College of Pharmacy, Memphis, TN
PURPOSE: Multiple medications have been associated with acute pancreatitis. However, data in the pediatric population is scarce secondary to the nonspecific presentation and infrequent diagnosis. The aim of this report is to characterize drug-induced pancreatitis in an adolescent patient.
METHODS: This case report was conducted via chart review and was evaluated in the context of current literature regarding drug-induced pancreatitis.
RESULTS: A 16 year-old African-American female presented with a surgical site infection 8 weeks after a motor vehicle accident with multiple traumas. Two weeks prior to the present admission the patient was hospitalized for a urinary tract infection (UTI), which resolved with a 10-day course of antibiotics. At discharge the patient was initiated on sulfamethoxazole/trimethoprim (SXT) daily for UTI prophylaxis. On day seven of the present admission the patient complained of abdominal pain and rifampin, prazosin, and iron sulfate were held. The abdominal pain persisted and on day 13 the patient was diagnosed with acute pancreatitis with an amylase level of 187 units/L (normal = 30–110) and a lipase level of 987 units/L (normal = 23–208). SXT was discontinued and pancreatic enzymes declined over three days, but did not reach normal. There are several potential etiologies of acute pancreatitis in this patient, and SXT was identified as the most likely cause by the medical team. Evaluation of this case with the Naranjo algorithm indicated that SXT was a "possible" cause of the adverse drug reaction with a score of three. Other potential causes of acute pancreatitis in this patient include possible gallstones, abdominal injury, and other medications.
CONCLUSION: Acute pancreatitis can have significant morbidity and mortality in the pediatric population, but can go undiagnosed due to the lower incidence observed in children. Pediatric patients presenting with idiopathic abdominal pain should be evaluated for pancreatitis and drug therapy should be reviewed for potential causative agents.

412. Kidney function, vancomycin dosing and achievement of therapeutic troughs: a pilot observational study in pediatric oncology patients. *Alexandra Chambers, Pharm.D. Candidate*[1], Thomas D. Nolin, Pharm.D., Ph.D.[2], Denise Schiff, Pharm.D.[3]; (1)University of Pittsburgh School of Pharmacy, PA; (2) University of Pittsburgh, Pittsburgh, PA; (3)Hematology/Oncology, Children's Hospital of Pittsburgh of UPMC
PURPOSE: This study compared kidney function, vancomycin dosing, and frequency of attainment of therapeutic drug troughs between age groups in a cohort of pediatric oncology patients.
METHODS: A retrospective chart review was completed in 50 patients between the ages of 1–16 years old who received vancomycin for empiric treatment of febrile neutropenia. Patients with pre-existing kidney disease or treated with doses outside recommended ranges (15 mg/kg/dose every 6 hours age <12 years; 15 mg/kg/dose every 8 hours ages 12–16 years) were excluded. Patients were stratified by age: toddlers (12–36 months), early childhood (EC, 2–5 years), middle childhood (MC, 6–11 years), and adolescence (12–18 years). Kidney function was calculated using the Bedside Schwartz equation. Vancomycin troughs were categorized using IDSA/ASHP definition of "therapeutic" of 10–15 mcg/mL. Descriptive statistics were calculated, and groupwise comparisons were made using one-way analysis of variance (GraphPad Prism v5.0f).
RESULTS: No statistically significant differences in calculated kidney function or in trough concentration values were observed between age groups. Vancomycin trough concentrations were subtherapeutic in all age groups except in adolescents. All patients in EC and MC age groups had subtherapeutic troughs, while 90% of toddlers had subtherapeutic troughs. Although mean ± SD vancomycin concentrations were 10.6 ± 7.4 ug/mL in the adolescent age group, only 10% of patients exhibited therapeutic trough concentrations, while 30% had supra-therapeutic and 60% had sub-therapeutic troughs.
CONCLUSIONS: Currently-recommended vancomycin dosing regimens are inadequate to achieve targeted therapeutic troughs in pediatric oncology patients. Doses exceeding 15 mg/kg/dose

every 6 hours may be necessary in children 1–12 years of age in this patient population.

Pharmacoeconomics/Outcomes

413. Utilizing clinical pharmacist specialists to address access to care barriers in the type 2 diabetes (T2DM) veteran population. *Ryan Hadley, Pharm.D. Candidate*, Laura Pedromo, Pharm.D. Candidate, Nidhu Baby, Pharm.D. Candidate, Cole Kildow, Pharm.D., MSHA, BCACP, CDE, Megan Stapleton, Pharm.D., BCACP, CDE, Krystal Edwards, Pharm.D., FCCP, BCPS; Texas Tech UHSC School of Pharmacy, Dallas, TX

PURPOSE: To demonstrate that clinical pharmacist specialists (CPS) provide cost effective, quality diabetes care while improving Veteran access at the Veterans Affairs North Texas Health Care System Fort Worth Outpatient Clinic (VANTHCS FWOPC), where diabetes specialty care is unavailable.

METHODS: This was a retrospective cohort study of patients with T2DM that were referred for diabetes management to a CPS at the FWOPC from 2007 through 2012. Patients were ≥18 years old and had ≥2 visits within a 12 month period to the CPS diabetes clinic. The primary outcome evaluated was cost savings in terms of travel reimbursement and staff salaries, with secondary clinical outcome measures of percent of patients reaching Hemoglobin A1c (A1c) goals and time to reach goal. Descriptive statistics were performed.

RESULTS: Preliminary analysis of 35 patients was completed. Baseline characteristics were an average age of 61.5 ± 9.5 with 97.1% males, 68.6% white, BMI 34.8 ± 7.19 kg/m2, and an A1c of 9.32 ± 4.7%. Results for primary outcomes showed that the total cost savings in travel reimbursement and salary difference was $80,702.45, making an average cost of $134.36 per patient for travel reimbursement, and $76,000 difference in salary cost between endocrinologist and a CPS per year. Clinical outcomes demonstrated that 46% of patients met an A1c goal of <7% and 74% of patients met an A1c goal of <8%, with an average time to goal of 5.75 ± 4.65 and 5.75 ± 5.94 months, respectively.

CONCLUSION: Pharmacist managed diabetes care at the FWOPC is cost effective, demonstrating provision of quality care for patients in cities that are remote to the VANTHCS campus. This study demonstrates that placing CPS managed clinics in cities that serve the VA population may be a solution to improving veteran access to specialty diabetes care.

414. Development and validation of a multidimensional scale "CLEO" for evaluating potential significance of pharmacist interventions. Thi-Ha Vo, Pharm.D.[1], Claire Catoire, Pharm.D.[1], Bruno Charpiat, Pharm.D.[2], Michel Juste, Pharm.D.[2], Renaud Roubille, Pharm.D.[2], Francois-Xavier Rose, Pharm.D.[2], Jean-Luc Bosson, M.D.[1], Ornella Conort, Pharm.D.[2], Benoit Allenet, Pharm.D.[2], Pierrick Bedouch, Pharm.D.[2]; (1)University of Grenoble Alpes/CNRS/TIMC-IMAG UMR 5525/ThEMAS & Grenoble University Hospital, Grenoble, France; (2)"Standardization and Valorization of Clinical Pharmacy Activities" Working Group of the French Society of Clinical Pharmacy (SFPC), France

PURPOSE: This study aims to develop and validate a multidimensional scale for evaluating potential significance of pharmacist interventions (PIs).

METHODS: Development of a scale was based from a systematic review of scales in PubMed, PsycINFO, PASCAL, and CINAHL from 1986 to 2013 and evaluation models of health care interventions. After content validation of the scale by a group of 7 experts of French Society of Clinical Pharmacy, the experts coded 50 scenarios extracted from the French database of PIs "Act-IP©" in order to test inter-rater reliability. Satisfaction on the content and structure of the scale by 4-level Likert (not satisfied = 0, somewhat satisfied = 2, satisfied = 4, very satisfied = 6) was questioned.

RESULTS: A first version of a multidimensional scale, named "CLEO", was developed according to evaluation models of health care interventions ("structure-process-outcome" by Donabedian and "economic-clinical-humanistic outcomes" by Kozma et al., and pharmacoeconomic models) and references from 81 distinct scales identified from 133 studies results of 873 citations screened. CLEO includes 3 dimensions: clinical (7 categories), economic (4 categories), and process-related dimension (4 categories) with assessment supports (definitions of keywords, an assessment algorithm). The inter-rater reliability showed fair agreement for clinical dimension (agreement 82%; kw = 0.34); moderate agreement for economic dimension (agreement 80%; kw = 0.53); and fair agreement for organizational dimension (agreement 76%; kw = 0.27). The average score of satisfaction on the whole scale, structure of scale, definitions of keywords, algorithms was 3.7; 4.9; 3.1; and 3.4, respectively. Many suggestions for improvement of the first version were provided.

CONCLUSIONS: A multidimensional scale CLEO for assessing potential significance of PIs was developed and tested. However, the modification of the first version is necessary to improve reliability, particularly for organizational and clinical dimension. A second version will be definitely validated in September 2014.

