2015 ACCP Virtual Poster Symposium

May 18–19

ORIGINAL RESEARCH

ADR/Drug Interactions

1. Drug-drug interactions assessment: potential to improve therapy outcomes in elderly Serbian patients with cardiovascular disease. *Milena Kovacevic, M.Pharm.*[1], Branislava Miljkovic, Ph.D.[1], Sandra Vezmar Kovacevic, Ph.D.[1], Slavica Radovanovic, Ph.D., M.D.[2]; (1) Department of Pharmacokinetics and Clinical Pharmacy, Faculty of Pharmacy, University of Belgrade, Belgrade, Serbia; (2) Medical Center Bezanijska Kosa, Serbia

OBJECTIVES: Cardiovascular disease (CVD) has a high prevalence in Serbian population, estimated to cause more than 50% of deaths. Drug-drug interactions (DDIs) considerably influence efficacy and safety of therapy, and result in increased morbidity and mortality. The aim was to assess the prevalence of clinically significant DDIs and identify the most common interacting drugs.

METHODS: A retrospective observational study was carried out in the Cardiology ward of Medical Center Bezanijska Kosa, Belgrade. Data for 100 patients aged ≥65 years with diagnosed CVD and prescribed ≥2 drugs during hospitalization, were collected from medical charts. DDIs were evaluated using *Lexicomp*® database. Data were analyzed using *MSOffice Excel 2010*.

RESULTS: A total of 877 prescriptions were recorded; the mean number of drugs per patient were 8.77 (2–14). Seventy interacting drugs contributed to 1269 clinically significant DDIs (risk rating C: monitor therapy 1156; D: consider therapy modification 106; X: avoid combination 7). Three patients received combination of amiodarone and ciprofloxacin, three clopidogrel and omeprazole, and one amiodarone and fluoxetine. These DDIs were of major severity and named coadministration should be avoided. Out of 70 interacting drugs, 32 (42.51%) were used in therapy for diseases of C-Cardiovascular system, A-Alimentary tract and metabolism 9 (12.86%), B-Blood and blood forming organs 8 (11.43%), N-Nervous system 6 (8.57%), R-Respiratory system 6 (8.57%), J-Anti-infectives for systemic use 4 (5.71%), H-Systemic hormonal preparations, excluding reproductive hormones and insulins 3 (4.29%) and M-Musculoskeletal system 2 (2.86%).

CONCLUSION: DDIs are common in a population of patients with CVD. Some DDIs are preferable, because of additive or synergistic antihypertensive effect (mostly in group C), but others (group D and X) require additional checks and therapeutic alternatives should be selected cautiously. A broader overall assessment of patient's therapy should be performed to minimize the risk to patient and improve outcomes of CVD therapy.

Ambulatory Care

2. Diabetes outcomes: comparison of patient assistance programs to 340B drug pricing. *Laura Challen, Pharm.D., MBA, BCPS, BCACP*[1], Christine Kelso, Pharm.D., BCPS, AE-C[2], Heather Pautler, Pharm.D., BCPS[3], Grace Benanti, Pharm.D. Candidate[4]; (1) Department of Pharmacy Practice, St. Louis College of Pharmacy, St. Louis, MO; (2) Barnes-Jewish Hospital; (3) Department of Pharmacy, Barnes-Jewish Hospital; (4) St. Louis College of Pharmacy

OBJECTIVES: For patients who cannot afford medications, patient assistance programs (PAPs) or federally discounted 340B drug pricing offers a means of providing medications at low or no cost. Previous studies have shown improved health outcomes for patients enrolled in PAP programs, but have not compared outcomes of PAP vs 340B patients. Our purpose was to determine whether primary care medicine clinic (PCMC) patients who receive insulin from PAPs have an improved change in A1c compared with patients who receive insulins through 340B. Secondary outcomes included change in serum creatinine (SCr), body mass index (BMI), number of hospital admissions, and adherence calculated as proportion of days covered (PDC).

METHODS: This was a retrospective, single-centered, observational study of PCMC adult, uninsured patients in a large hospital system who were prescribed and obtained insulin therapy through a PAP or 340B between June 1, 2012 and June 1, 2013. Patients were included if they saw a PCMC physician at least twice and obtained insulin from the hospital's retail pharmacy.

RESULTS: Of 113 patients, 99 met inclusion criteria. The baseline and changes in A1c for PAP patients were similar to 340B patients (10.3% vs 9.3%) (-0.52 ± 2.67 vs -0.3 ± 2.32, $p = 0.66$). Baseline and changes in SCr (1.0 vs 0.99) (0.08 ± 0.26 vs 0.08 ± 0.40, $p = 0.93$) and BMI (34.0 vs 33.9) (0.15 ± 2.29 vs 0.10 ± 2.16, $p = 0.89$) were also similar. PAP and 340B patients had a similar number of hospital admissions (1.23 ± 2.08 vs 1.48 ± 2.66, $p = 0.612$). Similarities were also noted with number of antihyperglycemic medications (2.04 ± 0.72 vs 1.96 ± 0.76, $p = 0.59$) and number of PCMC physician visits (7.59 ± 5.16 vs 7.82 ± 5.73, $p = 0.83$). PDC values averaged 0.74 in PAP patients, and 0.72 in 340B patients ($p = 0.93$).

CONCLUSION: Though we found no significant differences, this study may serve as a platform for future research.

3. Reducing the use of clonidine for hypertensive urgency in ambulatory care clinics. *Christine Chim, Pharm.D.*[1], Regina Ginzburg, Pharm.D.[2], Erica Dimitropoulos, Pharmacy Student[1]; (1) College of Pharmacy & Health Sciences, St. John's University, Queens, NY; (2) St. John's University, Queens, NY

OBJECTIVES: The primary objective is to achieve decreased rates of ordering clonidine for immediate treatment in the office. A secondary objective is to determine if reduced clonidine use led to a decline in adverse events documented within one week of the hypertensive urgency visit date.

METHODS: A protocol and algorithm was developed by clinical pharmacists to guide primary care providers in urban health clinics on the appropriate management of hypertensive urgencies encountered in the office. The protocol included the provision of avoiding short-acting antihypertensives (i.e. clonidine) in these situations. After approval of the protocol by the institution's Pharmacy and Therapeutics Committee, the clinical pharmacists provided an in-service within their respective health centers. Additionally, an electronic memorandum was posted to inform providers of the new protocol. An initial report was generated to determine the number of times clonidine was administered in the office, nine months prior to protocol implementation. A second report was generated nine months post-implementation to determine whether clonidine orders were reduced. Electronic health charts were also reviewed for documentation of adverse events within one week of hypertensive urgency visit date.

RESULTS: During the nine months prior to protocol implementation, there were 118 orders for clonidine administration. Eight patients were sent to the emergency department for additional management of post-clonidine administration. There were 89 orders for clonidine administration post-intervention. Fourteen patients were advised to go to the ED for additional management but eight patients refused. One patient was admitted into the hospital five days after one of these encounters due to continued hypertensive urgency. No adverse effects resulted from in-office clonidine administration in either cohort of patients.

CONCLUSION: The hypertensive urgency protocol and education reduced the number of in-office clonidine orders and hospital admissions. Although there were no adverse effects, the increase in ED referrals requires further assessment.

4. 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]; (1) Department of Pharmaceutical Services, Beaumont Hospital, Royal Oak, MI; (2) Beaumont Hospital, Royal Oak, MI

Was accepted for 2014 ACCP Annual Fall meeting, was not presented, but was published in *Pharmacotherapy* abstract proceedings: Pharmacotherapy 2014;34(10).

5. Evaluation of University of California Davis Medical Center (UCDMC) pharmacy prescription renewal clinic's intervention on LDL-cholesterol of primary care patients. *Josephine Quach, Pharm.D.*[1], Stacy Knox, Pharm.D., BCPS, BCACP[1]; (1) Pharmacy, University of California Davis Medical Center, Sacramento, CA
OBJECTIVES: The purpose of this study was to assess the Refill Clinic's intervention on statin therapy of primary care patients followed at UCDMC.
METHODS: This was a single center, retrospective study at UCDMC evaluating change in LDL levels of patients on statin therapy following pharmacist intervention. Patients were identified by the Refill Clinic when a prescription request for statin therapy was received. Per protocol, if the most recent lipid panel was measured more than 12 months before the request was received, the authorizing physician was contacted for further instructions and the intervention was documented. The primary investigator retrospectively reviewed whether pharmacist intervention led to improvement in LDL.
RESULTS: Between May 1 and December 30, 2013, 138 interventions were documented. The most commonly requested statin was simvastatin (n = 63). 43% of the physicians accepted the intervention by authorizing the prescription refill and ordering a new lipid panel (n = 60). Of the 138 interventions, 68% (n = 95) of patients had lipid panels drawn, 23% (n = 32) had no post-intervention labs ordered, 0.03% (n = 4) had statin therapy discontinued, and 0.05% (n = 7) were lost to care. A large percentage of patients with two points-of-reference witnessed a decrease in LDL (62.1%, n = 59). The average change in LDL was assessed using the paired t-test, which demonstrated the average change in LDL was −4% and the absolute difference in LDL was −9.26 (p = 0.0022).
CONCLUSION: Although physicians were contacted regarding patient's overdue lipid panels, some physicians authorized refills without requiring new labs, authorized refills and required labs but didn't order labs, or order them but patient didn't get post-intervention labs drawn. Patients whose lipid panels were drawn after the Refill Clinic's intervention demonstrated a significant average decrease of 4%. Most physicians were accepting of our intervention and recommendations but potential areas of improvement can be made to the Refill Clinic protocol.

6. Clinical impact and patient satisfaction with pharmacist preformed Medicare annual wellness visits. *Megan Dorrell, Pharm.D., BCPS*[1]; (1) Pharmacy Department, Community Health Network, Indianapolis, IN
Presented at the Society of Teachers of Family Medicine Conference on Practice Improvement, Tampa, FL, December 4–7, 2014.

Cardiovascular

7. Prevalence of peripheral arterial disease and diabetes. *Janis Vella, B.Pharm., M.Sc.*[1]; (1) Department of Pharmacy, University of Malta, Msida, Malta
OBJECTIVES: One of the major risk factors for developing peripheral arterial disease (PAD) is diabetes. Diabetic patients suffering from PAD are at an increased risk of lower extremity amputations due to poor healing of infected foot ulcers. The aim of this study was to assess the degree of PAD and the presence or absence of diabetes in a group of patients admitted for lower limb amputation procedures in Malta.
METHODS: The medical history was compiled for a group of patients admitted at Mater Dei Hospital over a 6-month period. Social and demographic data for these patients was noted. The presence and severity of PAD was determined by Ankle Brachial Pressure Indices and results from spectral waveform analysis.
RESULTS: A total of 38 patients were included (26 male, 12 female). The mean age of these patients was 69 years (range: 28–92 years). The majority of patients (n = 31) had type 2 diabetes while 3 patients had type 1 diabetes. Four patients did not suffer from diabetes. Twenty-two patients had severe PAD while 6 patients suffered from mild to moderate PAD.
CONCLUSION: The presence of PAD and diabetes are major risk factors for lower limb amputations in this group of patients. Further work aims to identify risk factors leading to the need of lower limb amputations and establishing better dosing schedules of antibiotics to treat developing foot infections in these patients.

Critical Care

8. Efficacy of phenobarbital vs clinical institute withdrawal assessment in treating severe alcohol withdrawal: a comparison of a prophylactic vs reactive approach. *Rachel Foster, Pharm.D.*[1]; (1) Pharmacy Department, Eastern Maine Medical Center, Bangor, ME
OBJECTIVES: The purpose of this study was to compare the need for mechanical ventilation in patients with severe alcohol withdrawal syndrome (AWS) who failed the clinical institute withdrawal assessment (CIWA) protocol, required a transfer in level of care to a critical care (CC) unit, and either continued on CIWA or received phenobarbital (PB) therapy.
METHODS: This study was performed retrospectively. The control patients continued on the CIWA protocol upon transfer to critical care. The study patients were started on phenobarbital upon transfer to critical care. Inclusion criteria consisted of: adult medical/surgical patients transferred to a critical care unit for treatment of severe AWS after receiving a CIWA score of >16. Exclusion criteria consisted of: patients <18 years old, patients admitted to critical care for reasons other than severe AWS, and patients intubated before transfer to critical care. Fisher's exact test used to analyze categorical data and t-test was used to analyze continuous data.
RESULTS: Patient demographics were similar between the groups. The phenobarbital group included 38 patients; the CIWA group included 60 patients. Five (13%) patients in the phenobarbital group were intubated compared to 14 (23.3%) patients in the CIWA group (p-value 0.2961). Two (5%) patients in the phenobarbital group and 3 (5%) people in the CIWA group experienced a seizure. Length of hospital stay in the phenobarbital group was 12.6 days vs 15 days in the CIWA group (p-value 0.2620). Average sedatives used before and after enrollment in the study were similar between both groups. Documented sedatives included benzodiazepines, opioids, antipsychotics, antiepileptics, alpha agonists and propofol.
CONCLUSION: The need for mechanical ventilation and length of hospital stay in patients who received phenobarbital vs CIWA protocol for treatment of severe AWS were similar.