Pharmacogenomics/Pharmacogenetics

415. Impact of a pharmacist guided pharmacogenetics service on prediction of warfarin stable dose. *Daniel Gratie, Pharm.D. Candidate*[1], Cheng Wendy, M.S.[1], Katarzyna Drozda, Pharm.D.[1], Julio Duarte, Pharm.D., Ph.D.[1], James Lee, Pharm.D.[1], William L. Galanter, M.D., Ph.D.[1], John Garofallo, Pharm.D.[1], Jerry A. Krishnan, M.D., Ph.D.[2], Larisa Cavallari, Pharm.D.[1], Edith Nutescu, Pharm.D., M.S.[1]; (1)University of Illinois at Chicago College of Pharmacy, Chicago, IL; (2)University of Illinois at Chicago, Pulmonary, Critical Care, and Sleep Medicine, Chicago, IL

PURPOSE: The objective of this study was to determine the accuracy of pharmacist-guided pharmacogenetics dosing compared to a clinical dosing algorithm in predicting the stable maintenance dose in warfarin treated patients.

METHODS: Descriptive analysis was performed to describe the sample demographics and clinical characteristics. Paired t-test was conducted to compare the estimated warfarin dose by a clinical algorithm and a pharmacist-guided pharmacogenetics service with the stable dose as well as the average percentages of the dose difference between the stable dose and the doses predicted by the two models. Mean absolute error (MAE) and the coefficient of determination (R^2) were used to determine the predictive accuracy of the two dosing models.

RESULTS: A total of 92 patients were included in the study. The mean age was 54.6 ± 18.5 years and 52% were females. The majority were African American (50%), followed by Hispanics (29%), Caucasians (9%), Asians (3%) and other (9%). The mean warfarin stable maintenance dose was 5.72 + 2.94 mg. Pharmacist-guided pharmacogenetic dosing was more effective in predicting the warfarin stable maintenance dose compared to the clinical dosing algorithm. (MAE 1.39 + 1.89 vs 1.86 + 1.93; $p<0.05$) The coefficient of determination between the estimated and the actual stable maintenance dose was higher with pharmacist-guided pharmacogenetic dosing compared to the clinical dosing algorithm. (R^2 0.44 vs 0.23) The pharmacist-guided pharmacogenetics dosing approach was better in predicting the warfarin dose to be within a 10% accuracy of the stable dose and also resulted in fewer patients having a >20% deviation from their stable dose compared to the clinical dosing algorithm. (40.22% vs 18.48%; and 43.48% vs 59.78%, respectively; $p<0.05$).

CONCLUSION: A pharmacist-guided pharmacogenetics dosing service demonstrated significantly improved warfarin dosing accuracy compared to a clinical dosing algorithm.

416. Association of apolipopotein E genotype and LDL levels in African American males with and without type 2 diabetes. Gina J. Ryan, Pharm.D., CDE, Kathryn M. Momary, Pharm.D., BCPS, *Lesly-Anne Samedy, M.S.*; Department of Pharmacy Practice, Mercer University College of Pharmacy, Atlanta, GA

PURPOSE: African Americans (AA) have the highest overall mortality rate from CHD, a direct result of elevated levels of low-density lipoprotein (LDL) which contribute to the formation of plaques. Apolipoprotein E (APOE), a protein involved in cholesterol homeostasis, facilitates the binding of lipoprotein remnants to their specific receptor, in turn, initiating the removal process. Defects in the gene encoding for APOE result in increased plasma cholesterol and triglycerides (TG) as well as impaired clearance. Three isoforms of the human gene exist (ε2, ε3 and ε4) defined by two non-synonymous polymorphisms (Cys112Arg and Cys158Arg). The primary objective will be to identify the association of ApoE gene polymorphisms with lipid levels in AA men. The secondary objective will be to compare and quantify differences in genotypic frequencies between patients with and without type 2 diabetes (DM).
METHODS: Following recruitment and informed consent, AA men, over 30 years old, with or without DM, and not being currently treated with lipid-lowering agents provided blood samples for advanced lipid analysis and genotyping. In addition, height, weight and demographic information were collected from subjects. Genotyping will be performed using commercially validated allelic discrimination assays via TaqMan real-time polymerase chain reaction according to the manufacturer's instruction in triplicate. Data will be compared between genotype group using ANOVA for continuous variables, and Chi-square or Fisher's exact test for nominal variables.
RESULTS: A total of 55 AA men with and 47 without DM were enrolled. Subjects had a mean (±SD) age of 50 (±10) as well as 59%, 28% and 50% had known hypertension, dyslipidemia and CVD, respectively. Allele frequencies and genotyping results are pending.
CONCLUSION: We propose that there will be few subjects possessing an ApoE- ε2 or ε4 allele, but those with these alleles will have an increase in LDL and TG levels.

Pharmacokinetics/Pharmacodynamics/Drug Metabolism/Drug Delivery

417. Response to a novel combination immunotherapy in two patients with advanced human papillomavirus-associated squamous cell carcinoma: a case report. *Saeed Alzghari, MBA, M.S.*[1], Mark Reedy, M.D.[2], Maureen Trotter, M.D.[2], Nihn La-Beck, Pharm.D.[1]; (1)Department of Immunotherapeutics and Biotechnology, Texas Tech University Health Sciences Center, Abilene, TX; (2)Hendrick Medical Center, Abilene, TX
PURPOSE: The human papillomavirus (HPV) is responsible for an increasing, global cancer burden in both men and women. Although overall cancer rates have fallen in the United States, HPV-associated oropharyngeal, anal, and vulvar cancers have increased. Two immunotherapeutic agents with potential for treatment of HPV-related malignancies are imiquimod and quadrivalent HPV vaccine. We report two consecutive patients with recurrent and refractory HPV-associated carcinoma who responded to treatment with imiquimod and quadrivalent HPV vaccine.
METHODS: Patient A had stage IV vulvar cancer and Patient B had stage IIIB cervical cancer; both were HPV-high risk positive. The two patients were treated with surgery, chemotherapy, and radiotherapy according to standard of care. In both patients, cancer recurrence was considered refractory to conventional treatments. Patient A was placed on hospice care and patient B was scheduled for exenterative surgery. Immunotherapy with quadrivalent HPV vaccine and imiquimod was initiated in both patients as a last effort to try to stimulate an immune response against the cancers.
RESULTS: Patient A experienced a decrease in size of one of the metastatic tumors and lived for another 5 months after treatment with immunotherapy. Remarkably, patient B had complete regression of all cancerous lesions which was verified by surgical pathology. She is still disease free 19 months post-treatment.
CONCLUSION: We showed successful immunotherapy treatment of two patients with recurrent and radiation refractory HPV-associated squamous cell carcinoma. Both patients happened to also have had radiotherapy 4 weeks prior to initiation of immunotherapy, which we theorized led to depletion of certain immune regulatory cells resulting in alleviation of tumor immunosuppression. This in turn enables imiquimod and quadrivalent HPV vaccine to stimulate an adaptive immune response leading to synergistic tumor cell killing and resolution. This approach has potential broad applications to other HPV-associated malignancies and warrants evaluation in prospective clinical studies.

418. Effects of verapamil and diltiazem on dabigatran etexilate hydrolysis by carboxylesterases. *Dina Ali, B.S.*[1], S. Casey Laizure, Pharm.D.[2], Zheyi Hu, Ph.D.[2], Robert B. Parker, Pharm.D.[2]; (1) College of Pharmacy, University of Tennessee Health Science Center, Memphis, TN; (2)Department of Clinical Pharmacy, University of Tennessee College of Pharmacy, Memphis, TN
PURPOSE: The direct thrombin inhibitor dabigatran etexilate (DABE, Pradaxa) is converted to the active dabigatran (DAB) through a two-step process mediated by human carboxylesterases (CES). DABE is a double prodrug requiring hydrolysis of the carbamate and ethyl esters by intestinal carboxylesterase-2 (CES2) and hepatic carboxylesterase-1 (CES1), respectively to form DAB. The aim of this study is to determine the effect of verapamil and diltiazem, two drugs that are not CES substrates and are frequently co-administered with DABE, on the hydrolysis of DABE to DAB.
METHODS: DABE enzyme kinetics in human recombinant CES1 and CES2, human intestinal microsomes (HIM) and human liver S9 fractions (HLS9) were determined alone and in the presence of increasing concentrations of verapamil and diltiazem. The effect of verapamil and diltiazem on the sequential hydrolysis of DABE in HIM and HLS9 was also conducted to simulate the *in vivo* disposition of DABE after oral administration. The formation of the ethyl ester hydrolysis product (M1), the carbamate ester hydrolysis product (M2), and the DAB active moiety were quantified by LC-MS/MS.
RESULTS: The addition of both diltiazem and verapamil resulted in inhibition of CES1- and CES2-mediated hydrolysis of DABE, but diltiazem more potently inhibited CES1 (IC_{50} CES1 1.8 uM; IC_{50} CES2 29.1 uM) while verapamil was a more potent CES2 inhibitor (IC_{50} CES2 1.7 uM; IC_{50} CES1 29.8 uM). The results of sequential hydrolysis experiments and the effects on DAB formation will be completed by the date of presentation.
CONCLUSION: Diltiazem and verapamil significantly inhibit the *in vitro* hydrolysis of DABE by CES1 and CES2, respectively. Carboxylesterase hydrolysis can be inhibited by drugs that are not substrates of these enzymes, and may represent a new mechanism of drug-drug interactions. Further investigation is needed to establish the impact of CES inhibition on the safety and efficacy of CES-substrate drugs.

419. Comparison of fentanyl pharmacokinetics and dose-determining factors in adults and children. *Sin Yin Lim, Pharm.D. Candidate*[1], Peter Johnson, Pharm.D., BCPS[2], Jamie Miller, Pharm.D., BCPS[2], Sukyung Woo, Ph.D.[3]; (1)College of Pharmacy, University of Oklahoma, Oklahoma City, OK; (2)Department of Pharmacy: Clinical and Administrative Sciences, University of Oklahoma College of Pharmacy, Oklahoma City, OK; (3) Department of Pharmaceutical Sciences, University of Oklahoma College of Pharmacy, Oklahoma City, OK
PURPOSE: Fentanyl continuous infusions (CI) are utilized in mechanically ventilated, critically-ill children to provide sedation/analgesia. There is a paucity of published studies evaluating fentanyl pharmacokinetics (PK) in critically-ill children. The unknown relationship between PK differences in children and adults can impact dosing. Dosing based on inaccurate assumptions about PK in children can lead to either over-sedation or under-sedation. The objective of the study is to compare fentanyl pharmacokinetics (PK) and major contributing factors to dose determination in adults versus children based on previously published studies.
METHODS: Data from two previously published studies in 109 lean and obese adults and one study in 19 critically-ill children (age

0.05–14 years of age) will be utilized for comparisons. A semi-physiologic based PK approach was used to simulate pediatric PK models and to compare the pediatric PK models with adult models to understand the pharmacokinetic changes with age. Using the PK model from the previously published study in adults describing fentanyl clearance in relation to total body weight (TBW) and PK mass, data were extrapolated to lower TBWs to simulate data from the pediatric population. The primary objective of the study is to compare fentanyl CI PK parameters (volume of distribution and clearance) between adults and children. Secondary objectives include determination of the relationship of age and clearance and TBW and clearance. PK model simulations were performed using Berkeley Madonna software.
RESULTS: Fentanyl CI clearance using TBW did not correlate with previously published PK data in critically-ill children. Body-weight-normalized clearances in neonates are higher compared to infants and toddlers who are critically-ill. Final results pending project completion.
CONCLUSION: Pending project completion. Estimated completion date 9/1/2014.

Substance Abuse/Toxicology

420. The serotonin-2 receptor modulator, (-)-trans-PAT, decreases voluntary ethanol consumption in rats. *Joseph Ladd, 2015 Pharm.D. Candidate*; Department of Pharmacodynamics, University of Florida College of Pharmacy, Gainesville, FL
PURPOSE: Recently, a novel phenyl-aminotetralin (PAT) demonstrated selective agonism for the 5-HT_{2C} receptor. Serotonin (5-HT) 5-HT_{2C} receptor agonists have shown promise as novel pharmacotherapies for alcohol use disorder (AUD), but developing selective agonists has been problematic.
METHODS: Female Sprague Dawley rats were given ethanol in a palatable gel vehicle during operant sessions. 5-HT_{2C} receptor modulators (Ro60-0175, SB242,084, and (-)-trans-PAT) were administered before operant sessions. As a control for the effects of 5-HT_{2C} receptor agonism on caloric intake, modulators were also tested using a non-ethanol containing gel vehicle.
RESULTS: Ro60-0175, a 5-HT_2 family receptor agonist, decreased both ethanol and vehicle responding while (-)-trans-PAT, a 5-HT_{2C} receptor agonist with 5-$HT_{2A\text{-}2B}$ receptor inverse agonist activity, selectively reduced only ethanol responding. The effect of 5-HT_{2C} receptor agonists on self-administration after reinstatement of ethanol after a 3 week deprivation was also determined. (-)-trans-PAT eliminated increases in ethanol intake following ethanol deprivation whereas Ro60-0175 had no effect.
CONCLUSION: These results both emphasize the need for caloric controls paired with ethanol intake experiments and support the validity of 5-HT_{2C} selective agonists a potential AUD pharmacotherapy.

421. Attitudes and prevalence regarding prescription stimulant use among pre-health and health professions students: a cross-sectional study. *William Johnson, Student*[1], Kristine Dolbeare, Ph.D.[1], Robert Helmer, II, Pharm.D.[1], Paul Jungnickel, Ph.D., RPh.[2]; (1) Auburn University Harrison School of Pharmacy, Mobile, AL; (2)Auburn University Harrison School of Pharmacy, Auburn, AL
PURPOSE: College students may use prescription stimulant drugs, not to treat Attention Deficit Hyperactivity Disorder (ADHD), but to increase academic performance. Although data regarding the prevalence of prescription stimulant use for academic enhancement exist, little is known about how students perceive this use, especially among professional students. The objective of this study is to gain a better understanding regarding prescription stimulant use for academic enhancement among health professions students. There are three aims: To determine the prevalence of prescription stimulant drug use for academic enhancement among pre-health professions and health professions students, to determine the route of acquisition of stimulants with intent to use for academic enhancement by these students, and to assess the attitudes towards stimulant use for academic enhancement among these students.
METHODS: This is a cross-sectional, internet-based, anonymous survey study of pre-health and health professions students at Auburn University and the University of South Alabama. The survey was designed by study investigators and utilizes Qualtrics® survey software to facilitate ease of administration and data collection. Student demographics, prevalence of stimulant use, manner of stimulant acquisition, and attitudes towards use and prescribing are assessed using both direct and scenario-based survey items. A pilot study, utilizing students on a smaller satellite campus, will assess survey completion time, survey flow, and survey item quality. Following the pilot study, the survey will be disseminated electronically to potential participants by the study investigators in collaboration with university and college administrators and advisors. Reminder emails will be sent 2 weeks after initial contact in an effort to increase response.
RESULTS: Preliminary survey data are being collected through late August and will be presented at the 2014 ACCP Annual Meeting.
CONCLUSION: –

Transplant/Immunology

422. Fenofibrate impact on graft function after renal transplantation - fact or fiction. *Kripa Patel, B.A.*[1], Melissa Moriarty, B.S.[1], Maya Campara, Pharm.D.[2], Sanjeev Akkina, M.D.[2]; (1)Pharmacy Practice, University of Illinois at Chicago, Chicago, IL; (2)University of Illinois Hospital and Health Sciences System, Chicago, IL
PURPOSE: Several studies have shown the potential negative impact of fenofibrate therapy on renal function. In renal transplant (RTx) population, a few reports published showed mixed impact on serum creatinine levels. The purpose of our study is to discern the impact of fenofibrate on serum creatinine levels and eGFR in large patient cohort of renal transplant recipients.
METHODS: This is a retrospective chart review of all patients at the University of Illinois Hospital who underwent RTx and received fenofibrate for management of hypertriglyceridemia from 2010 to 2012. Serum creatinine (SCr) levels at baseline, 1, 3, 6, 12 month, and post-fenofibrate use were obtained. The primary outcome measure was a 25% increase in creatinine from baseline at two different time points. Multivariate logistic regression was used to determine factors associated with increases in serum creatinine.
RESULTS: A retrospective review of electronic prescription records revealed 156 RTx recipients were prescribed fenofibrate. A total of 101 patients were used in the final analysis of the study with 55 patients excluded due to the lack of SCr levels following therapy initiation, fenofibrate use prior to renal transplant or due to re-transplantation due to rejection. Eighteen patients (18%) had multiple elevated SCr (ElevCr) while 83 (83%) had stable function (StabCr) for 1 year after initiating fenofibrate. The ElevCr group had a higher percentage of female recipients (61% vs 35%, p=0.04) but was otherwise similar to the StabCr group in age, race, type of transplant, maintenance immunosuppression, diabetes, and fenofibrate dose. Logistic regression models showed females were more likely to exhibit SCr increases versus males (OR 4.64, 95% CI 1.22–17.7). Of the 18 individuals, 4 discontinued fenofibrate and 3 returned to baseline SCr.
CONCLUSION: Fenofibrate usage may increase SCr levels in kidney transplant recipients, especially female recipients, but appears to be reversible when discontinuing fenofibrate.