9. Mortality outcome assessment of the Surgical Care Improvement Project-Card-2 measure. *Kent Owusu, Pharm.D., BCPS*[1], Paul Staffieri, Pharm.D.[1], Sara Cohn, Pharm.D., BCPS[1]; (1) Department of Pharmacy, Yale-New Haven Hospital, New Haven, CT
Abstract presented at Eastern States Regional Conference, Hershey, PA, May 5, 2014.

Education/Training

10. Students' and preceptors' view of professionalism during introductory and advanced pharmacy practice experiences. *Kali VanLangen, Pharm.D.*[1], Abigail Fish, Pharm.D.[1]; (1) College of Pharmacy, Ferris State University, Grand Rapids, MI

OBJECTIVES: To determine students and preceptors views of student professionalism during introductory and advanced pharmacy practice experiences.
METHODS: An electronic survey was distributed to all students enrolled in the second, third, and fourth professional years in the College of Pharmacy. An electronic survey was also sent to all preceptors that currently take students on introductory and/or advanced pharmacy practice experiences. The surveys consisted of questions based on a five point Likert scale (strongly agree to strongly disagree) and a ranking of traits (1 – very concerning to 10 – not concerning).
RESULTS: A total of 136 (37%) students and 235 (38%) preceptors completed the professionalism surveys. Students and preceptors had similar views on appearance and communication skills. Students and preceptors had differing views on the use of electronic devices and time management. A statistical difference was seen between student and preceptor responses in relation to the benefit of students completing a professionalism course prior to starting pharmacy practice experiences (p value of < 0.001). No statistical difference was seen in students views of professionalism based on professional year.
CONCLUSION: Students and preceptors have similar views regarding students' appearance and communication skills but have differing view on the use of electronic devices and time management. Preceptors do believe there is value in students completing a course on professionalism prior to starting pharmacy practice experiences.

ACCP Virtual Symposium Abstract: (Original Research; Student-Led Investigation)

11. Using simulation for instruction of rapid-sequence intubation and reinforcing basic life support among third-year Pharm.D. students *Elias Bassil, Bachelor of Science in Pharmaceutical Sciences*[1], Michael Peeters, Doctor of Pharmacy[1], Martin Ohlinger, Doctor of Pharmacy[1], Kimberly Zitko, Bachelor of Science in Pharmaceutical Sciences[1], Kimberly Schmude, Doctor of Pharmacy[1], Jeffrey Schneiderman, NREMT-P[1], Chen Yixing, Masters of Public Health[1]; (1) The University of Toledo College of Pharmacy and Pharmaceutical Sciences
OBJECTIVES: A literature search of rapid-sequence intubation' (RSI) education among pharmacy students yielded no results; we created a simulation-based module to teach this content. Our objective was to characterize the instruction of RSI, and reinforcement of basic life support (BLS), into a newly developed laboratory module for third-year Pharm.D. students.
METHODS: This investigation was IRB-approved. A newly created laboratory module on RSI and BLS was implemented into a Pharm.D. program's third year. Before lab, a required RSI reading was assigned, with an accompanying online quiz; BLS content was also reviewed independently (students were BLS-certified previous summer).The lab was 90 minutes, with two stations (RSI & BLS). For two lab days, 89 students were initially divided into 2 groups (i.e. 4 groups of ~24 students).Students were then allocated into 1 of 2 concurrent stations (i.e. 12 students/station). After RSI was explained and demonstrated, the first group of 12 students worked on cases employing various RSI medications and practiced intubating head/torso mannequins. The other station reinforced BLS skills and was further divided into two sub-groups of 6 students; one sub-group worked on their CPR quality with simulator feedback, while the other sub-group worked through community- and clinic-based high-fidelity simulation cases. Student perception questionnaires (5-items on Dreyfus-scale) were administered before and after this lab. The Dreyfus scale was analyzed with a Rasch Measurement Model.
RESULTS: Eighty-nine third-year Pharm.D. students participated. The pre- and post-lab questionnaire scores were 1.48/0.71 and 3.08/0.81 (mean/SD), with 0.98 reliability (Cronbach's alpha); the difference ($p < 0.001$, t-test or Mann-Whitney U) had a very-large 2.1 effect size (Cohen's d). The Rasch analysis demonstrated good Dreyfus-scale function. For this lab, numerous students commented positively ("interesting", "helpful") within their entire-semester course evaluations.
CONCLUSION: This RSI & BLS simulation lab was successfully implemented into a Pharm.D. program's third year. Overwhelmingly, students found this simulation helped them learn/integrate this important emergent-care content.

12. Evaluating the patient-education outcome of warfarin-related health literacy in a pharmacist-based warfarin clinic – experience in a regional hospital in Taiwan. *Ming-Der Chao, M.S.*[1], Hsiu-Chen Chan, M.S.[1], Lung Chan, M.D., MsD[2], Xuet-Yit Chen, Pharmacy Student[3], Hsuan-Tung Cho, Pharmacy Student[3], Chun-Tse Lin, Pharmacy Student[3], Kuan-Wei Chan, Pharmacy Student[3], Yu-Mei Lin, M.S.[1], Wuan-Jin Leu, M.S.[1]; (1) Department of Pharmacy, Taipei Medical University - Shuang Ho Hospital, New Taipei City, Taiwan; (2) Department of Neurology, Taipei Medical University - Shuang Ho Hospital, New Taipei City, Taiwan; (3) School of Pharmacy, Taipei Medical University, Taipei City, Taiwan
OBJECTIVES: We assessed warfarin-related health literacy in patients who were under warfarin treatment and followed in neurology clinics and regularly visited the pharmacist-based Warfarin clinic of a regional hospital in Taiwan.
METHODS: This is a cross-sectional study. A questionnaire including five categories of warfarin literacy was used to detect patient's knowledge, attitude, and practice. All patients filled the questionnaires by themselves (IADL scale > 7) or caregivers (IADL scale < 7).
RESULTS: There were 32 patients participating in this study. In this test, patients with TTR >75% in the past 1 year were classified as good INR control group and the others were grouped as poor INR control. There were no difference in this test between the 2 groups in categories of thromboembolism-related disease information, INR, side effect of warfarin and drug-drug/-food interactions except in issues of drug usage and storage (70.94% vs 60.44%). Relative well warfarin-related knowledge was noted in good INR control group (69.9% vs 54.5%, compared with poor INR control group) that were related to neither their educational background nor age. Further investigations of questions with significant differences between these groups were done, and we found that patients with good INR control has more alerts in taking right warfarin dosage (83.3% vs 28.6%), over/under therapeutic effect of anticoagulants (72.2% vs 35.7%), and well known of their targeted INR range (72.2% vs 28.6%).
CONCLUSION: All these patients were followed in a pharmacist-based warfarin clinic that there were total 61 patients regularly visited in the past year. We inspected the patient-education outcome through this study that demonstrated their association with warfarin adherence and TTR. Also, results of this investigation indicated the deficits in knowledge and practice regarding warfarin treatment in our patients.

Emergency Medicine

13. Comparison of 3-factor and 4-factor prothrombin complex concentrates for the reversal of warfarin in emergency situations. *Laura Zane, Pharm.D.*[1], Marc Reichert, Pharm.D., BCPS[2]; (1) Department of Pharmacy, Vidant Medical Center, Greenville, NC; (2) Wake Forest Baptist Medical Center, Winston-Salem, NC
OBJECTIVES: Evidence suggests 3-factor prothrombin complex concentrates (3-PCC) and 4-factor prothrombin complex concentrates (4-PCC) are more efficient at reversing warfarin than fresh frozen plasma (FFP). However, no studies directly compare the two. The objective of this study is to compare the safety and efficacy of 3-PCC vs 4-PCC for INR reversal in subjects taking warfarin that present with a life-threatening bleed.

METHODS: This retrospective, single-center, case-matched study included adults taking warfarin with an INR >1.5 who received 3-PCC or 4-PCC. Subjects were matched on indication for warfarin reversal and age. Exclusion criteria were pregnancy and missing follow-up INR. A sample size of 41 subjects per group would provide 80% power to detect a 20% difference between groups with an alpha < 0.05. The primary outcome was percentage of subjects with INR reversal to <1.5 after one dose of factor product. Secondary outcomes included overall mortality, length of stay, and adverse events (DVT, PE, MI, stroke, and rebleed). Descriptive statistics were used for baseline characteristics and Fisher's exact, Chi-square, and Mann-Whitney U tests were used for primary and secondary outcomes.
RESULTS: Of the 75 subjects meeting inclusion criteria, 20 per group were available for primary analysis. Percentage of INR reversal was similar, 80% vs 70% (p = 0.47) in the 3-PCC and 4-PCC groups respectively. There was no statistical difference in the secondary outcomes of mortality, length of stay and adverse events. Mortality was slightly higher in the 4-PCC group, 20% vs 10% (p = 0.66). Of the subjects that survived until discharge, length of stay was shorter in the 4-PCC group, 6.2 vs 7.5 days (p = 0.09). One subject in the 4-PCC group experienced a rebleed.
CONCLUSION: 3-PCC appears to be safe and effective compared to 4-PCC for INR reversal. Results are limited by the small sample size and further studies are needed.

Gastroenterology

14. Pentoxifylline in combination with metformin in the treatment of non-alcoholic steatohepatitis. *Milica Culafic, M.Sc. ClinPharm*[1], Sandra Vezmar Kovacevic, Ph.D.[1], Milos Stulic, M.D.[2,3], Aleksandra Krstic, M.D.[2,3], Katarina Vucicevic, Ph.D.[1], Branislava Miljkovic, Ph.D.[1], Djordje Culafic, M.D., Ph.D.[2,3]; (1) Department of Pharmacokinetics and Clinical Pharmacy, Faculty of Pharmacy, University of Belgrade, Serbia; (2) Clinic of Gastroenterology and Hepatology, Clinical Center of Serbia; (3) School of Medicine, University of Belgrade, Belgrade, Serbia
OBJECTIVES: This study aimed to evaluate the efficacy of pentoxifylline and metformin in the treatment of nondiabetic patients with non-alcoholic steatohepatitis (NASH).
METHODS: Patients were recruited on an outpatient basis between January 2013 and February 2014. Diagnosis was based on medical history, physical examination, and liver ultrasound imaging, performed during the screening visit. For all 25 patients NASH was confirmed by liver biopsy. Blood tests were checked at baseline and every three months. Insulin resistance was assessed by the homeostasis model assessment (HOMA-IR). Pentoxifylline 400 mg three times a day and metformin 500 mg three times a day were administered for 24 weeks. The efficacy of the treatment was assessed based on biochemical results.
RESULTS: All 25 patients (mean age 38.76 ± 11.2 years, 18 male/7 female) completed 24 weeks of treatment. Most patients lost weight, 3.5 kg in average. We detected improvement after treatment for the following parameters: alanine aminotransferase decreased by 12 IU/L (p < 0.001), aspartate aminotransferase decreased by 6 IU/L (p = 0.02), gamma-glutamyl transferase decreased by 7 IU/L (p = 0.05). The mean glycosylated hemoglobin (HbA1c) decreased from 5.47% before treatment to 5.2% after the treatment (p = 0.02). HOMA-IR score improved after treatment decreasing by 1.3 (p = 0.03). Furthermore, mean serum uric acid levels showed significant decrease by 33.21 micromol/L (p = 0.01).
CONCLUSION: Pentoxifylline and metformin combination therapy led to a decrease in serum transaminases and serum uric acid levels, and to an improvement in HbA1c and HOMA-IR in nondiabetic patients with NASH, presumably by its anti-inflammatory properties and effects in causing weight loss.

Geriatrics

15. How much our geriatrics know about their medications and the potential of inappropriate medications (PIMs). *Sanaa Mekdad, B.S. and Board Certified and Student at Master Degree*[1], *Adher Alsayed, M.D.*[2], Leenah Alsayed, B.S.[3]; (1) Pharmacy Department, KFMC, Riyadh, Saudi Arabia; (2) Oncology Department, KFSH&RC, Riyadh, Saudi Arabia; (3) School of Pharmacy, King Saud University, Riyadh, Saudi Arabia
BACKGROUND: The geriatric patients (GP) population is increasing. They are at risk of multiple medical problems. Polypharmacy is common and hence are prone to PIMs and MRPs.
OBJECTIVES: Measure the knowledge of GP about prescription medications (PM).Use of non-prescription medications (OTC). Assess the rate of (PIMs) and (MRPs).
METHODS: Prospective study conducted at King Fahad Medical City from Jan 2014 to 30 Oct 2014. A Geriatric Certified Pharmacist (CGP) interviewed the patients and caregivers during a pharmacy visit and reviewed all medications. Patients' knowledge was assessed using a validated Medication Knowledge Assessment Questionnaire (MKAQ). Data was reviewed for the presence of PIMs and MRPs. Stop\Start criteria, and Medication Appropriateness Index was used with 2012 AGS Beers Criteria for PIMs.
RESULTS: 365 GP (≥65 years) were included. The mean age of the GP was 70.8 years. Rate of illiteracy was 202 (55.3%). 300 GP (82.2%) had poly pharmacy. 75 (20.5%) were taking (OTC) medications. 75 (20.5%) were taking high alert medications, 30 (8.2%) were on medications with low therapeutic index. GP knowledge of PM was poor (90% did not know the name or side effects of their medications, 75% did not know indication, 45% did not know the direction of use. Education levels and age were negatively associated with knowledge. 140 (38.35%) had MRPs. 9.5% had medication errors, 90 (24.6%) needed an intervention.
CONCLUSION: The study confirmed the poor knowledge about PM in the GP. The majority of GP are on poly pharmacy and commonly use OTC and herbal medications. A structured review of medication revealed that MRPs are common almost 40%. Regular medication review by a CGP should be routine in care of GP. It will help in optimizing patient safety and minimizing toxicity of medications in this increasing population of senior patients.