423. Path to developing a national student transplant organization. *Amanda Szczepanik, Pharm.D. Candidate*; School of Pharmacy, MCPHS University, Boston, MA
PURPOSE: More than 100,000 Americans are waiting for lifesaving organ transplants and even more are waiting for donated tissues. Pharmacy students as pharmacist extenders are poised to have a key role in supporting this patient population thereby decreasing potential for adverse outcomes due to non-adherence, and admission or readmission to a hospital. Currently, there is

one national transplant organization, the American Society of Transplantation (AST) that allows professionals specializing in transplant to become members. However, AST does not currently have any student memberships. A student led transplant organization, Transplant Pharmacy Student Network (TPSN), was created at MCPHS University to raise awareness and address this identified growing area of pharmacy practice for students. Expanding TPSN to a national level aligns the structure with that of other pharmacy organizations including, American College of Clinical Pharmacy (ACCP). ACCP offers many avenues of communication for students and practicing pharmacists via the StuNet and PRN networks.
METHODS: Outreach to targeted focus groups within ACCP (e.g. Immunology and Transplant (Imtr) PRN Chair) resulted in dialog regarding mechanisms to achieve national recognition for TPSN. A campaign to further raise awareness was mounted in the Boston area pharmacy school community via networking and community service events. Events included TPSN's annual Organ Donation Awareness (ODA) Event in collaboration with the New England Organ Bank (NEOB) and Rhode Island Blood Bank.
RESULTS: In the Boston community, TPSN has grown from 7 members at inception to 83 currently.
CONCLUSION: Transplant pharmacy is an under-recognized area of pharmacy practice for student participation. As a result, it is important to create national student organizations that represent the field of transplant pharmacy. The development of a student-led national transplant organization would be beneficial to unite students with common interests across the United States and to help foster expansion in the field.

424. A comparison of cumulative rabbit antithymocyte globulin dose and clinical outcomes in obese kidney transplant patients. Benjamin Duhart, Jr, M.S., Pharm.D.[1], *Dagny Ulrich, Ph.D.*[2], Vinaya Rao, M.D.[3]; (1)Pharmacy, University of Tennessee Health Science Center/ Methodist University Hospital, Memphis, TN; (2) Pharmacy, University of Tennessee Health Science Center, Memphis, TN; (3)Transplant Nephrology, University of Tennessee Health Science Center/Methodist University Hospital Transplant Institute, Memphis, TN
PURPOSE: Optimal dosing of rabbit antithymocyte globulin (rATG) in obese patients (BMI≥30) is undefined and varies among transplant centers. The rATG induction regimen for kidney transplant recipients at the University of Tennessee and Methodist University Hospital Transplant Institute (UT/MUHTI) was 3 to 7 doses of 1.5 mg/kg rATG based on actual body weight. Cumulative rATG dose was determined by physician preference and allograft function. The aim of this study was to compare clinical outcomes of obese kidney transplant recipients receiving a cumulative dose of <6 mg/kg (low-dose) and patients receiving ≥ 6 mg/kg of rATG (high-dose).
METHODS: A retrospective chart review was done to identify obese adult patients who received a single-organ kidney transplant at the UT/MUHTI between January 2000 and March 2008. The following 1-year outcomes were compared between low-dose and high-dose rATG groups: serum creatinine, estimated glomerular filtration rate (eGFR), acute rejection, graft survival, and patient survival. A Chi-square test was used to analyze categorical variables, and a Student's t-test was used for continuous variables. A Kaplan–Meier analysis was used to compare patient and graft survival.
RESULTS: Of the 120 patients included in the study, 78 received <6 mg/kg of rATG and 42 received ≥ 6 mg/kg. African-Americans accounted for 77% of the low-dose group and 83% of the high-dose group. The mean cumulative rATG dose for the low and high-dose groups was 4.5 ± 1.1 mg/kg and 7.5 ± 1.3 mg/kg ($p<0.05$), respectively. At 1 year, there was no significant difference between the groups for serum creatinine, eGFR, acute rejection and graft survival. However, the 1-year patient survival rate was significantly higher in the low-dose group (100% vs 90%, $p<0.05$).
CONCLUSION: Based on the favorable clinical outcomes seen in this study, low-dose rATG may be a suitable option for obese kidney transplant recipients.

425. Evaluation of clinical outcomes in kidney transplant recipients receiving rabbit antithymocyte globulin induction and tacrolimus within 7 days post-transplant. *John Jackson, Pharm.D. Student*[1], Benjamin Duhart, Jr, M.S., Pharm.D.[2]; (1)Pharmacy, University of Tennesee College of Pharmacy, Memphis, TN; (2)Pharmacy, University of Tennessee Health Science Center/Methodist University Hospital, Memphis, TN
PURPOSE: Initiation of tacrolimus in kidney transplant recipients with rabbit antithymocyte globulin induction is normally delayed to prevent recovery of renal function. However, the optimal time to initiate tacrolimus (TAC) is controversial. Our study compared renal outcomes based on serum creatinine and calculated estimated glomerular filtration rate (eGFR) at 1, 3, 6, and 12 months post-transplant between renal allograft patients that received TAC either within the first 7 days (early initiation) or >7 days post-transplant (late initiation).
METHODS: A single center, retrospective chart review of adult renal allograft recipients transplanted from January 2005 to April 2011 was completed. All patients received rabbit antithymocyte globulin induction, tacrolimus, and mycophenolate. The following clinical outcomes were compared between groups: serum creatinine, estimated glomerular filtration rate (eGFR), delayed graft function, acute rejection, graft survival, patient survival, and incidence of BK and cytomegalovirus (CMV) viremia. A Chi-square test was used to analyze categorical variables, and a Student's t-test was used for continuous variables. Kaplan-Meier curves were utilized for graft and patient survivals.
RESULTS: Of the 67 patients included in the study, 41 received TAC within the first 7 days post-transplant and 26 received TAC after 7 days post-transplant. 56 (87%) patients were African-American. Demographic variables were similar between groups, except for TAC day of initiation (median: 5.5 vs 13 days, $p<0.05$). TAC levels were significantly higher in the early initiation group at 1 month (median: 8.6 vs 7, $p<0.05$). Serum creatinine and eGFR were similar between groups at each time point. In the early initiation group, a significant incidence of BK viremia was noted (50% vs 24%, $p<0.05$). No difference was detected in acute rejection and the incidence of CMV viremia.
CONCLUSION: Early initiation of TAC in kidney transplant recipients receiving rabbit antithymocyte globulin did not compromise 1-year post-transplant renal outcomes.

Late Breakers
Cardiovascular

426. Evaluation of the safety and efficacy of prophylactic amiodarone therapy for prevention of postoperative atrial fibrillation in patients who underwent cardiothoracic surgery. Danny Ephraim, Jr, Pharm.D.[1], Alison Stevens, Pharm.D., BCPS[1], *Anastasia Armbruster, Pharm.D., BCPS*[2]; (1)Missouri Baptist Medical Center, Saint Louis, MO; (2)St. Louis College of Pharmacy, Saint Louis, MO
PURPOSE: Pre-protocol incidence of POAF in patients who underwent coronary artery bypass graft (CABG) surgery at Missouri Baptist Medical Center was approximately 21%. Implementation of postoperative amiodarone, in combination with beta-blocker therapy, has been initiated to further reduce the incidence of POAF. The objective of this study was to evaluate the safety and efficacy of postoperative amiodarone therapy.
METHODS: Cardiothoracic surgery (CTS) patients who received postoperative amiodarone therapy (0.5 mg/minute intravenously (IV) for twenty-four hours, then 200 mg orally three times daily until discharge) from February 2012 to November 2013 were included. Patients with a history of atrial fibrillation with or without antiarrhythmic treatment, and patients who underwent any concomitant non-cardiothoracic procedures were excluded. Primary outcomes included the incidence of POAF and acute amiodarone adverse effects.
RESULTS: A total of 444 patients were included for analysis. Of these, 111 (25%) patients developed POAF. Sixty of the 237 patients who underwent CABG developed POAF (25.3%). Prolonged length of postoperative mechanical ventilation was associ-

ated with an increased risk of POAF (p=0.042). Risk of POAF was also increased when the stay in the intensive care unit (ICU) was prolonged (p=0.005). A total of 70 (15.8%) patients experienced acute amiodarone adverse effects that led to therapy interruption and/or discontinuation. The most common adverse effects included: bradycardia (10.8%), hypotension (5.9%), and nausea (3.2%).
CONCLUSION: Postoperative amiodarone treatment did not result in a decrease in POAF in patients who underwent CABG. However, there may be some utility in specific patient groups, such as patients with prolonged postoperative mechanical ventilation. Amiodarone therapy appears to be relatively safe. Prospective trials that utilize amiodarone in the immediate postoperative setting are warranted to better define its role.