16. Evaluation of drug-related problems in geriatric patients with polypharmacy in India. *Divya Asavadi, IV, Doctor of Pharmacy*[1], Mohanraj Rathinavelu, Doctor of Pharmacy[1]; (1) Department of Pharmacy Practice, Raghavendra Institute of Pharmaceutical Education & Research, Ananthapuramu, India
OBJECTIVES: Although pharmacotherapy for the elderly can treat disease and improve well-being, its benefits can be compromised by drug related problems. The objectives of the present study were to examine the number and nature of drug related problem in geriatric patients receiving polypharmacy and to demonstrate the role of pharmacist in ensuring safe and efficient use of medicine in daily practices in the inpatient setting.
METHODS: A prospective cross sectional study was carried out for 6 months period in the general medicine department of a 500-bed multispecialty private corporate hospital. Geriatric patients meeting the poly-pharmacy criteria were included in the study. DRPs were assessed using PNCE (Pharmaceutical Care Network Europe Foundation) classification system. Medications most frequently associated with DRPs and the drug risk ratio was calculated.
RESULTS: A total of 186 DRPs were identified in 490 medication orders of 45 geriatric patients. Mean number of DRPs was 4.13 ± 0.34 per patient. The drug class with frequently reported DRPs were anti-hypertensives (30.10%), antiasthmatics (15.05%), anxiolytics (12.09%), and antithrombotic drugs (8.06%). Drug interaction (31.18%) and over-dosage (23.11%) were identified as

most common DRPs. Drug risk ratio was the highest with anxiolytics (1), anti-asthmatics (0.56), anti- thrombotic (0.5) and antihypertensive (0.45) medications.
CONCLUSION: The fact that most of the DRPs recorded in the present study were of clinical significance lends support to activity including clinical pharmacist in drug risk ratio. Age, polypharmacy, severity of disease has a significant association with the risk measures.

Health Services Research

17. Impact of online personal health record use on patients with type 2 diabetes. *Kevin T. Fuji, Pharm.D., M.A.*[1], Amy Abbott, Ph.D., RN[1], Kimberly Galt, Pharm.D., Ph.D.[1]; (1) Center for Health Services Research and Patient Safety, Creighton University, Omaha, NE
OBJECTIVES: To examine how online personal health record (PHR) use by patients with type 2 diabetes impacts their hemoglobin A1c (HbA1c) and social cognitive outcomes.
METHODS: An intervention mixed methods design was used. 140 participants with type 2 diabetes were randomized to a control group (usual care) or a PHR group who used Microsoft HealthVault to manage their diabetes-related health information. HbA1c and social cognitive outcomes (modifying factors for diabetes self-management; diabetes knowledge; and self-efficacy) were compared at baseline and 3–6 months later. HbA1c was obtained from medical records. Social cognitive outcomes were obtained from a patient survey and scored from 1–5 (higher scores indicated more positive responses). Interviews were conducted with all PHR group members to explore how participants engaged with the PHR.
RESULTS: 117 participants completed the study (61 control, 56 PHR). Neither group experienced a significant change in HbA1c (control: 7.53% ± 1.53% to 7.75% ± 1.22%, p = .252; PHR: 7.86% ± 1.96% to 7.98% ± 2.01%, p = .535) or in the social cognitive outcomes of modifying factors (control: 3.78 to 3.70, p = .204; PHR: 3.78 to 3.83, p = .379) and self-efficacy (control: 3.77 to 3.80, p = .317; PHR: 3.82 to 3.83, p = .657). While no significant change in diabetes knowledge was found in the control group (4.13 to 4.19, p = .254), the PHR group experienced significant improvement (4.11 to 4.25, p = .029). Qualitative analysis revealed positive PHR experiences (use as a complete and accessible record and a stimulus for behavioral change) and barriers inhibiting use (usability problems and lack of a perceived value add).
CONCLUSION: Pharmacists frequently assist patients with medication self-management. As PHRs become increasingly used for self-management purposes, pharmacists must understand the benefits and current limitations of these technologies. While the PHR has potential to enhance diabetes self-management and lead to long-term improvement in clinical outcomes, barriers identified in the study must be addressed to facilitate optimal PHR use.

Hematology/Anticoagulation

18. Evaluation of a pharmacist-managed warfarin dosing protocol at an acute care facility. *Aaron Shaver, Pharm.D. Candidate*[1], *Jacqueline L. Olin, M.S., Pharm.D., BCPS, FCCP*[1], Gwen Mitchell, Pharm.D., BCPS[2], Jessica Valentine, Pharm.D.[3]; (1) Wingate University School of Pharmacy, Wingate, NC; (2) Department of Pharmacy, Novant Health Matthews Medical Center, Matthews, NC; (3) Novant Health Charlotte Orthopedic Hospital, Charlotte, NC
OBJECTIVES: Managing warfarin can be challenging in an inpatient setting due to acuity of illness, interacting medications, and interruptions due to procedures. This study was conducted to evaluate a newly implemented institutional Collaborative Practice Inpatient Warfarin Dosing program. The protocol allows providers to order a 'pharmacy to dose warfarin' consultation on all admitted patients, which allows pharmacists to manage warfarin and adjust doses at their discretion.
METHODS: From September to December 2014, patients that received warfarin in the inpatient setting, and had documentation of pharmacist intervention were identified. Of these patients, those that received at least one dose of warfarin with an order for 'pharmacy to dose' met the inclusion criteria and were observed. Retrospectively, data were collected including demographics, indication for warfarin therapy, INR values, presence of bleeding/clotting episodes, use of phytonadione, and interacting medications.
RESULTS: A total of 69 patients were evaluated, with 79.7% continuing warfarin from prior to admission. The average percent time in therapeutic range (TTR) among the pharmacist-managed warfarin cases was 41%. Thirteen patients maintained TTR of 100%. Newly initiated interacting antibiotics were noted in 28 patients. Of those 28, 54% maintained TTR <50% of the time.
CONCLUSION: Many factors associated with inpatient care including interacting medications and acuity of care cause complexity with maintaining a TTR >50%. Data observed with this protocol were consistent across our facilities and similar to those observed with provider maintenance. These data provide a baseline benchmark for the facility. Further analysis of data will allow for optimal implementation of the protocol. By allowing clinical pharmacists to manage inpatient warfarin therapy there can be a more consistent effort to ensure these factors do not negatively impact patient outcomes.

Herbal/Complementary Medicine

19. Rhein elicits in vitro cytotoxicity in primary human liver HL-7702 cells by inducing apoptosis via mitochondria-mediated pathway. *Guy-Armel Bounda, B.Sc. (Pharm), M.Sc. (Clin, Pharm), Ph.D., Candidate (Clin, Pharm)*[1], Wang Zhou, B.Sc., Master Candidate[2], Dan-dan Wang, B.Sc., Master Candidate[2], Feng Yu, Ph.D.[1,2,3]; (1) Department of Clinical Pharmacy, China Pharmaceutical University, Nanjing, China; (2) Department of Pharmacology, China Pharmaceutical University, Nanjing, China; (3) Key Laboratory of Drug Quality Control and Pharmacovigilance, China Pharmaceutical University, Nanjing, China
OBJECTIVES: Rhein is a natural anthraquinone molecule enriched in the rhizome of *Polygonum multiflorum*, with various bioactivities such as anti-tumor, antibacterial, anti-inflammation and anti-aging. However, liver injuries induced by *Polygonum multiflorum* have been raising serious concern in recent years, and the mechanisms are still not fully elucidated. The aim of this study was to assess rhein-induced apoptosis and to investigate its molecular mechanisms in primary human hepatic HL-7702 cells.
METHODS: Cell viability, cytotoxicity, morphological, flow cytometry, qRT-PCR and Western blot assays were performed in order to observe alterations of primary human hepatic cell survival or death related pathways mechanism.
RESULTS: Cell viability of HL-7702 cells treated with rhein showed significant decrease in dose-dependent manner. After exposure cells to rhein (25 μmol/L, 50 μmol/L, 100 μmol/L) for 12 h, the detection of apoptotic cells were significantly analyzed by flow cytometry and nuclear morphological changes by Hoechst 33258, respectively. Lipoapoptosis and fatty degeneration studies showed an up-regulation level of the hepatic triglyceride (TG), total cholesterol (TC), hydroxymethylglutaryl coenzyme A reductase (HMGCR) and acetyl coenzyme-A carboxylase (ACoAC) in a dose-dependent manner ($p < 0.001$). Caspase activities expressed significant up-regulation of caspase-3, -9, and -8. Overproduction of reactive oxygen species, lipid peroxidation and loss of mitochondrial membrane potential were detected by fluorometry ($p < 0.001$). Furthermore, real-time qPCR results showed significant up-regulation of p53, PUMA, Apaf-1, Casp-9 and -3 mRNA, with no significant changes of Fas and cytochrome *c*. Immunoblotting revealed significant cytochrome *c*

release from mitochondria into cytosol, and no change in Fas expression.
CONCLUSION: Taken together, these observations suggested rhein could induce apoptosis in HL-7702 cells via mitochondria-mediated signal pathway with involvement of oxidative stress mechanism. These findings provide a mechanistic explanation for the hepatotoxicity of rhein in drug-induced oxidative liver injury from herbal medicine. To our knowledge, this is the first report of rhein-induced apoptosis in primary human hepatic HL-7702 cells.

20. *Gymnema sylvestre* extract improving liver function in genetic metabolic syndrome model animal. *Hong Luo, M.D./Ph.D.*[1,2], St Liu, N/A[3], Yi Ryuu, M.S.[4,5]; (1) Global Science Institute/Global Culture Education Center, GSCP, Japan; (2) CAMS/PUMC, China; (3) Faculty of Pharmaceutical Sciences, Okayama University, Japan; (4) GSCP, Japan; (5) USTB, China
OBJECTIVES: Metabolic syndrome is a cluster of metabolic abnormalities. As liver is a mainly metabolic organ, protecting the liver function in the syndrome is very important. The aim of this work was to find the method.In our previous studies, gymnemate extracted from traditional herb of *Gymnema sylvestre*, improved glucose and lipid metabolism, which was a good candidate. The Otsuka Long-Evans Tokushima Fatty (OLETF) rat, a genetic metabolic syndrome animal model, exhibits a progressive overweight, hyperlipidemia, hyperglycemia, fatty liver, etc. The protecting effects of *Gymnema sylvestre* extract on the liver function of OLETF were studied.
METHODS: The animals were divided into 3 groups: (i) GW group in OLETF, *Gymnema sylvestre* water extract (GW) was mixture in diet (62.5 g/kg) for 2 weeks. General diet was fed for 3 weeks following GW treatment to observe if it rebound, (ii) control of OLETF and (iii) the counterpart Long-Evans Tokushima Otsuka rats (LETO) as normal control. The enzymes of hepatic function were detected.
RESULTS: The serum levels of hepatic function enzymes alanine aminotransferase (ALT) and aspartate aminotransferase (AST) were significantly increased in OLETF group. In GW treated OLETF group, the ALT and AST were returned to normal levels that no significant different with LETO (normal control) group. The effects were continuous even GW withdrawn without rebound.
CONCLUSION: *Gymnema sylvestre* could improve liver function, which could be useful method for prevention and treatment of metabolic syndrome by improving liver metabolism.

Infectious Diseases

21. Timing of the first dose antimicrobials in a community cancer hospital. *Inna Tsuker, B.S., Pharm.D., BCPS*[1], Joanne McGovern, RN, BSN, CCRN[2]; (1) Department of Pharmacy, Cancer Treatment Centers of America, Eastern Regional Medical Center, Philadelphia, PA; (2) Department of Nursing, Cancer Treatment Centers of America, Eastern Regional Medical Center, Philadelphia, PA
OBJECTIVES: This collaboration between the Departments of Pharmacy and Nursing aimed to improve timely administration of first dose antimicrobials at a cancer hospital to facilitate the treatment. The goal for the Department of Pharmacy was to deliver antimicrobials in ≤30 minutes from the order entry. Department of Nursing goal was to administer first dose antimicrobials within ≤60 minutes from the order entry.
METHODS: Prospective, observational study included all first dose antimicrobial cases over 12 months. The times of order entry, order verification, delivery, and administration were collected. The times were analyzed for "all orders administered" and for the "first antimicrobial order administered."
RESULTS: A total of 472 antimicrobial start cases were reviewed. Antimicrobials were ordered STAT in 20.8%. Majority of the orders (82%) were initiated between 7 am and 10 pm. Pharmacy met this goal 6 months out of a year, with more consistent results in the end of the year. Hospital goal was met 9 months out of a year. Average time from order entry to delivery was 32 minutes for all orders and 27 minutes for STAT orders. Average time from order entry to first antimicrobial administered was 55 min for all orders and 43 minutes for STAT orders. For STAT orders, order entry to delivery time ranged from 2 minutes to 90 minutes, with the majority of the cases falling within 30 minutes. Average time from delivery to administration of first doses was 23 and 17 minutes for all and STAT orders respectively. Efficiency flowcharts were developed and shared with staff for improvement.
CONCLUSION: Both departments' goals were met by the end of the study. Education raised staff awareness about STAT orders, antimicrobial compatibility, and policies about turnaround times. Department of Pharmacy works with Clinical Informatics to assure a continual monitoring of the proper antimicrobial timing in the hospital.

22. Impact of evidence-based guidelines for management of *Clostridium difficile* infection. *Brian Skinner, Pharm.D. Candidate*[1], Ryan Medas, Pharm.D. Candidate[1], Lindsay Saum, Pharm.D., BCPS, CGP[2], Stephen Knaus, M.D.[1], Emily Cochard, M.D.[1], Carol Rupprecht, M.D.[1], Wesley Prichard, M.D.[1]; (1) St. Vincent Hospital, Indianapolis, IN; (2) Department of Pharmacy Practice, Butler University, Indianapolis, IN
OBJECTIVES: To determine the impact of an evidence-based guideline established for the treatment of *Clostridium difficile* infection (CDI) at a community teaching hospital. Endpoints included length of stay (LOS) after diagnosis, mortality, direct cost, and 30-day readmission rates.
METHODS: Relevant literature was reviewed by internal medicine physicians, residents, and pharmacists to develop an internal treatment guideline for the classification and management of CDI. The guideline follows the Infectious Disease Society of America/ Society for Healthcare Epidemiology of America 2010 recommendations. The hospital guideline was provided to physicians and medical residents via email, an internal website, a resident pharmacotherapy handbook, and as a formal presentation during a noon conference. A retrospective chart review was conducted to identify LOS, mortality, direct cost, and readmission rates, as well identify physician adherence to the guideline provided.
RESULTS: Seventy-nine patients were evaluated and it was found that guideline-based therapy (n = 31) was associated with a shorter LOS (7.45 days vs 7.9 days), decreased mortality (3.2% vs 6.3%), and a reduction in 30-day hospital readmission (29% vs 38%). However, guideline-based therapy was associated with a mean higher cost ($17,141 vs $12,787). None of these results achieved statistical significance. Although education was provided and access to the guideline was readily available, adherence by physicians and residents to the guideline-based therapy only occurred in 45% of patients.
CONCLUSIONS: Implementation of guideline-based therapy for CDI may result in a reduction in LOS, 30-day hospital readmission, and mortality. Surprisingly a reduction in cost was not noted in the guideline-based therapy. Barriers to physician adherence still seem to exist despite seemingly adequate education and availability of the guidelines. Perhaps periodically revisiting education and adding requirements for ordering medications could improve adherence. Additionally, higher adherence rates may provide more definitive data for potential significance.

23. Retrospective cohort study of empiric gram-negative antibiotic coverage in critically ill septic shock patients. *Maria Cardinale, Pharm.D.*[1], Alison Brophy, Pharm.D.[2], Daryl Schiller, Pharm.D.[3]; (1) Pharmacy Department, Yale-New Haven Hospital, New Haven, CT; (2) Pharmacy Department, Saint Barnabas Medical Center, Livingston, NJ; (3) Pharmacy Department, Nyack Hospital, Nyack, NY

Presented at Cardinale M, Brophy A, Schiller D. Retrospective Cohort Study of Empiric Gram-Negative Antibiotic Coverage in Critically Ill Septic Shock Patients. New Jersey Society of Health-System Pharmacists Annual Meeting, Long Branch, NJ, April 2014.

Medication Safety

24. Perceptions on antibiotic prescribing by medical practitioners and pharmacists. *Maresca Attard Pizzuto, M.Sc. (Clinical Pharmacy)*[1], Anthony Serracino-Inglott, B.Pharm., Pharm.D. (Cinc.), MACCP, MRPharmS[1], Lilian M. Azzopardi, B.Pharm. (Hons.). MPhil., Ph.D., MRPharmS[1]; (1) Department of Pharmacy, Faculty of Medicine and Surgery, University of Malta, Msida, Malta

OBJECTIVES: To assess results of a validated questionnaire on antibiotic prescribing and how these relate to the perception by physicians on competencies of pharmacist prescribing and risks presented by such prescribing.

METHODS: The results from a previously validated questionnaire, using the Delphi technique, disseminated to 154 medical practitioners on antibiotic prescribing by physicians and by pharmacists were analysed.

RESULTS: Diagnosis (92%), specific signs indicating a bacterial infection (86%), source of infection (68%), knowledge of infection aetiology (68%) and familiarisation with antibiotic guidelines (62%) were the factors indicated by medical practitioners as influencing the choice of antibiotics. Pharmacists are regarded as being competent to treat common infections on a Likert scale by 8% of physicians, 37% have no opinion and 14% think pharmacists are not competent. The 3 most commonly cited reasons against pharmacist prescribing are that pharmacists are not qualified to clinically examine patients (78%), pharmacists do not have access to patient medical records (60%), and that local pharmacies' setting lack privacy (49%). The 3 most significant risks of pharmacist prescribing were perceived by physicians to be misdiagnosis (53%), development of antibiotic resistance (52%) and therapeutic failure (49%).

CONCLUSION: Physicians perceive that a physical examination influences their prescribing of antibiotics. They assign the concept of lack of physical examination competence by pharmacists to be a determining factor in their lack of support for establishing a national structure to enable pharmacist prescribing. A collaborative approach between medical practitioners and pharmacists should be evaluated as a possible national structure towards achieving better antibiotic prescribing while alleviating the medical practitioner perception of the risk of misdiagnosis by independent pharmacist prescribing.

25. A systematic review and meta-analysis evaluating the association between fluoroquinolones use and development of retinal detachment. *Carlos Alves, Pharm.D.*[1], Ana Penedones, M.Sc.[2], Diogo Mendes, Pharm.D.[3], Francisco Batel-Marques, Pharm.D., Ph.D.[4]; (1) Centre for Health Technology Assessment and Drug Research, AIBILI, Association for Innovation and Biomedical Research on Light and Image, Coimbra, Portugal; (2) Central Portugal Regional Pharmacovigilance Unit, AIBILI, Association for Innovation and Biomedical Research on Light and Image, Coimbra, Portugal; (3) Central Portugal Regional Pharmacovigilance Unit, AIBILI – Association for Innovation and Biomedical Research on Light, Coimbra, Portugal; (4) CHAD – Centre for Health Technology Assessment and Drug Research, AIBILI – Association for Innovation and Biomedical Research on Light, Coimbra, Portugal

OBJECTIVES: Fluoroquinolones are one of the most commonly prescribed antibiotics, with a good efficacy profile and generally well tolerated. Lately, several pharmacoepidemiologic studies have been conducted evaluating the risk for retinal detachment associated with these antibiotics. This meta-analysis aims to investigate the association between fluoroquinolones and retinal detachment.

METHODS: A literature search was conducted in order to identify relevant studies evaluating the risk for retinal detachment associated with fluoroquinolones. A meta-analysis was performed using a random-effects model to pool rate ratios (RRs). Meta-regressions were conducted aiming to evaluate the influence of time interval between fluoroquinolones use and retinal detachment diagnosis or treatment one risk estimates.

RESULTS: Seven observational studies were included in this meta-analysis. Overall, fluoroquinolones were associated with a slightly increased risk for retinal detachment (RR 1.09 [95% CI 1.01–1.17]; $p = 0.03$; $I^2 = 42.0\%$). However, when the analysis was stratified according to different study' designs, the result was no longer statistically significant, with the exception of an increased risk identified for past users of fluoroquinolones, based on data from case-control studies (RR 1.07 [95% CI 1.01–1.12]; $p = 0.01$; $I^2 = 0.0\%$). According to meta-regressions, the risk for retinal detachment did not varied according to different time intervals between fluoroquinolones prescription and retinal detachment diagnosis or treatment.

CONCLUSION: The increasing body of evidence on fluoroquinolones potential ocular iatrogenics led the regulatory authorities to reevaluate the benefit/risk ratio of fluoroquinolones. Both FDA and Health Canada decided that no action was necessary at this time based on the available information, while EMA recommended updating the "Warnings" section of fluoroquinolones' labels as precaution. There is limited evidence linking retinal detachment to oral fluoroquinolones. If existing, an increase in the risk would be verified for individuals with a high baseline risk for developing retinal detachment.

26. Pharmacovigilance in Portugal: activity of the central pharmacovigilance unit. *Francisco Batel-Marques, Pharm.D., Ph.D.*[1], Diogo Mendes, Pharm.D.[2], Carlos Alves, Pharm.D.[3], Ana Penedones, M.Sc.[4], Patricia Dias, M.D.[4], Angelina Martins, Pharm.D.[4], Luiz Santiago, M.D., Ph.D.[4], Carlos Fontes Ribeiro, M.D., Ph.D.[4], Margarida Caramona, Pharm.D., Ph.D.[4], Tice Macedo, M.D., Ph.D.[4]; (1) CHAD – Centre for Health Technology Assessment and Drug Research, AIBILI – Association for Innovation and Biomedical Research on Light, Coimbra, Portugal; (2) Central Portugal Regional Pharmacovigilance Unit, AIBILI – Association for Innovation and Biomedical Research on Light, Coimbra, Portugal; (3) Centre for Health Technology Assessment and Drug Research, AIBILI, Association for Innovation and Biomedical Research on Light and Image, Coimbra, Portugal; (4) Central Portugal Regional Pharmacovigilance Unit, AIBILI, Association for Innovation and Biomedical Research on Light and Image, Coimbra, Portugal

OBJECTIVES: To characterize the activity of the Central Portugal Regional Pharmacovigilance Unit.

METHODS: The reporting ratio was calculated. We considered all spontaneous reports received between 01/2001 and 12/2013. All cases were characterized according to their seriousness, prior knowledge, causality assessment, report' origin and reporter' professional group, adverse event and pharmacotherapeutic groups including the most frequent reported suspected drugs.

RESULTS: We received 2.408 reports, corresponding to 5.749 adverse events. During 2013, the reporting rate was calculated as 171 reports per million inhabitants. Fifty-five percent of the reports were assessed as serious. Regarding the causal relation, 90% of cases were assessed as being at least possible related with the suspected drug. The suspected drugs most frequently reported were the anti-infectives for systemic use (n = 809, 33%). The most frequently reported adverse events were "skin and subcutaneous tissue disorders" (n = 1.139, 20%). There were 154 (6.4%) reports involving life-threatening situations and/or death, and 88 (3.6%) contained at least one adverse event assessed as serious, unknown, and certain or probable.

CONCLUSION: These results are in line with those from similar studies regarding the seriousness of adverse events and the type of suspected drugs and adverse events reported. During the years, Central Portugal Regional Pharmacovigilance Unit improved its activities as a result of the growth global reporting rate, as well as the increase in the reporting of unknown and serious adverse drug reactions.

27. Are morphine and hydromorphone prescribed in equianalgesic doses in opioid naive postoperative patients? *Juan Alberdi, Pharm.D.*[1], June Vasquez, Pharm.D.[1], Anthony Pazanese, Pharm.D.[1], Georgia Keriazes, Pharm.D.[1]; (1) Lakeland Regional Medical Center, Lakeland, FL

OBJECTIVES: To compare initially prescribed doses of IV morphine and hydromorphone, as morphine equivalents, in opioid naïve postoperative patients at a tertiary care hospital and identify opportunities for improving safe and effective opioid utilization.

METHODS: This was an IRB-approved retrospective chart review of 140 opioid-naive postoperative patients who received IV morphine or hydromorphone within 24 hours of completion of surgery. For conversion to morphine equivalents, 10 mg of IV morphine was considered equivalent to 1.5 mg of IV hydromorphone. Opioid tolerant, chronic pain, and opioid use disorder patients, as well as pregnant women and those who received oral opioids or PCA postoperatively were excluded.

RESULTS: The mean initial dose of morphine (n = 64) vs hydromorphone (n = 76), in morphine equivalents, was 2.7 mg vs 6 mg ($p < 0.0001$). The proportion of patients who received doses above the FDA recommend range for morphine compared to hydromorphone was 3% vs 9% ($p = 0.14$). In the hydromorphone group, 56 (73.7%) patients received more than the ISMP recommended starting dose of 0.5 mg for opiate naive patients. The proportion of patients who developed respiratory depression was similar for morphine and hydromorphone (4.6% vs 3.9%; $p = 0.83$).