427. Effects of long term proton pump inhibitor use in those receiving dual antiplatelet therapy after percutaneous coronary intervention. *Penelope Bland, B.A.*[1], Kelly C. Rogers, Pharm.D.[2], Shannon W. Finks, Pharm.D.[2]; (1)College of Pharmacy, University of Tennessee Health Science Center, Memphis, TN; (2) Department of Clinical Pharmacy, University of Tennessee College of Pharmacy, Memphis, TN
PURPOSE: The short-term adverse event profile of proton pump inhibitor (PPI) therapy is considered minimal; however, long-term use is associated with bone fractures, gastrointestinal (GI) infections, and nutritional deficiencies. Extended administration of PPIs for 12 months or longer is common in those receiving dual antiplatelet therapy (DAPT) after percutaneous coronary intervention (PCI) to prevent GI bleeding. This study evaluated whether significant adverse drug events (ADEs) are associated with the use of PPIs in a post-PCI population receiving DAPT at a Veterans Affairs Medical Center.
METHODS: Medical records of Veterans who underwent PCI in 2012 were reviewed retrospectively. Patients on DAPT who received PPI were compared to a control group not on PPIs. The incidence of fractures, Clostridium difficile, pneumonia, and nutritional deficiencies were evaluated.
RESULTS: Fifty patients receiving DAPT after PCI were included (mean [SD] age, 64 [7.44]) in the preliminary sample. Fifty-eight percent (n = 29) were prescribed PPIs, with pantoprazole being the most commonly prescribed agent (55.2%). More ADEs occurred in those receiving PPIs than in controls (61.7% vs 42.6%, respectively; p=NS). Three patients experienced a stent thrombosis with concomitant PPI therapy.

Adverse Event	PPI (n = 29)	No PPI (n = 21)	P Value
Bone Fracture	3 (10.3%)	1 (4.5%)	0.6
Clostridium difficile	1 (3.4%)	0	1.0
Pneumonia	0	2 (9.1%)	0.17
Hypoalbuminemia	8 (28.6%)	6 (28.6%)	1.0
Hypomagnesemia	17 (60.6%)	11 (52.4%)	0.5

One patient receiving a PPI was found to have B12 deficiency; however, only seven were screened for this ADE. Most received PPIs for >12 months (82.8%) of which 41.7% (n = 10) lacked compelling indications for continued use.
CONCLUSIONS: Extended duration of PPI use beyond 1 year in the post PCI population is common and is not without harm. Practitioners should anticipate potential ADEs in patients receiving long-term PPIs and evaluate the need for continued GI prophylaxis once DAPT is discontinued.

Education/Training

428. Improvement in pharmacy students' familiarity with tackling the challenges of the community pharmacy setting after a simulation activity. *Jose Barboza, Pharm.D., CDE*[1], Wen-Yi Jiang, Pharm.D., BCPS[2], Sarah Steinhardt, Pharm.D., JD[3]; (1) Pharmacotherapeutics and Clinical Research, University of South Florida College of Pharmacy, Tampa, FL; (2)CVS, FL; (3) University of South Florida College of Pharmacy
PURPOSE: Community pharmacists anecdotally state that Colleges of Pharmacy do not adequately prepare students for the challenges of the community pharmacy setting, especially in areas of immunizations protocols, prescription insurance issues, selecting a Medicare Part D plan, dispensing controlled substances, and communicating effectively. The purpose of this study was to assess pharmacy students' familiarity with these topics prior to the community pharmacy simulation activity and to describe if students perceived improvement in their ability to perform these skills after the activity.
METHODS: Second-year pharmacy students (n = 65) enrolled in Pharmaceutical Skills course participated in a simulation activity that included 4 different stations: (i) overview of pharmacist immunizations, insurance rejections, and corresponding responsibility in dispensing controlled substances, (ii) applying pharmacy law to controlled substances, (iii) helping patients select a Medicare Part D plan, and (iv) Performing an Elevator Speech. After the activity, students were asked to complete a survey that evaluated the effectiveness of the simulation activities.
RESULTS: The survey was completed by 98% (64/65) of students and 100% of students stated that they found the experience valuable and that they feel more prepared for the community pharmacy setting after the activity (p<0.01).

Table 1: Students' responses in percentages to the respective skill

Skills	Familiar prior to the activity, %	Improved because of the activity, %	Unclear after the activity, %
Immunizations, Insurance and Dispensing Controlled Substances	59	66	16
Pharmacy Law – Controlled Substance	69	70	6
Medicare Part D	6	80	16
Elevator Speech	19	94	17

CONCLUSION: The survey suggests high percentages of students were not familiar with community pharmacy tasks. The simulation based activity resulted in improved students' perception and preparedness of community pharmacy skills and that these activities are valuable to students. Therefore, completing activities focusing on skills required in community pharmacy settings should be encouraged in pharmacy education.

429. A comparison of the entry characteristics of the highest and lowest performers on the North American pharmacist licensure examination. *Connie H. Yoon, Pharm.D.*, Jill Morgan, Pharm.D., Bhavi Patel, Pharm.D. Candidate, Cherokee Layson-Wolf, Pharm.D., Lisa Lebovitz, J.D.; University of Maryland School of Pharmacy, Baltimore, MD
PURPOSE: A proactive way to insure highly competent pharmacists are generated is to start at the preadmission level. Our primary objective is to identify entry characteristics that distinguish the most successful PharmD candidates by comparing the highest and lowest performers on the North American pharmacist licensure examination (NAPLEX), a *minimum* competency test.
METHODS: This IRB exempt, retrospective review included only the top 20% and lowest 20% of performers on the NAPLEX within each graduating class from 2011 to 2013. Only students who signed consent to release their scores were evaluated.
RESULTS: A total of 148 subjects met the inclusion criteria; 76 were in the top-20% group. The mean NAPLEX score for the top versus bottom groups were 121.4 ± 4.5 and 87.4 ± 8.7, respectively. The average preadmission GPA for the top versus bottom groups was 3.5 versus 3.3 (p<0.0001); while the mean science GPA was 3.4 versus 3.2 (p<0.001). A significant difference was found in students who received an "A" in organic chemistry I (p<0.001). This difference was not found with organic chemistry II or biology

grades. There were statistically significant differences in composite PCAT scores as well as each subcomponent (composite p<0.0001; biology p=0.005; chemistry p=0.037; quantitative p=0.003; reading p=0.0007; verbal p<0.0001). Of the four components that comprised the interview process (written essay, faculty, student and group interviews), only the faculty interview showed significant results (p=0.04). There were no significant differences between the two groups' scores on leadership and work history.
CONCLUSION: The PCAT results and preadmission GPAs were strong predictors of higher passing scores on the NAPLEX. Within the interview process, only faculty interview scores were positive predictors of higher scores. These results suggest a need to re-evaluate our admissions process, specifically the interview program and the assessment of all PCAT sub-scores (vs composite and science only) for admission.

430. Improvement in pharmacy students' confidence before and after an active learning simulation-based activity. *Jose Barboza, Pharm.D., C.D.E.*[1], Dawn Schocken, Ph.D.[2]; (1)Pharmacotherapeutics and Clinical Research, University of South Florida College of Pharmacy, Tampa, FL; (2)USF Health Morsani College of Medicine, Tampa, FL
PURPOSE: To assess pharmacy students' confidence gained from a simulation based case by conducting a pre and post survey on: (i) interviewing a patient, (ii) creating an assessment and plan, (iii) presenting a patient, and (iv) conducting a patient counseling session
METHODS: Second-year pharmacy students (n = 65) enrolled in a Pharmaceutical Skills course participated in a 2-session group-based simulation case that included: (i) conducting a patient interview of a standardized patient, (ii) ordering laboratory values, (iii) working in a group to create an assessment and plan, (iv) presenting the patient, assessment, and plan to a pharmacist or physician preceptor, (v) and providing a patient counseling session to the same standardized patient, including lifestyle recommendations and counseling on point-of-care devices. The students completed a pre and post anchored survey describing their confidence before and after the case in 4 clinical areas using a 5-point Likert scale. Additionally, students evaluated their own performance, their group member's performance, the preceptors evaluated the students' performance, and the students evaluated the preceptors ability.
RESULTS: The survey was completed by 98% (64/65) of students. Students' confidence levels in their ability to perform in each of the assessed clinical skills improved after the case (p<0.01 for all). The percentages of students expressing confidence in exceeding or greatly exceeding expectations resulted in the following:

Clinical Skill	Pre-Case, %	Post-Case, %	p Value, %
Conducting a patient Interview	43.7	82.4	p<0.01
Creating an assessment and plan	54.7	92.2	p<0.01
Presenting a patient and an assessment/ plan to a preceptor	48.4	90.6	p<0.01
Providing patient counseling	57.8	93.7	p<0.01

CONCLUSION: The use of a simulation-based case contributed to increased student confidence in completing clinical skills and is an effective teaching method. The data obtained suggests continued emphasis in active learning activities and that they should be encouraged in pharmacy education.

Endocrinology

431. Cardiovascular risk associated with dipeptidyl peptidase-4 inhibitors compared with metformin. *Chun-Nan Kuo, Master*, Ya-Leng Lin, Pharm.D., Man-Tzu Wu, Pharm.D.; Wan Fang Hospital, Taipei Medical University
PURPOSE: Diabetes mellitus (DM) and its comorbidities such as hypertension and dyslipidemia are risk factors for cardiovascular disease (CVD). CVD is the major cause of morbidity and mortality for DM patients. According to some previous studies, the relationship between dipeptidyl peptidase-4 (DPP-4) inhibitors and risk of CVD has not been established. The aim of this study is to evaluate whether DPP-4 inhibitors are associated with cardiovascular risk compared with metformin in a medical center in Taiwan.
METHODS: Patients with type 2 DM who newly received sitagliptin or metformin monotherapy or took sitagliptin as add-on therapy to the current metformin monotherapy within January 2010 to June 2010 were included. The primary outcome was a composite of myocardial infarction, arrhythmia, angina, ischemic stroke, heart failure and coronary artery disease. Each patient would be followed until a cardiovascular event occurred, stopping study medication or January 31, 2014, depending on whichever happened first. During the period of follow-up, switching sitagliptin to vildagliptin or linagliptin, or adding other antihyperglycemic agents were permitted.
RESULTS: Among 298 patients included, 32 received DPP-4 inhibitor monotherapy, 212 received metformin monotherapy, and 54 received add-on therapy. First, we compare the two groups of monotherapy. After using propensity score matching, 32 patients were in the DPP-4 inhibitor group and 96 were in the metformin group. The primary end-point events occurred in 3 patients in DPP-4 inhibitor group and 11 in metformin group (9.4% vs 11.5%, odds ratio: 0.80, 95% confidence interval [CI]: 0.21–3.07). Second, add-on therapy group was compared with metformin group. We also used propensity score to match the two groups. The incidence of primary end-point events was not significantly different (7.4% vs 10.5%, odds ratio: 0.68, 95% CI: 0.22–2.12).
CONCLUSION: When comparing with metformin monotherapy, neither DPP-4 inhibitor monotherapy nor add-on therapy increase or decrease the risk of cardiovascular events.

Family Medicine

432. Improving health of at-risk rural patients (IHARP): interim clinical outcomes associated with a novel comprehensive coordinated care model. *Karen Williams, Pharm.D.*[1], Leticia R. Moczygemba, Pharm.D., Ph.D.[2], Andrea L. Pierce, Pharm.D.[2], Tanvi Patil, Pharm.D.[1], Nikisa Blevins, Pharm.D.[1], Heidi Wengerd, Pharm.D.[1], Courtney Dickerson, Pharm.D.[1], Kelley Mills, Pharm.D.[1], Ann Lucktong, Pharm.D.[1], Randi Carpenter, Pharm.D.[1], Michael Czar, Ph.D., RPh.[1], William Lee, B.Pharm., MPA[1], Gary R. Matzke, Pharm.D.[2]; (1)Carilion New River Valley Medical Center; (2)Department of Pharmacotherapy and Outcomes Sciences, Virginia Commonwealth University School of Pharmacy, Richmond, VA
PURPOSE: Improve medication related health care outcomes and reduce costs of patients with multiple chronic diseases by implementing a sustainable patient centered continuity of care process, the IHARP model, within a rural health system comprised of multiple hospitals, primary care practices, and community pharmacies.
METHODS: The IHARP model integrates specialty-trained pharmacists into primary care practices who coordinate patient care, via a customized EMR shared with hospital and community pharmacists. Comprehensive medication therapy management and chronic disease state management are used to enhance patient clinical outcomes of those with at least 4 medications and 2 chronic diseases. A paired t-test was utilized to assess the significance of the changes in interim outcome measures in those enrolled for at least 6 months who had lab values measured at baseline and 180 days.
RESULTS: As of April 2014 1780 patients were enrolled and 1633 were actively receiving care at one of 21 clinics staffed by 7 pharmacists. 54.4% of patients were ≥ 65 years old and 58.2% were women. Diabetics (n = 123) experienced a decline in A1c from 7.9 + 1.9 to 7.6 + 1.7 at 180 days. (p=0.13) In 73 patients with hyperlipidemia, LDL was similar at baseline (99.8 + 36.9) and 180 day follow-up (100.2 + 35.9) (p=0.91) Improvements in BP among 482 followed for 6 months were: 141 + 30/76 + 14 at baseline to 134 + 23/74 + 13 at 180 days.(p≤0.0001/0.007) Patient and

physician satisfaction with the program were high, 4.33 + 0.87 (n = 159) and 4.58 + 0.93 (n = 24) on a 5 point Likert-scale.
CONCLUSION: The addition of comprehensive medication and disease state management into team based PCMHs is scalable and can be coordinated with virtual team members at regional hospitals and community pharmacies. Early data indicates significant clinical improvement for blood pressure, a trend in improvement in A1c, and strong patient and medical staff support.

Health Services Research

433. Primary care prescriber understanding, perceptions, and utilization of medication copay coupons. *Cara Liday, Pharm.D., BCPS, CDE*[1], Alan Pannier, Pharm.D., MBA[2], Rex W. Force, Pharm.D., BCPS, FCCP[3]; (1)Department of Pharmacy Practice, Idaho State University, Pocatello, ID; (2)Idaho State University; (3)Department of Family Medicine, Departments of Family Medicine and Pharmacy Practice, Idaho State University, Pocatello, ID
PURPOSE: For many new medications, copay coupons (CCs) serve as a direct-to-consumer marketing method, and have replaced samples as promotional tools used by the pharmaceutical industry. CCs offset some or all of the patient copay required, with insurance plans then paying the balance of the prescription cost. It has been estimated that CCs will increase medication expenditures by $32 billion over the next decade. CCs are considered kickbacks and may not be used in Medicare and Medicaid patients. The objective of this project was to evaluate primary care prescriber perceptions, utilization, and understanding of the use of CCs.
METHODS: A convenience sample of prescribers from 17 practices participating in 3 regional or national PBRNs received the survey, which had been developed, piloted with several family physicians, and refined. Subsequently, research champions at practices affiliated with the PBRNs were contacted and distributed surveys locally. Questions evaluated prescriber knowledge of CC programs. Demographic data were obtained.
RESULTS: 172 of 411 distributed surveys were returned (response rate: 41.8%). 56.5% of respondents were resident physicians, 22.6% faculty, 13.1% community physicians, and 7.7% were mid-level prescribers. 62.8% stated that they had used a CC in a situation where a low-cost generic drug alternative was available and 49.1% reported that patients had requested a new drug based on the availability of a CC. Although 33.3% of respondents indicated they had received education on CCs, 63.1% thought that CCs have a neutral effect or decrease health care costs. Only 9.1% of respondents correctly identified that insurance companies incur the majority of costs associated with CCs, and 59.8% incorrectly stated that CCs could be used in Medicare patients.
CONCLUSION: The majority of prescribers surveyed did not understand the ramifications of CCs. Educational efforts should be promoted to address these knowledge deficits.

HIV/AIDS

434. Virologic outcomes with elvitegravir (EVG) and raltegravir (RAL) in an urban cohort. *Siddharth Swamy, Pharm.D.*[1], Roopali Sharma, Pharm.D., BCPS (AQ-ID), AAHIVP[2], Agnes Cha, Pharm.D., AAHIVP, BCACP[2], Jameela Yusuff, M.D., MPH, FACP[3]; (1)Department of Pharmacy, SUNY Downstate Medical Center; (2)Long Island University; (3)Division of Infectious Diseases, SUNY Downstate Medical Center
PURPOSE: RAL and EVG have demonstrated comparable efficacy and are preferred regimens. The current study compares virologic suppression between RAL and EVG in an urban cohort.
METHODS: A retrospective, comparative study was conducted at two hospital HIV clinics on adult subjects receiving RAL or EVG from January, 2008 to January, 2014. The primary outcome was virologic suppression at week 20–28 of therapy. Secondary outcomes included virologic suppression at week 44–52 of therapy, virologic failure at week 20–28 of therapy, virologic failure at week 44–52 of therapy, and immunologic response at week 20–28 of therapy.
RESULTS: Of 316 patients evaluated, 219 patients met eligibility criteria. The median age was 49 years, 48% were females, and 84% were African Americans. At baseline, the CD4 cell count was $\leq$ 200 cells/mm^3 in 33% of patients and viral load was >100,000 copies/mL in 15% of patients. Virologic outcome data was not available at week 44–52 for 53% and 8% of EVG and RAL recipients, respectively. Virologic suppression at 20–28 weeks occurred in 66% and 53% of EVG and RAL recipients, respectively (AOR 1.45; 95% CI 0.80, 2.65, p=0.0609). No association was found between virologic suppression and prior AIDs diagnosis, hepatitis C co-infection, treatment experience, baseline CD4 cell count $\leq$ 200 cells/mm^3, and baseline viral load >100,000 copies/mL in RAL and EVG recipients (p=0.202). Additional secondary outcomes are listed in the table below.

Secondary outcomes	EVG, %	RAL, %	p-values
Virologic suppression at 44–52 weeks	76	58	0.042
Virologic failure at 20–28 weeks	22	26	0.521
Virologic failure at 44–52 weeks	14	23	0.294
Immunologic response at 20–28 weeks	40	47	0.405
Immunologic response at 44–52 weeks	43	55	0.210

CONCLUSION: A similar virologic response was observed at 20–28 weeks with EVG and RAL in a HIV-positive urban cohort.