CONCLUSION: As opposed to incorrect dose conversions between hydromorphone and morphine, the results of this study demonstrate a more than a two-fold difference in the initial dose selection of hydromorphone in morphine equivalents compared to morphine. Risk control strategies for reducing patient harm while maintaining adequate pain control should include prescriber education and measures to assure appropriate pre-selected opioid doses in the CPOE system.

28. A retrospective evaluation of a pharmacist-managed warfarin anticoagulant clinic for neurology outpatients. *Yu-Ning Aw*[1], Wei-Ling Kao[2], You-Meei Lin, M.S.[3]; (1) Department of Pharmacy, Taipei Medical University-Shuang-Ho Hospital, Ministry of Health and Welfare, New Taipei City, Taiwan; (2) Department of Pharmacy, Shuang-Ho Hospital, Taipei Medical University, Taipei Medical University-Shuang-Ho Hospital, Ministry of Health and Welfare, New Taipei City, Taiwan; (3) College of Pharmacy, Taipei Medical University, Taipei, Taiwan

OBJECTIVES: A successful anticoagulant clinic requires managing patient compliance, warfarin dosage adjustments, routine monitoring of patient's international normalized ratio (INR), coordination of dietary factors, interactions by herbal products and/or drugs, and interfering disease status. Pharmacist-managed warfarin clinic has improved medication safety and effective anticoagulant therapy in preventing recurrent stroke at the neurology outpatient clinic. The study objective was to determinate whether warfarin dosage monitoring by pharmacists in warfarin clinic would benefit to the patients.

METHODS: Patients with stroke who had received warfarin therapy were retrospectively reviewed. The primary outcome was to assess the INR values within the target therapeutic range of 2 to 3 ± 0.2 units while patients' warfarin dosages were adjusted by pharmacists from July 2012 to September 2014. The incidence of thromboembolic and bleeding events were assessed as the secondary outcome.

RESULTS: A total of 113 stroke patients were recruited in the warfarin clinic managed by pharmacists. For determining the primary outcome, 1309 INRs were obtained which is corresponding to the number of days between true INR measurements. About 65.03% of time INR values were within the therapeutic range that was attributable to pharmacist adjustment of the warfarin dosages. Two thromboembolic events and 68 bleeding events were observed. The bleeding events included 31 gums bleedings, 29 ecchymoses, 2 bloody stools, 2 patients occurring hemoptysis, 2 patients with hematuria, 1 patient with epistaxis, and 1 patient with ICH. Most of the gums bleeding were related to the patient's history of periodontitis. No recurrent stroke was found. The ICH patient's INR is 2.13, which is within the therapeutic range, presented with right frontal epidural hematoma.

CONCLUSION: The present study demonstrated that therapeutic warfarin dosages can be effectively monitored by pharmacists at the warfarin clinic. Appropriate therapeutic range of INR levels can be achieved during the majority of time period (>60%).

Nephrology

29. Predictors of resistance to erythropoietin therapy in chronic kidney disease. *Ayesha Khan, Pharm.D.*[1], Mariann Churchwell, Pharm.D., BCPS, FCCP[2], Rose Jung, Pharm.D., MPH, BCPS[3], Deepak Malhotra, M.D., Ph.D.[4]; (1) Department of Pharmacy Practice, Chicago State University College of Pharmacy, Chicago, IL (2) College of Pharmacy and Pharmaceutical Sciences, The University of Toledo, Toledo, OH (3) University of Toledo College of Pharmacy, Toledo, OH (4) Department of Medicine, Chief, Nephrology Division, The University of Toledo Medical Center, Toledo, OHPresented at the Ohio Pharmacy Residency Conference, Ada, OH, May 18, 2013.
Presented at the American Society of Health-System Pharmacists Midyear Meeting and Exhibition, Las Vegas, NV, December 1, 2012.

Oncology

30. Effectiveness of single 4.5 mg IV dose of rasburicase. *Kajal Patel, Pharm.D.*[1], Erika Gallagher, Pharm.D.[1], Anthony Zembillas, Pharm.D.[1], Jessica Lau, Pharm.D.[1]; (1) Department of Pharmacy, Cleveland Clinic, Cleveland, OH

OBJECTIVES: Rasburicase is a recombinant urate oxidase enzyme administered for treatment of hyperuricemia associated with tumor lysis syndrome. Studies demonstrate effectiveness of single fixed-dose rasburicase as compared to FDA-approved dose of 0.2 mg/kg IV once daily for up to 5 days. Doses in these studies range from 1.5 mg to 7.5 mg. The purpose of this study is to evaluate the appropriateness of our institutional practice by describing the outcomes of patients after a single 4.5 mg rasburicase dose.

METHODS: A retrospective, IRB-approved chart review (January 2007 – April 2014) was conducted to determine the percentage of patients with normalization of uric acid (UA) level to <8 mg/dL within 24 hours after a single 4.5 mg rasburicase dose. The incidence of initial failure of fixed-dose rasburicase and normalization of UA level in obese vs non-obese patients were also evaluated. Inclusion criteria consisted of adult oncology patients who received an initial 4.5 mg dose and had at least one UA level documented prior to their dose. Patients were excluded if they required chronic renal replacement therapy (RRT) at baseline. Initial failure was defined as need for additional doses and/or progression to RRT within 1 week of the initial dose.

RESULTS: The analysis included 128 patients. The mean baseline UA level was 14.84 mg/dL. Of the 105 patients with a baseline UA level ≥8 mg/dL, 66% achieved normalization of their UA level within 24 hours. Overall, 10 patients (8%) received additional dose(s), 21 (16%) required RRT, and 7 (5%) received additional dose(s) and RRT. Normalization of UA level in obese vs non-obese patients was 66% and 73%, respectively.

CONCLUSION: A single 4.5-mg dose effectively normalized UA levels in 66% of patients within 24 hours. Further studies are needed to determine the optimal single fixed-dose necessary for treatment response across all patients.

Pain Management/Analgesia

31. Adherence to adjuvant neuropathic pain medications in palliative care. *Lindsey Dayer, Pharm.D.*[1], Sarah Harrington, M.D.[2], Bradley Martin, Pharm.D., Ph.D.[3]; (1) Department of Pharmacy Practice, University of Arkansas for Medical Sciences College of Pharmacy, Little Rock, AR; (2) Department of Internal Medicine, Division of Hematology/Oncology, University of Arkansas for Medical Sciences College of Medicine, Little Rock, AR; (3) Department of Pharmacy Practice, Division of Pharmaceutical Evaluation and Policy, University of Arkansas for Medical Sciences College of Pharmacy, Little Rock, AR
OBJECTIVES: Neuropathic pain (NP) is often managed with adjuvant pain medications (APM) including antiepileptics and antidepressants. Studies suggest adherence to APM may present a significant problem with adherence rates as low as 43%. The primary objective was to evaluate patient adherence to APM in a palliative care (PC) clinic.
METHODS: This pilot study was an observational study conducted in a single public university hospital ambulatory PC clinic. Eligible patients must: have been taking ≥1 APM for ≥3 months, provide informed consent, and complete baseline assessments. Baseline self reported adherence (SRA) was measured by the Morisky Medication Adherence Scale (MMAS-8) and a 7-day medication recall questionnaire. Adherence was also assessed using the Medication Possession Ratio (MPR) based on refill records over the 6 prior months. QOL (EORTC QLQ-C15-PAL) and pain scores (rated 1–10) were also recorded. T-tests and ANOVA were used to compare the unadjusted adherence levels across demographic and comorbidity subgroups when adherence was continuous and Chi-square or Fisher's exact tests when adherence was categorized. This study was IRB approved.
RESULTS: 32 patients (average age: 47 years) met the inclusion criteria. 81% had NP related to a cancer diagnosis. 87.5% had low or medium adherence using the MMAS-8. The mean SRA based on 7 day recall was 94%. The mean MPR was 63%. 88% of patients had high SRA (>80%); however, only 44% of patients had an MPR > 80%.
CONCLUSION: SRA to APM in PC patients based on recall is high; however, adherence assessed by MPR based on refill records is much lower. Clinicians should consider objective measures of adherence to APM prior to making therapeutic changes to regimens. Future research should confirm these wide discrepancies between self reported and refill record adherence rates and identify patients at highest risk of non-adherence.

Pediatrics

32. Retrospective medication utilization review of vancomycin dosing in pediatric inpatients. *Leesa Prunty, Pharm.D., BCPS*[1], Derek Grimm, Pharm.D., BCPS[2], Khoa Nguyen, Pharm.D. Candidate[3]; (1) Department of Pharmacy Practice, Administration, and Research, Marshall University School of Pharmacy; (2) Cabell Huntington Hospital, Huntington, WV; (3) Marshall University School of Pharmacy, Huntington, WV
OBJECTIVES: Vancomycin is an antibiotic commonly used to treat infections due to gram-positive organisms especially methicillin resistant *Staphylococcus aureus*. Intravenous vancomycin can be difficult to dose in pediatric populations due to the wide variation in patient sizes and volumes of distribution when compared to the adult population. This study evaluated the trough levels produced by the current protocol to determine appropriateness of the empiric and revised dosing regimens.
METHODS: A chart review was conducted of 150 pediatric patients who were admitted to Cabell Huntington Hospital, in Huntington, West Virginia from December 2012 to July 2013 and were treated with intravenous vancomycin. Data collected included patient's date of birth, height, weight, gestational age (if available), vancomycin doses, dosing start and end dates/time, and vancomycin levels.
RESULTS: Patients were evaluated in groups of neonates (post-menstrual age (PMA) <44 weeks) and non-neonates (PMA 44 weeks to 18 years). The average daily doses of vancomycin in the neonatal group were 21.5 mg/kg/day (empiric) and 25.8 mg/kg/day (revised). In the neonatal dosing group, 88% of trough levels were suboptimal (<15 mcg/mL) after empiric dosing, and 66% of levels were suboptimal after first dose revision. The average daily doses of vancomycin in the non-neonatal group were 60 mg/kg/day and 71.4 mg/kg/day in the empiric and revised groups respectively. In the non-neonatal dosing group, empiric trough levels were less likely to be within the goal range of 15 to 20 mcg/ml compared with levels after the first dose revision (20.5% vs 39%, $p = 0.49$).
CONCLUSION: Empiric dosing strategies in both the neonatal and non-neonatal populations were found to produce suboptimal levels the majority of the time. Pharmacist assessment and revision of the dosing strategy increased the number of therapeutic trough levels. Further study is needed to identify the best vancomycin dosing strategy for pediatric patients.

Pharmacoeconomics/Outcomes

33. Cost-effectiveness of different strategies of antimicrobial stewardship programs. *Lucas Okumura, RPh*[1], Bruno Riveros, RPh, M.Sc.[2], Monica da Silva, M.D. ID, M.Sc.[3], Izelandia Veroneze, RPh, M.Sc.[4]; (1) Clinical Pharmacy/Hospital Pharmacy Division, Clinical Hospital, Federal University of Paraná, Curitiba, Brazil; (2) Pharmacy Department, Federal University of Paraná, Curitiba, Brazil; (3) Infectious Diseases Division, Clinical Hospital, Federal University of Paraná, Curitiba, Brazil; (4) Infection Control Service, Clinical Hospital, Federal University of Paraná, Curitiba, Brazil
OBJECTIVES: To assess the cost-effectiveness of different strategies of Antimicrobial Stewardship Programs (ASP).
METHODS: Study's perspective was a Brazilian Public Hospital. We collected relevant costs by using microcosting bottom up method (drug consumption, hospital stay, microbiological and imaging diagnostics costs and human resources costs) and effectiveness from a previous published cohort study that compared two different strategies of ASP (Optimized Strategy vs Conventional Strategy) by using 30-day mortality outcome. Optimized ASP was more active and had: daily clinical pharmacist antimicrobial review, discussion with ID physicians and microbiologists, feedback and education with prescribers and continuous follow up. On the other hand, Conventional ASP was based on antimicrobial review and discussion with ID physician. Costs and effectiveness were incorporated to a Health-State Transition Model. Moreover, gamma and beta distributions were respectively applied for costs and probabilities. We performed ten thousand iterations (2nd Order Monte Carlo Simulations) to determine model's uncertainty. Data were expressed as ICER (Incremental Cost-Effectiveness Ratio), CER (Cost-Effectiveness Rate), Tornado Diagram and Cost-Effectiveness Acceptability Curve (CEAC).
RESULTS: In the Base Case, Optimized ASP was more effective (30-day mortality outcome: 27% vs 38%, $p < 0.05$) and expensive (US$ 17,999 vs 16,096) than Conventional Strategy. When analyzing CER, Optimized ASP was the most cost-effective (US$ 24,618 vs 25,924). One-way and probabilistic sensitive analysis determined that ICER Base Case (US$ 17,235) was robust. By setting Conventional Strategy CER as Willingness-to-pay value, we found in CEAC that Optimized ASP has higher probabilities to be a cost-effective strategy, in comparison to the Conventional ASP.

CONCLUSION: Optimized ASP is the most effective and efficient technology. By incorporating such high performance programs in the Brazilian Health System, there will be better human and financial resources allocation, which will directly benefit assisted patients, society and health institutions.