Infectious Diseases

435. Assessing the impact of computerized physician order entry (CPOE) upon adherence to Center for Medication Safety (CMS) core measures for empiric treatment of community-acquired pneumonia (CAP) at a Community Hospital. *Virginia Fleming, Pharm.D., BCPS*, Robin Southwood, Pharm.D., BCPS, CDE; Department of Clinical and Administrative Pharmacy, University of Georgia College of Pharmacy, Athens, GA
PURPOSE: Empiric Therapy of pneumonia is a CMS national focus area. Core measures provide criteria for assessing evidence-based empiric antibiotic therapy in the management of CAP. Order sets (both paper and electronic) may improve adherence to core measures. This study evaluated the compliance of empiric antibiotic selection with core measures before and after implementation of CPOE and change from a detailed, specific paper antibiotic order form to a generic electronic order set.
METHODS: Adult patients admitted between June 1st 2013 and May 31st 2014 with an ICD code for pneumonia were identified by hospital electronic medical record (EMR). Records were reviewed to confirmed diagnosis of pneumonia and immunocompetent state. Patients were categorized into their respective Infectious Disease Society of America and the American Thoracic Society (IDSA/ATS) guidelines category. Patients with CAP were evaluated for compliance with CMS core measures. The data set was compared to a previous pneumonia dataset gathered between January 1st 2008 and April 17th 2009 when a paper order form was used.
RESULTS: Of the total screened, 111 pre-CPOE and 66 post-CPOE patients met inclusion. Baseline demographics were similar between groups. Compliance of initial empiric antibiotic therapy was consistent with core measure for 94.3% of pre-CPOE patients compared to 94.6% of post-CPOE patients ($x^2 = 0.23$, p>0.05). For patients admitted to the ICU, antibiotic compliance was 57.1% for pre-CPOE population compared to 91.7% for post-CPOE patients. For Non-ICU patients, initial antibiotic selection was consistent for 97.5% of the pre-CPOE population compared to 96.0% for post-CPOE patients.

CONCLUSION: Compliance with CAP core measures did not change significantly after implementation of CPOE and change to a new electronic order set. In the small sample of ICU patients, compliance increased numerically, though upon review was likely due to factors other than change to the electronic order form and CPOE.

Medication Safety

436. Impact of Intensive Pharmacotherapeutics on emergency department medication reconciliation: a novel clinical pharmacy practice model. *Amanda Winans, Pharm.D.*, Amanda Engle, Pharm.D.; Bassett Medical Center, Cooperstown, NY

PURPOSE: The Agency for Healthcare Research and Quality (AHRQ) links the benefit of medication reconciliation to pharmacist clinical intervention. With healthcare reform demanding improved patient satisfaction and quality of care, we piloted a novel Clinical Pharmacy Intensive Pharmacotherapeutics (IP) Program in our Emergency Department (ED) medication reconciliation process. This program aimed to optimize pharmacotherapy, improve patient satisfaction with medication communication, and avoid costly and unsafe medication errors.

METHODS: This Clinical Pharmacy Program was performed at a rural, non-profit teaching hospital in Upstate New York. ED patients were considered for medication review by a pharmacist after registered nurse review if they met the following criteria: (i) age ≥65 years, (ii) ≥6 medications, and (iii) diagnosis of diabetes mellitus, heart failure, or chronic obstructive pulmonary disease. Medication review consisted of verification and update of home medications in the electronic medical record, with severity scale classification (low acuity, significant, serious, or life threatening) assigned to each medication error identified. After medication review, if all clinically relevant data was available, IP was performed to optimize pharmacotherapy based on national best practices and evidence-based guidelines.

RESULTS: 140 service hours yielded 81 medication reviews. Medication errors identified when comparing nurse to pharmacist reviews were: 59 medications added by pharmacist; 124 medications deleted; 92 *sig* modifications; 28 dose modifications; 303 total changes to the medication list. Of these medication errors, 76% were designated low acuity, 22% significant and 1.4% serious. The average of 3.7 mediation changes per patient was statistically significant ($p<0.05$). IP was performed on 44% of patients seen for home medication review, with 120 interventions.

CONCLUSION: Our novel ED Clinical Pharmacy IP Program found a statistically significant improvement in medication errors compared to usual care. This finding is consistent with the AHRQ report identifying the key, yet underutilized, role of pharmacists as the standard of care for medication reconciliation.

437. Pharmacist facilitated admission and discharge medication reconciliation reduces medication errors. *Julie L. Cunningham, Pharm.D.*[1], Lance Oyen, Pharm.D.[2], Jenna Lovely, Pharm.D.[3], Christopher McCoy, M.D.[4], David Larson, M.D.[5], Diane Foss, R.N.[6]; (1)Department of Hospital Pharmacy Services, College of Medicine Mayo Clinic, Mayo Clinic, Rochester, MN; (2) Department of Hospital Pharmacy Services, College of Medicine Mayo Clinic, Mayo Medical Center, Rochester, MN; (3) Department of Information Systems, Mayo Medical Center, Rochester, MN; (4)Department of Hospital Internal Medicine, College of Medicine Mayo CLinic, Mayo Medical Center, Rochester, MN; (5)Department of Colon and Rectal Surgery, College of Medicine Mayo Clinic, Mayo Medical Center, Rochester, MN; (6)Department of Nursing, Mayo Medical center, Rochester, MN

PURPOSE: Errors due to inconsistent or the poor quality of medication reconciliation on hospital admission and discharge continue to impact patient safety. Health systems struggle with identifying a unified process advocated by the Joint Commission. A project team at a large academic medical center was assigned the task to pilot a new best medication reconciliation practice along with technology enabled solutions to detect and avert medication discrepancies, eliminating medication errors, in order to prevent adverse drug events and associated patient harm in transitions.

METHODS: A best practice was identified that modeled a current practice on one surgical service. Specific processes included a nurse/pharmacist collaboration to collect and document a medication history on admission, prescriber chronic continuity therapy orders placed only following medication history verification on admission, a multidisciplinary checklist, a huddle between the pharmacist and prescriber at the time of hospital dismissal, and the issuance of any home going prescriptions following the discharge huddle. This model was piloted on 2 surgical and 2 medical services for 2 weeks.

RESULTS: Baseline dismissal documentation in pilot areas of any error ranged from 67 to 90% of patients and was reduced to 16–33% with the enhanced model. Baseline specific medication errors on dismissal ranged from 8 to 26% of medications to 1–6% of medications with the enhanced model. High risk medication error rates at baseline ranged from 11 to 49% of all medication errors and decreased to only 1 (4%) medication error with the enhanced model. Pharmacist and provider huddles took an average time of 8 minutes, with more time spent for medical patients compared to surgical patients.

CONCLUSION: Transition preventable medication errors were dramatically reduced through pharmacist facilitated medication reconciliation. Based on pilot result success, hospital wide implementation will begin in the fall of 2014.

Oncology

438. Metformin and pancreatic cancer risk in type 2 diabetic patients: a systematic review and meta-analysis. *Yanmo Liu, Master*; The Pharmaceutical Department of Shaw Run Run Hospital, Shaw Run Run Hospital, Hangzhou, China

PURPOSE: Metformin is an agent which is used for the management of diabetes primarily. I performed a literature search and meta-analysis of epidemiologic studies to assess the effect of metformin on pancreatic cancer incidence and mortality in diabetic patients compared with sulfonylureas, insulin or other anti-diabetic treatments.

METHODS: I used Pubmed until November 2013, limited my search results written in English, with no time restriction. Independent reports with sufficient information to allow risk estimation of cancer risk/mortality and a measure of uncertainty were reviewed. Seven studies were selected for relevance in terms of intervention, population studied, independence, and reporting of pancreatic cancer incidence or mortality data, reporting 5353 cases of pancreatic cancer events.

RESULTS: A 21% reduction in overall summary relative risk (RR, 0.79; 95% CI, 0.64–0.97) was found in subjects taking metformin compared with other anti-diabetic treatments. Compared with sulfonylureas, a 41% reduction in relative risk (RR, 0.59; 95% CI, 0.40–0.85) was found in subjects taking metformin, but not with insulin.

CONCLUSION: Metformin is associated with a decreased risk of cancer incidence compared with other treatments among patients with type 2 diabetes, but whether it can reduce the risk of pancreatic cancer needs to be further researched.

Pain Management/Analgesia

439. Efficacy and safety of extended-release tramadol for osteoarthritis: a meta-analysis. *Yuan Xue, M.S.*, Xiaobin Zhu, B.S., Jiangfeng Wang, M.S., Ke Ma, B.S.; Department of pharmacy, Sir Run Run Shaw Hospital, School of Medicine, Zhejiang University, Hangzhou,Zhejiang, China

PURPOSE: To evaluate the efficacy and safety of tramadol extended-release (tramadol ER) tablets for osteoarthritis (OA) systematically.