34. Albumin use evaluation in Tawam Hospital (a tertiary care hospital in UAE). *Muna Al Safi, Pharm.D.*[1]; (1) Inpatient Pharmacy, Mafraq Hospital (currently was previously working at Tawam Hospital), Abu Dhabi, United Arab Emirates
Presented at Seha research conference (Abu Dhabi).

Pharmacogenomics/Pharmacogenetics

35. Point-of-care CYP2C19 genotyping in patients prescribed clopidogrel therapy following a percutaneous coronary intervention. *Francesca Wirth, B.Pharm. (Hons.), M.Phil.*[1], Albert Fenech, M.D., MD(Aberd.), FRCP.(Glas.), FRCP(Lond.)[2], Robert G. Xuereb, M.D., FRCP, FASA, FESC[2], Anthony Serracino-Inglott, B.Pharm., Pharm.D. (Cinc.), MACCP, MRPharmS[1], Lilian M. Azzopardi, B.Pharm. (Hons.). MPhil., Ph.D., MRPharmS[1]; (1) Department of Pharmacy, Faculty of Medicine and Surgery, University of Malta, Msida, Malta; (2) Cardiac Catheterisation Suite, Department of Cardiology, Mater Dei Hospital, Msida, Malta
OBJECTIVES: To implement a point-of-care (POC) pharmacist-led process to determine prevalence of the CYP2C19 loss-of-function (*2) allele in patients prescribed clopidogrel following a percutaneous coronary intervention (PCI) using the Spartan™ RX CYP2C19 system.
METHODS: Patients age 75 years or <, body weight >60 kg, no history of stroke/TIA and who were prescribed clopidogrel post-PCI were recruited over 3 months. After obtaining written informed consent, patients were requested to rinse the mouth with water and a buccal sample was collected. The swab was transported in temperature-controlled conditions to the analyser, air bubbles were removed, and the sample was put into the analyser for automated genotyping. A printed result was obtained after 1 hour. One of 3 genotype results was possible: not a carrier of *2 allele (*1/*1), carrier of one (*1/*2), or two *2 alleles (*2/*2).
RESULTS: Out of 39 tests, 30 first-run genotype results (76.9%) were obtained; in 4 tests a fault code resulted, these tests were repeated and a second-run genotype result was obtained. One test was inconclusive and was not repeated since the patient was already discharged home. Out of the 34 patients, 25 are male, mean age is 63 years (range 49–75 years) and all patients are Caucasian. Most patients (n = 21) tested negative for the *2 allele, 12 patients are carriers of one *2 allele and 1 patient is a carrier of two *2 alleles.
CONCLUSIONS: This POC system is very user-friendly and gives a rapid result to identify patients who are carriers of the *2 allele. According to the Clinical Pharmacogenetics Implementation Consortium guidelines, an alternative to clopidogrel should be prescribed in these patients. A failure rate for successful first-time genotype result of 12.8% was obtained and this needs to be incorporated into the pharmacoeconomic model for the evaluation of this service.

Pharmacokinetics/Pharmacodynamics/Drug

36. Evaluation of an institutional vancomycin pharmacokinetic dosing protocol in adult patient weighing greater than 100 kg. *Cara L. Phillips, Pharm.D., BCPS*[1], Rosario Avelino, Pharm.D., BCPS[2], Nathan Grimes, Pharm.D., BCPS[2], Julie B. Giddens, Pharm.D., BCPS[1]; (1) OSF Saint Francis Medical Center, Peoria, IL; (2) Saint Francis Medical Center
OBJECTIVES: This study seeks to: (i) determine the frequency at which the current SFMC adult vancomycin dosing protocol reaches target serum trough levels of 15–20 mcg/mL in patients weighing >100 kg; (ii) determine the distribution of high vs low levels in cases where target is not met; and (iii) evaluate the relationship between patient factors (age, gender, weight, renal function, dose received) and resultant trough levels.
METHODS: Retrospective chart review of 184 adult patients weighing >100 kg dosed on vancomycin via institutional protocol which doses at 15 mg/kg/dose to a max of 1500 mg. Age, gender, weight, serum creatinine, creatinine clearance, vancomycin dosing regimen, and initial vancomycin trough were collected. Basic statistical values (min, max, range, average) were calculated.
RESULTS: Initial therapeutic serum trough (15–20 mcg/mL) was obtained 27% of the time. Patients had subtherapeutic trough levels 55% of the time. The remaining 18% of patients had trough values >20 mcg/mL.
CONCLUSION: Current institutional vancomycin dosing protocol did not frequently reach target trough levels in patients > 100 kg. A majority of patients were underdosed, but some had supratherapeutic levels. The patient factors identified, including weight, could not account for the variation in the resultant levels. Further examination is needed to determine the best protocol modifications to decrease underdosing while avoiding an increase in frequency of supratherapeutic levels.

37. Prediction of topiramate serum levels according to variability factors using artificial neural networks. *Marija Jovanovic, M.Pharm.*[1], Dragoslav Sokic, Ph.D.[2], Iztok Grabnar, Ph.D.[3], Tomaz Vovk, Ph.D.[3], Milica Prostran, Ph.D.[4], Slavica Eric, Ph.D.[5], Igor Kuzmanovski, Ph.D.[6], Katarina Vucicevic, Ph.D.[1], Branislava Miljkovic, Ph.D.[1]; (1) Department of Pharmacokinetics and Clinical Pharmacy, Faculty of Pharmacy, University of Belgrade, Belgrade, Serbia; (2) Clinic of Neurology, Clinical Centre of Serbia, Belgrade, Serbia; (3) Department of Biopharmaceutics and Pharmacokinetics, Faculty of Pharmacy, University of Ljubljana, Ljubljana, Slovenia; (4) Department of Pharmacology, Clinical Pharmacology and Toxicology, School of Medicine, University of Belgrade, Belgrade, Serbia; (5)

	Therapeutic	Sub-therapeutic	Supra-therapeutic
Age Range-years (Avg)	25–82 (58)	20–87 (54)	33–79 (57)
Gender	31%F; 69%M	38%F; 62%M	21%F; 79%M
Weight Range–kg (Avg)	102–188 kg (128)	102–277 kg (131)	103–182 kg (127)
Renal function			
>90 mL/min	41%	38%	39%
50–90 mL/min	49%	53%	58%
30–49 mL/min	10%	9%	0%
Dose Received mg/kg/dose Range (Avg)	8–14.7 (12)	5.4–14.9 (12)	8.2–14.6 (12.2)

Department of Pharmaceutical Chemistry, Faculty of Pharmacy, University of Belgrade, Belgrade, Serbia; (6) Institute of Chemistry, Faculty of Natural Sciences and Mathematics, University Sts. Cyril and Methodius, Skopje, Macedonia

OBJECTIVES: Topiramate (TPM) is a broad-spectrum antiepileptic drug approved for monotherapy or adjunctive therapy. Various factors can influence pharmacokinetics of TPM, and consequently its blood level and effect. The objective of this study was to investigate the applicability of counter-propagation artificial neural networks (CPANN) approach and genetic algorithm (GA) for predicting TPM serum levels based on important variability factors.

METHODS: Analysis was performed on 118 TPM observations obtained from adult epileptic patients. Patients were at least for one week on TPM monotherapy or co-therapy with other antiepileptic drugs. High performance liquid chromatography was used for measurement of TPM steady state serum concentration. Data analysis was performed by CPANNs while GA was used for variable selection, adjustment of relative importance and optimisation. Statistical analysis was performed by SPSS® software (version 17, Chicago, Illinois, USA).

RESULTS: Model training was performed on majority (74.6%) of measured TPM concentrations (7.69 ± 4.04 mg/L). CPANN model was developed for predicting blood level based on selected variability factors. TPM daily dose, renal function (eGFR) and carbamazepine daily dose were selected as factors that significantly influence TPM concentrations. The greatest impact was obtained for TPM dose, as expected, and relative importance was 0.7500. Relative importance for renal function (eGFR) and carbamazepine daily dose were 0.2813, 0.0625, respectively. Validation was performed on remaining TPM concentrations (7.62 ± 5.78 mg/L). Model performances were checked by adequate statistical parameters.

CONCLUSION: This work represents the feasibility of CPANNs combined with GA to predict TPM concentrations in adult epileptic patients and to obtain relative importance of variability factors. The results of the study may help to predict whether the drug level in an individual patient, considering important descriptors, should be within the reference range according to final CPANN model. Therefore, this approach can be useful in routine clinical practice.

38. Accuracy of corrected phenytoin levels using the Winter-Tozer equation in non-critically ill patients at a community hospital. *Nuttavat Rojprasitporn, Pharm.D. Candidate*[1], Maitri Desai, Pharm.D. Candidate[1], Ayesha Khan, Pharm.D.[2]; (1) Chicago State University College of Pharmacy; (2) Department of Pharmacy, Ingalls Memorial Hospital, Harvey, IL

OBJECTIVES: This study analyzed free vs calculated phenytoin levels using a correction equation at a large, community hospital in order to (i) assess the accuracy of the Winter-Tozer correction equation in predicting physiologic phenytoin levels, and (ii) evaluate the need for ordering routine free phenytoin levels.

METHODS: Electronic medical records of 150 patients admitted to Ingalls Memorial Hospital between January 2010 and April 2013 with free phenytoin levels were retrospectively reviewed. Patients' height, weight, gender, age, race, total phenytoin level, free phenytoin level, serum albumin, and serum creatinine were documented.

RESULTS: A total of 67 hypoalbuminemic adult patients were included for data analysis. Mean serum albumin and serum creatinine was 2.7 and 1.4 g/dL respectively. A documented history of diabetes mellitus, hypertension, congestive heart failure, and atrial fibrillation was documented in 23, 42, 6, and 3 patients, respectively. Corrected total phenytoin showed a significant increase compared to measured total phenytoin (18.6 vs 12.3 mcg/mL, $p < 0.0001$). No significant differences were observed between corrected free phenytoin and measured free levels (1.9 vs 1.8 mcg/mL, $p = 0.66$).

CONCLUSIONS: Clinical studies have revealed that free phenytoin is a better indicator of physiologically active phenytoin than total levels in hypoalbuminemia. Owing to the added costs of free serum levels, the Winter-Tozer correction equation is traditionally used to correct total levels. Preliminary results from this single-center study validate this equation and support its accuracy. Continued analysis is forthcoming to further assess these findings.

39. Rapid attainment of $C_{max}/MIC \geq 10$ in patients receiving aminoglycosides for serious gram-negative infections. *Larry Bauer, Pharm.D.*[1]; (1) UW Department of Pharmacy, University of Washington, Seattle, WA

OBJECTIVES: Compare the C_{max}/MIC ratio for initial gentamicin/tobramycin doses selected by treating clinicians using estimated population parameters and actual computed parameters to those attained after individualized adjusted doses were prescribed.

METHODS: 82 patients were included using the following criteria: treating clinicians self-identified aminoglycoside treatment goal of $C_{max}/MIC \geq 10$, culture-documented gram-negative infection, MIC measured using the Etest method, aminoglycoside and serum creatinine concentrations during therapy. Estimated population C_{max} was determined using the following equation: $C_{max} = [(D/t')(1-e^{-kt'})]/[kV(1-e^{-kt})]$, where D is dose, t' is the infusion time, t is the dosage interval, k is the elimination rate constant ($k = 0.00293(CrCl_{est})+0.014$ and $CrCl_{est}$ is estimated creatinine clearance in mL/min (Cockcroft-Gault for nonobese patients [within 30% IBW] and Salazar-Corcoran for obese patients [>30% over IBW]), V is the volume of distribution (0.26 L/kg for nonobese, or ABW for obese [ABW = IBW+[0.4 (TBW-IBW)], TBW = total body weight). Estimated population MIC for gram-negative bacteria was the average institutional value for the organism during the past 6 months. Actual initial and adjusted C_{max} values were computed using a Bayesian computer program and a measured aminoglycoside concentration (2–6 h post-dose, 2–3 doses after initial dosing or a dosing adjustment began). Initial aminoglycoside doses were determined by the treating clinicians, and adjusted aminoglycoside doses were prescribed to attain treatment goals.

RESULTS: While treating clinicians expected all doses initially prescribed to patients to attain the C_{max}/MIC treatment goal, only 74% of the aminoglycoside dosage regimens were expected to achieve goal using population estimates for C_{max} and MIC. For initial dosing of aminoglycosides, only 63% of patients actually achieved the goal of $C_{max}/MIC \geq 10$. Subsequently, the adjusted dosage achieved the treatment goal in all cases (100%; $p < 0.05$).

CONCLUSIONS: Gentamicin/tobramycin doses can be rapidly individualized to attain a widely used pharmacokinetic/pharmacodynamic goal. Clinician-prescribed initial doses or doses computed using population estimates will not achieve this goal for all patients.

Psychiatry

40. Pharmacy students' attitudes toward provision of pharmaceutical care to mentally ill patients are improved after participation in a psychiatric pharmacy clinical rotation. *Marshall E. Cates, Pharm.D., BCPP, FASHP*[1], Thomas Woolley, Ph.D.[2]; (1) Samford University McWhorter School of Pharmacy, Birmingham, AL; (2) Samford University, Birmingham, AL

OBJECTIVES: Previous educational research conducted in the classroom setting found that contact with mental health consumers can improve pharmacy students' attitudes toward providing pharmaceutical care services to patients with mental illness. The purpose of this study was to determine how participation in an actual psychiatric clinical rotation would affect pharmacy students' attitudes toward provision of pharmaceutical care services to patients with mental illness.

METHODS: Students participating in a Psychiatric Pharmacy Advanced Pharmacy Practice Experience were asked to com-

plete an attitudinal survey on the first and last days of the 4-week, inpatient clinical experience. The survey included the 10-item Provision of Pharmaceutical Services to Consumers with a Mental Illness scale, with one scale specifying patients with schizophrenia and the other specifying patients with depression. Mean scores on the scales at the beginning and end of the course were compared using two-independent samples t-tests, and results were corroborated by Wilcoxon-Mann-Whitney tests. The research was approved by the university's Institutional Review Board, and the survey was voluntary and anonymous.
RESULTS: The survey was completed by all 23 students who took the course during the academic year. The mean total score on both scales statistically significantly increased (i.e., improved attitudes) from pre- to post-rotation (schizophrenia, $p = 0.02$; depression, $p = 0.006$). Eight items of the schizophrenia scale showed numerical increases in mean scores from pre- to post-rotation, and changes on 1 item reached statistical significance. All 10 items of the depression scale showed numerical increases in mean scores from pre- to post-rotation, and changes on 5 items reached statistical significance.
CONCLUSION: An inpatient psychiatric clinical experience led to improved attitudes of pharmacy students toward providing pharmaceutical care services to patients with schizophrenia and depression. Thus, even contact with acutely psychotic and severely depressed patients can improve pharmacy students' attitudes toward caring for mentally ill patients.

Pulmonary

41. Selenium improves oxidative stress and respiratory outcomes in patients with idiopathic pulmonary fibrosis. *Nada Hazem, B.Sc.*[1], Lamia Mohamed El Wakeel, Ph.D.[2], Mona F. Schalaan, Ph.D.[1], Ahmed Mahmoud Abd El Hafiz, M.D., Ph.D.[3], Samah Selim, M.D., Ph.D.[3]; (1) Clinical Pharmacy and Pharmacy Practice Department, Faculty of Pharmacy, Misr International University, Cairo, Egypt; (2) Clinical Pharmacy Department, Faculty of Pharmacy, Ain Shams University, Cairo, Egypt; (3) Chest Disease, Faculty of Medicine, Cairo University, Imbaba, Cairo, Egypt
OBJECTIVES: Oxidative stress is reported to contribute to the pathogenesis of Idiopathic Pulmonary Fibrosis (IPF). This study aimed to evaluate the effect of selenium supplementation, an essential trace element with potential antioxidant effect, as a novel pharmaceutical approach on the outcome of IPF patients.
METHODS: Prospective, randomized comparative study. Eligible patients were randomly assigned to either group A; 20 patients with IPF received oral Selenium 200 μg once daily for 6 month or group B; 20 patients received oral NAC 600 mg 3 times daily for 6 month. Prednisone tabs (0.5 mg/kg/day) were given to both groups. Glutathione peroxidase (GPx) and Matrix Metalloproteinase 7 (MMP 7) levels were estimated in serum once every 2 month in both groups. Six-minute walk test (6MWT) was performed once every 2 months for both groups in order to assess the clinical improvement. Informed consents were obtained from all patients.
RESULTS: The comparison of Selenium group with NAC one revealed a significant increase of serum GPx level (227.17%, 168.82%, respectively), and significant decrease of MMP7 (83.88%, 35.4%, respectively) using a 2 way ANOVA, all values are relative to their baseline levels. There were no remarkable adverse drug reactions observed in both groups, other than gastric upset in NAC group.
CONCLUSION: This study showed that selenium supplementation in IPF patients significantly improved GPx and MMP 7 levels, which reflect a potent antioxidant capacity. In addition, patients' clinical presentation showed a significant decrease in coughing and dyspnea on exertion. Key Words: Idiopathic pulmonary fibrosis; selenium; antioxidant

Women's Health

42. Medication use evaluation of counseling on teratogenic medications at a Veterans Affairs health care system. *Jennifer Cook, Pharm.D.*[1], Lynsey Neighbors, Pharm.D.[1], Addison Ragan, Pharm.D.[1]; (1) Pharmacy, Central Alabama Veterans Health Care System, Montgomery, AL
OBJECTIVES: To assess compliance at the Central Alabama Veterans Health Care System (CAVHCS) with providing teratogenic-related patient counseling when prescribing potentially teratogenic medications in female patients with child-bearing potential.
METHODS: In order to assess compliance, four commonly prescribed, potentially teratogenic medications were evaluated: divalproex, lisinopril, simvastatin, and warfarin. Sixty-five randomly selected females of child-bearing age (18–50) who were on at least one of the teratogens were reviewed. Each patient's medical chart was examined for the following: documentation of teratogenic-related patient counseling upon initiation of the teratogen, pregnancy test obtained upon initiation, and documentation of current contraception use. Non-research approval for this MUE was obtained from the CAVHCS Office of Research Oversight.
RESULTS: Of the 65 patients evaluated, 35 (54%) had documentation of an inability to conceive, leaving only 30 (46%) patients with child-bearing potential. Only 1 patient with an ability to conceive (3%) was counseled on the teratogenic risks of the medication they were being prescribed. Only 1 patient with an ability to conceive (3%) had a pregnancy test obtained upon initiation of the teratogen. Twelve of the 30 patients able to conceive (40%) were documented as being on contraception. Only 25% of the patients documented to be on VA-provided contraception were actually compliant.
CONCLUSION: These results overwhelmingly support the need for an improvement in documentation of patient counseling related to teratogenic medications being prescribed in female CAVHCS patients with child-bearing potential, as well as improving pregnancy screenings and contraception documentation in this patient population.

Adult Medicine

43. Qualitative assessment of admission medication lists obtained by pharmacy vs non-pharmacy personnel. *Jason Lancaster, Pharm.D., MEd*[1], Philip Grgurich, Pharm.D., MBA[2], Jacqueline MacCormack, Pharm.D.[3], Yvonne LeBlanc, Pharm.D., MBA[3], Jennifer Set, Pharm.D.[3]; (1) School of Pharmacy, Northeastern University, Boston, MA; (2) Department of Pharmacy Practice, Massachusetts College of Pharmacy and Health Sciences University, Boston, MA; (3) Lahey Hospital & Medical Center
OBJECTIVES: To compare the accuracy and completeness of home medication lists obtained at the time of hospital admission by pharmacists and student pharmacists to those obtained by physicians and nurses.
METHODS: Consecutive patients admitted to an inpatient internal medicine teaching service at a 350-bed tertiary academic medical center were screened for inclusion over a 6-month time period. Inclusion criteria consisted of age ≥ 18 years, English speaking, and admission from a non-institutional place of residence. Patients were excluded if their admission was expected to last <24 hours. Patients' home medication lists, obtained by student pharmacists working as part of the internal medicine team and a pharmacist practicing within the emergency department, were compared to those obtained by physicians and nurses. The following types of discrepancies were identified: inaccuracies in drug name, dose, route, frequency, and/or omission. Additionally, the time to gather each list was reported. Rates of discrepancies between the pharmacy-obtained list vs the lists obtained by physicians and nurses are reported and the average number of medica-

tions per patient, obtained by each group, is compared using the student t-test.
RESULTS: A total of 128 patients were reviewed, and the total number of discrepancies identified by the pharmacy personnel was 402, average of 3.14/patient. Of these, 47.5% were omissions. Inaccuracies occurred at the following rates: 22.9% dose, 14.1% frequency, and 15.5% for the combination of drug name and/or route. The average number of medications identified by pharmacy and non-pharmacy personnel was 10.3 (SD 4.6) and 8.3 (SD 4.5), respectively (p-value 0.002). Ninety-six percent of the patients' medication lists were obtained in <30 minutes.
CONCLUSION: Pharmacy personnel, including student pharmacists, obtained more complete and accurate home medication lists at the time of admission compared to their physician and nursing colleagues.

Ambulatory Care

44. Description of clinical pharmacy services within a patient-centered medical home model. *Kristen Pate, Pharm.D.*[1], Laurel Sampognaro, Pharm.D.[1]; (1) Department of Clinical Sciences, University of Louisiana at Monroe School of Pharmacy, Monroe, LA
OBJECTIVES: To describe the delivery of a variety of clinical pharmacy services offered within an innovative healthcare delivery model.
METHODS: Five clinical pharmacists provide the following pharmacy services within 3 physicians' clinics and a health management center: Medication Therapy Management (MTM), tobacco cessation counseling, spirometry, and anticoagulation management. These services are offered through a patient-centered medical home (PCMH) that is owned and managed by a health maintenance organization (HMO). Three of the clinical pharmacists involved are employed by the HMO or PCMH, and two of the pharmacists are employees of a school of pharmacy and precept fourth professional year student pharmacists at these sites. The health management center houses ancillary services for the PCMH, including pharmacy, nutrition, diabetes education, diabetes foot care, speech therapy, occupational and physical therapy, and wellness. This environment was designed to allow all members of the healthcare team, including pharmacy, to be easily accessible to patients and work together to improve patient care. Physicians and other providers refer patients for all of the above-mentioned clinical pharmacy services. MTM patients are also identified through the HMO and contacted for scheduling based on qualifications regarding chronic conditions and quantity of medications. The tobacco cessation program is 1 year in length and includes 15 encounters. When patients are referred for spirometry they are also counseled regarding inhaler technique, and pharmacists provide medication-related recommendations within their documentation. All patient encounters are documented within the electronic medical record and services are billed using appropriate CPT codes.
RESULTS: N/A.
CONCLUSION: Pharmacists have been able to integrate themselves as a core component of this PCMH in order to help the healthcare team in their efforts to improve quality of patient care, patient outcomes, and patient satisfaction, while also decreasing costs. Future research is needed to quantify pharmacy impact on these efforts.

45. Development and implementation of an outpatient deep vein thrombosis diversion protocol. *Karie Morrical-Kline, Pharm.D.*[1], James Long, RPh[2], Molly Alberts, BSN, RN[2], Amber Cummins, Pharm.D.[2]; (1) St Vincent Joshua Max Simon Primary Care Center, Indianapolis, IN; (2) St. Vincent Indianapolis Hospital, Indianapolis, IN
OBJECTIVES: To develop an outpatient deep vein thrombosis (DVT) diversion (ODD) protocol minimizing emergency department (ED) visits and hospital admissions for acute uncomplicated DVT.
METHODS: A core group of pharmacy personnel and physician advisors convened to determine ODD protocol target population, review available primary literature supporting this treatment option, identify inclusion and exclusion criteria, and review the logistics and potential barriers for implementation. To identify the potential volume of ODD protocol eligible patients, a query of adult patients admitted for <36 hours for DVT was obtained over a 6-month time frame. There were many steps to successfully coordinate to ensure safe and effective outpatient management of uncomplicated DVT. Therefore, the core group developed an order and referral form, a flow sheet for the outpatient providers and ED providers, and coordination of care with various supporting disciplines. Additionally, the ODD protocol was reviewed by the institutions risk management and legal department to ensure appropriate coordination and documentation of care.
RESULTS: A review of DVT patients with <36 hour admission between July and December 2013, revealed 16 patients meeting the query criteria for an estimated volume of 35 patients per year potentially eligible for ODD protocol treatment. The ODD protocol was developed with three treatment arms based on patient disposition: (i) outpatient physician- business hours (ii) outpatient physician- after hours, and (iii) emergency department. Treatment options for each arm of the protocol are the same allowing for provider preferred anticoagulation strategy.
CONCLUSION: The ODD protocol was approved for implementation by the institutions pharmacy and therapeutics committee in June 2014. The core group continues to modify components of the protocol, streamlining workflow while ensuring patient safety and efficacy. Future goals are to expand ODD protocol use to regional affiliated institutions and measure outcomes via an Institutional Review Board approved study.

46. A novel cardiovascular disease risk review and referral service within a patient-centered medical home. *Brody Maack, Pharm.D.*[1]; (1) Department of Pharmacy Practice, College of Pharmacy, Nursing and Allied Sciences, North Dakota State University/Family HealthCare, Fargo, ND
OBJECTIVES: Increase clinician adherence to, and awareness of, 2013 ACC/AHA cholesterol treatment and atherosclerotic cardiovascular disease (ASCVD) risk reduction guidelines. Additionally, utilize clinical pharmacy services (CPSs) to make recommendations for guideline-appropriate statin therapy, and integrate the CPSs to facilitate optimization of uncontrolled modifiable CV risk factors.
METHODS: CPSs are currently provided within a level three patient-centered medical home (PCMH) at a Midwestern federally qualified health center. The CPSs employ collaborative drug therapy management (CDTM) protocols. An ASCVD risk estimation and referral service program was designed and implemented in order to meet project objectives. Electronic charts of patients scheduled for clinic appointments are reviewed prior to their appointments, with assistance from APPE students. ASCVD risk (estimated using the pooled cohort equations risk estimation tool), and treatment recommendations are documented in a SOAP note in the patient chart, and sent to the patient's primary care provider. If uncontrolled modifiable risk factors are identified, referral to the novel ASCVD Risk Reduction Service (ARRS) is recommended for additional clinical pharmacist (Pharm.D.) intervention.
RESULTS: Outcomes data are being collected, and include clinical outcomes (reduction in ASCVD risk), provider guideline-adherence, recommendation acceptance rates, and number of ARRS referrals. Preliminary data collected from 92 patients reviewed revealed that a change to statin therapy was recommended by the Pharm.D. for 39% of patients, and laboratory recommendations were made for 42% of patients. Suggestion for ARRS referral was made for 26 patients, and 73% of those were ultimately referred by the provider to the ARRS.