METHODS: We searched the PubMed, Embase, Cochrane, Medline Ovid, CNKI, VIP and Wangfang databases up to March 2014 for randomized controlled trials (RCTs) published in the English and Chinese languages. All the trials studied the efficacy and safety of tramadol ER for OA. The quality of included RCTs was assessed and the data was extracted by two reviewers independently using the Cochrane method. All the data were analyzed by RevMan 5.2 software.
RESULTS: Twenty RCTs were included with a total of 5973 participants who received tramadol and 2649 participants who received placebo. These studies indicated that participants who received tramadol ER tablets had significantly less pain (MD = 6.77; 95% confidence interval [CI] [3.58, 9.97], p<0.0001) than patients who received placebo measured with the visual analogue scale (VAS). Tramadol ER also showed more effective than placebo regarding the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), including pain extent walking on flat surface(MD = 4.08,95%CI [1.59, 6.57], p<0.001), composite score (MD = 106.43, 95%CI [52.52, 160.35], p<0.0001), physical function (MD = 23.42, 95%CI [10.93, 35.91], p<0.0002), and stiffness (MD = 9.72, 95%CI [4.72, 14.71], p<0.0001). Adverse events (e.g., nausea [RR = 2.72, 95%CI (2.33, 3.18), p<0.00001]; dizziness [RR = 3.13, 95%CI (2.60, 3.75), p<0.00001]; constipation [RR = 3.71, 95%CI (3.03, 4.55), p<0.00001]) occurred more often with tramadol ER than placebo.
CONCLUSION: Tramadol ER showed significant improvement in pain intensity and physical function, and it was also well tolerated. Tramadol ER is a useful treatment option for patients with osteoarthritis pain. But its adverse events, although are reversible and not life threatening, often cause the participants to stop taking the medication and may limit the use of tramadol.

Pharmacoeconomics/Outcomes

440. Assessing the quality of reporting medication adherence in published clinical trials. *Emily Tabinski, Pharm.D.*; VA Cooperative Studies Program Clinical Research Pharmacy Coordinating Center, Albuquerque, NM
PURPOSE: To describe the development of a scale to assess the quality of reporting medication adherence in published clinical trials.
METHODS: A panel of clinical trial specialists was assembled and brainstormed a list of preliminary items. Using a modified Delphi method, a multidisciplinary team reviewed the preliminary items, provided feedback, and assessed face validity. The list of items was revised and categorized as either essential or supplemental. Using 30 articles, two raters assessed frequency of endorsement and reliability via kappa coefficient and intraclass correlation coefficient (ICC). The sample of articles consisted of 10 selected from a searching process using PubMed performed for the years 2000–2013, 10 from New England Journal of Medicine and Lancet, 5 predefined as high quality (meeting all essential items plus one or more supplemental items) and 5 predefined as low quality (missed any one of the essential items). A preliminary scoring system was applied, where the essential items were assigned 3 points each and the supplemental items were assigned 0.5 points each.
RESULTS: The scale consisted of 4 essential and 5 supplemental items. The endorsement rates for the essential items ranged from 43% to 80%, while the supplemental items ranged from 10% to 20%. The kappa coefficient for the scale items was 0.992, p<0.001. The ICC was 0.995, p<0.001, indicating strong agreement between the two raters for all articles. The mean quality score for all articles was 8.20 (SD ±3.76). The median quality scores for the predefined high and low quality were 12.5 and 6.0, respectively with a statistically significant difference.
CONCLUSION: This scale highlights the important aspects for adequate reporting of medication adherence. It has the ability to differentiate articles with low and high quality of reporting mediation adherence in clinical trials. Furthermore, the quality scores from the tested articles indicate the need for improved reporting.

Pharmacoepidemiology

441. Metoclopramide prescription and neurological side effects in adult Taiwanese patients. *Shin-Chia Tsai, M.S.*[1], Rey-Yue Yuan, M.D.[2], Shiow-Yunn Sheu, Ph.D.[3], You-Meei Lin, M.S.[1], Meng-Ting Hsu, M.S.[1]; (1)Department of Pharmacy, Shuang Ho Hospital, Taipei Medical University, New Taipei City, Taiwan; (2)Department of Neurology, School of Medicine, College of Medicine, Taipei Medical University, Taipei, Taiwan; (3)School of Pharmacy, College of Pharmacy, Taipei Medical University, Taipei, Taiwan
PURPOSE: In July 2013, the European Medicines Agency restricted the use of metoclopramide for reducing its potentially risk for neurological side effects. This restriction limits the maximum daily dose to 30 mg and prescription duration to 5 days. This pilot study was to investigate the incidence, prevalence of a more than 5-day metoclopramide prescription, and the relationship between the prescription duration of metoclopramide and the risk of extrapyramidal symptoms (EPS) development in Taiwanese patients.
METHODS: This retrospective cohort study analyzed data on adult patients receiving oral solid dosage forms of metoclopramide prescriptions between January 1, 2005 and December 31, 2011 from Taiwan's National Health Insurance Research Database. Patients with a diagnosis of Parkinson's disease before using metoclopramide were excluded. EPS therapeutics was used as an indicator for developing neurological side effects. Multivariable logistic regression was employed to estimate the association between use of metoclopramide and occurrence of EPS.
RESULTS: The patients newly received metoclopramide were decreased from 18.44% in 2006 to 8.94% in 2011. The prevalence of the 5-day more metoclopramide users was 20.20% in 2006 and 16.10% in 2011, respectively. An increased EPS risk was observed in the users with metoclopramide for more than 5 days when compared to those with the drug for <5 days (15.49% vs 12.31%; p<0.0001). After adjusted for sex, age and commodity channel index, the association between an increased duration of metoclopramide prescription and an increased risk of EPS development was statistically significant (adjusted OR, 1.15; 95% CI, 1.11 to 1.20).
CONCLUSION: The present preliminary results showed that EPS events increase significantly after a more than 5-day prescription of metoclopramide in adult Taiwanese patients. Further investigation for the association between EPS and prescription doses needs to be elucidated.

Pharmacogenomics/Pharmacogenetics

442. Evaluation of the effects of obesity on the epigenome in acute myeloid leukemia patients: correlation with clinical outcome and drug response. *David DeRemer, Pharm.D., BCOP*[1], Megan Hartranft, Pharm.D., BCPS[2], Ashis Mondal, Ph.D.[3], Ravindra Kolhe, M.D. Ph.D[4], Bradley Phillips, Pharm.D., BCPS, FCPP[5]; (1) Clinical and Administrative Pharmacy, University of Georgia College of Pharmacy, Augusta, GA; (2)Department of Pharmacy Practice, Rosalind Franklin College of Pharmacy, Chicago, IL; (3)Department of Pathology, Georgia Regents University, Augusta, GA; (4)Department of Pathology, Georgia Regents University, Georgia Regents Cancer Center, Augusta, GA; (5) Clinical and Administrative Pharmacy, University of Georgia College of Pharmacy, Athens, GA
PURPOSE: Epidemiologic studies have even identified a link between obesity and several types of cancer, including leukemia. Previous studies have demonstrated that obese patients express particular epigenetic changes at key immune regulating genes. One of the hallmarks of acute myeloid leukemia (AML) is aberrant methylation of cytosine residues at CpG islands that results in gene transcriptional inactivation. This investigation sought to – (i) determine the effect of obesity on DNA methylation patterns in AML patients (ii) identify CpG sites where methylation patterns differs between obese and non-obese and (iii) evaluate specific genes which play a role in drug response.

METHODS: Cytogenetically normal AML patients (negative CKIT, CEPBA, and FLT-3, NPM1 mutation) who were to receive induction chemotherapy (anthracycline + cytarabine) were identified by a hospital database. Patients were characterized by obesity status (obese, BMI ≥30 kg/m2) and drug response (complete remission (CR), ≤ 5% blasts at day +14 bone marrow biopsy). DNA was extracted from paraffin-embedded bone marrow tissue from identified study patients (n = 12). We analyzed genome-wide methylation (GWM) profiles of over 450,000 cpGs by Illumina Infinium Human Methylation 450K Beadchip (Infinium®). Beta t-test was applied with probes with p-value<0.01 and absolute methylation difference >0.25 and probes with q-value <0.05 and absolute methylation difference >0.25 where q-value represents adjusted p-value for multiple comparisons.
RESULTS: A distinct differential methylation in obese patients who obtained a CR was confirmed when compared to non-responders. Differential methylation was focused on negative regulation of immune response; genes *PRKCZ, KCNQ1DN, BANP, PLEKHG4B and LYPD1* met the threshold for differential methylation (p<0.01). Also, a distinct differential methylation obese vs non-obese non-responders patient was demonstrated.
CONCLUSION: Our data highlights the importance of GVM analysis in understanding the difference of epigenetic differences between obese and non-obese patients with AML which could affect clinical outcome or drug response.

Pharmacokinetics/Pharmacodynamics/Drug Metabolism/Drug Delivery

443E. Validation of a dosing strategy for cefazolin for surgery requiring cardiopulmonary bypass. *Emily Heil, Pharm.D.*[1], Allison Hollis, Pharm.D.[1], David Nicolau, Pharm.D.[2], Patrick Odonokor, M.D.[1], Kerri Thom, M.D.[3], Thomas Dowling, Pharm.D., Ph.D.[4]; (1)University of Maryland Medical Center, Baltimore, MD; (2) Center for Anti-Infective Research and Design, Hartford, CT; (3) University of Maryland School of Medicine, Baltimore, MD; (4) Department of Pharmacy Practice and Science, University of Maryland, Baltimore, MD

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