CONCLUSION: Preliminary results suggest needed improvement in providers' guideline-adherence may exist, and providers are willing to utilize the ARRS. This service is applicable in any pharmacy-practice setting with access to patient health records, thus expanding pharmacist collaboration with primary care providers to optimize patients' cardiovascular outcomes.

47. Impact of pharmacist-led training of nurses and medical assistants on medication reconciliation knowledge in a Federally Qualified Health Center. *Caitlin McCarthy, Pharm.D.*[1,2], Thomas Bateman, Jr, Pharm.D.[1,2], Sarah Gregg, RN[3], Drew Madsen, B.A.[3], Mary Wagner, Pharm.D., M.S.[1], Kemi Alli, M.D., FAAP[4]; (1) Ernest Mario School of Pharmacy, Rutgers, the State University of New Jersey, Piscataway, NJ; (2) Henry J. Austin Health Center, Trenton, NJ; (3) Quality Improvement, Henry J. Austin Health Center, Trenton, NJ; (4) Medical Department, Henry J. Austin Health Center, Trenton, NJ

OBJECTIVES: Successful completion of Medication Reconciliation (MedRec) can reduce medication errors and adverse drug events, improve workflow, and allow for more productive meetings between patient and provider. The objective of this project was to design and pilot a pharmacist-led training seminar for nurses and medical assistants on proper MedRec techniques in order to improve this process in a Federally Qualified Health Center (FQHC). This presentation will report on the first phase of this project by detailing change in seminar attendees' MedRec knowledge from baseline.

METHODS: A team of two pharmacists trained nurses and medical assistants on proper MedRec technique. Each four-hour training seminar comprised of a PowerPoint slideshow, an interactive patient case, a presentation on documentation of MedRec within the Electronic Medical Record, and a jeopardy-based activity. Additional materials were provided to attendees to detail information about common medications and proper MedRec processes. Pre- and posttests were administered to attendees to assess change from baseline knowledge.

RESULTS: A total of 20 staff members attended one of the five MedRec training seminars and completed pre- and posttests. Overall, the mean pretest score was 4.38 out of 10 (43.8%) and the mean posttest score was 8.56 out of 10 (85.6%). This resulted in an absolute improvement of 41.8% and a relative improvement of 95.4%. Nineteen of the twenty participants demonstrated improvement between pre- and posttest scores (95%), and no participant experienced a decline in score.

CONCLUSION: Implementation of a structured and interactive pharmacist-led training seminar resulted in improvement in MedRec knowledge of nurses and medical assistants within an FQHC. Additional qualitative and quantitative data will be utilized by the pharmacy team to address any inadequacies of the training program and to further refine the current MedRec process across the health center.

48. Expanding the prevalence of aspirin use for primary prevention among high-risk patients: a pharmacy-based intervention study. *Scott Coon, Pharm.D.*[1], Amie Brooks, Pharm.D.[1]; (1) Pharmacy Practice, St. Louis College of Pharmacy, St. Louis, MO

OBJECTIVES: To determine if a pharmacist intervention can improve the prevalence of primary prevention aspirin therapy in a low income, minority population.

METHODS: Men aged 45–79 and women 55–79 without cardiovascular disease (CVD) were considered for study inclusion prior to scheduled primary care appointments. Aspirin eligibility was then determined by evaluating CVD risk in contrast to risk for a serious/complicated bleed (HAS-BLED $\geq$3, history of NSAID-related bleed, ongoing anemia, or concomitant anticoagulation/antiplatelet). Those with sufficient CVD risk (Framingham Risk Score $\geq$ 10%) and none of the aforementioned risks for a serious/complicated bleed were considered aspirin-eligible. The intervention included: (i) provider education on primary prevention recommendations via a written newsletter, and (ii) patient-specific provider notification of aspirin eligibility. Provider notifications occurred via patient-specific electronic medical record message on the day of scheduled appointments. Atherosclerotic cardiovascular disease (ASCVD) risk, anti-hypertensive and statin use were also recorded.

RESULTS: There were 326 patients screened for study inclusion, from which 116 patients were further examined for aspirin eligibility (a majority of the screened patients were excluded based on age). Of those included, 10 (9%) were taking aspirin at baseline. There were 38 patients with a FRS $\geq$ 10%, but only 31 were considered aspirin-eligible based on having a minimal risk for a complicated/serious bleed. Providers either approved (N = 19), didn't respond (N = 11), or denied (N = 1) the recommendation to begin aspirin therapy. The prevalence of aspirin use was significantly increased to 25% following pharmacy intervention ($p < 0.01$). Additionally, risk for atherosclerosis was high at baseline (median ASCVD risk 13%), but only a minority of those eligible were receiving statin therapy.

CONCLUSION: A provider-focused pharmacist intervention improved the prevalence of aspirin use for primary prevention, while minimizing risk for serious bleeding events. Additional pharmacy interventional studies focusing on other primary prevention strategies may be warranted.

Clinical Administration

49. Evaluation of a novel tool pCATCH™: method to allocate clinical pharmacist resources. *Hanna Park, Pharm.D.*[1], Robert Granko, Pharm.D., MBA[2], Adam Wolfe, Pharm.D., M.S., BCPS[3]; (1) Department of Pharmacy, Cape Fear Valley Health System/Southern Regional Area Health Education Center, Fayetteville, NC; (2) Department of Pharmacy, The Moses H. Cone Memorial Hospital, Greensboro, NC; (3) Department of Pharmacy, University of North Carolina Health Care, Chapel Hill, NC

OBJECTIVES: pCATCHTM methodology was developed to determine the appropriate allocation of clinical pharmacists at University of North Carolina (UNC) Healthcare in 2010. Since then, this model was utilized annually and results of first application were published in 2012. pCATCHTM integrates five core metrics: patient census, patient acuity, teaching involvement, medication cost, and use of high-priority medications. The purpose of this study is to demonstrate annual application of pCATCHTM and present a historical review and advancement of the acute care pharmacy practice model.

METHODS: Five metrics of pCATCHTM were collected from available database between January 1 and December 31, 2013. Refinement in the 2013 assessment includes a new qualitative medication revenue metric. After completion of data analysis, the top 20 ranked services within each metric were assigned a point value of 1. The new medication revenue metric was not counted in the composite score. Thus, the maximum composite score that a service can earn is 5 and minimum is 0.

RESULTS: A total of 39 services were analyzed. Eight services were assigned with the maximum score of 5. These results represent 3 additional services lines with a maximum score compared to 2010 application of pCATCHTM. These top services represent a growth of complexity of patient care that required fully supportive clinical pharmacists. The oncology and hematology were associated with the highest medication revenue. The revenue was generated and captured effectively through a transitions of care service.

CONCLUSION: There is a great challenge to develop an assessment tool that describes and validates clinical pharmacists in continuously evolving healthcare practice model. Pharmacy Management Practitioners can utilize a novel tool to appropriately refine pharmacy human resource allocation and demonstrate the overall performance and value-add of the department of pharmacy. Lastly, the advancement of 2013 pCATCHTM by incorporating medication revenue, displayed positive influence on both clinical and financial outcomes.

50. Impact of a pharmacy technician admission medication history pilot program in a Veterans Affairs medical center. *Veldana Nuhi, Pharm.D., BCPS*[1], Anne Parnell, Pharm.D., MBA[1], Elizabeth MacKenzie, Pharm.D., BCPS[1], Michelle Macumber, Pharm.D., BCPS[1], Sharon Castle, Pharm.D., BCPS[1]; (1) Department of Pharmacy, Ralph H. Johnson Veterans Affairs Medical Center, Charleston, SC
OBJECTIVES: To evaluate the impact of a pharmacy technician (PT) medication history (MH) pilot program.
METHODS: A pilot program using PTs to obtain admission MHs was implemented at the Ralph H. Johnson Veterans Affairs Medical Center (RHJ VAMC) from February 9, 2014 to May 30, 2014. This retrospective study was approved by IRB and VA R&D. Eligible patients were ages 18–88, receiving inpatient care at RHJ VAMC, and interviewed by a PT. The pilot program occurred alongside an established pharmacist-led medication reconciliation program.
RESULTS: PTs conducted 112 admission MHs; 108 (96.4%) patients met inclusion criteria. The interviews resulted in 91/108 (84%) patients with at least 1 medication related discrepancy. There was a range of 1–11 discrepancies per patient. For the 91 patients, there were 317 discrepancies: 146 (46%) errors of commission, 92 (29%) errors of omission, 51 (16%) wrong frequency error, 28 (9%) wrong dose error. Each discrepancy was classified by medication type: 217 (68.5%) VA prescription medication, 67 (21.1%) over-the-counter/supplement, 33 (10.4%) non-VA prescription medication. Each discrepancy received a severity classification upon pharmacist review: 1 – unlikely to cause discomfort or deterioration, 2 – potential to cause discomfort or deterioration, 3 – potential to cause severe discomfort or deterioration. Of the 317 discrepancies, 84 (26.5%) received a classification of 2 or 3. Of the 91 patients with at least 1 medication discrepancy, 48 (52.7%) patients had a least 1 discrepancy classified as 2 or 3 severity.
CONCLUSION: MH interviews by PTs contributed to the accuracy of medication reconciliation. Discrepancies discovered resulted in interventions by pharmacists or providers. The impact of a MH is apparent considering over half of the patients had at least 1 discrepancy classified as 2 or 3 severity. The results of this study support existing literature for the role of PTs in the medication reconciliation process.

Critical Care

51. Evaluation of student pharmacist involvement in obtaining home medication lists for patients admitted to a medical intensive care unit. *Philip Grgurich, Pharm.D., MBA*[1], Jason Lancaster, Pharm.D., MEd[2], Jacqueline MacCormack, Pharm.D.[3]; (1) Department of Pharmacy Practice, Massachusetts College of Pharmacy and Health Sciences University, Boston, MA; (2) School of Pharmacy, Northeastern University, Boston, MA; (3) Lahey Hospital & Medical Center
OBJECTIVES: To characterize the accuracy and completeness of admission medication lists obtained by student pharmacists compared to those obtained by nurses and physicians in a medical intensive care unit (ICU).
METHODS: Pharmacy students on an advanced pharmacy practice rotation independently obtained home medication lists for consecutive patients admitted to a medical ICU at a 350-bed tertiary academic medical center over two months. Patients were eligible if they were ≥18 years old, English speaking, and they or a family member could communicate about the home medication list. Patients were excluded if their ICU stay occurred at a time when the students were unavailable. Home medication lists obtained by student pharmacists were compared to those obtained by physicians and nurses. The rates of omitted home medications and inaccuracies in medication name, dose, frequency, and route were assessed. The average number of medications on the lists obtained by the student pharmacists was compared to the average number on the lists gathered by nurses and physicians using the Student t-test. Students documented the time required to obtain patients' lists.
RESULTS: 75 patients were assessed and home medication lists were gathered on 29 patients (38.7%). The student pharmacists identified 80 discrepancies, for an average of 2.76 discrepancies per patient. 39.5% were omissions, 21.1% involved an incorrect medication name, 18.4% involved an inaccurate dosage, 15.8% were wrong frequency, and 5.3% were wrong route. On average, the student pharmacists identified 13.6 (±6.5) medications per patient while nurses and physicians identified 12.4 (±6.1) medications ($p = 0.02$). Medication lists were obtained in <20 minutes 75.6% of the time and within 30 minutes in 96.3% of the cases.
CONCLUSION: Student pharmacists obtained more complete and accurate admission medication lists compared to their physician and nursing colleagues in a medical ICU setting.

Education/Training

52. STEPing up student research. *Carmelo Alonso, Pharm.D. Candidate, B.S. Biology*[1], J. Brock Harris, Pharm.D., BCPS[2], J. Andrew Woods, Pharm.D., BCPS[2]; (1) Wingate University School of Pharmacy, Wingate University, Wingate, NC (2) Wingate University School of Pharmacy, Wingate, NC
OBJECTIVES: The Wingate University School of Pharmacy student chapter of ACCP (Wingate SCCP) recognized a perceivable limitation in the education and training of future clinical pharmacists. While students are familiarized with the responsibilities of clinical pharmacists through their experiential rotations, most often do not get the opportunity to participate in clinical research processes. Wingate SCCP has sought to improve access to and enhance the quality of student clinical research opportunities with the development of the Student Team Experiential Project (STEP). STEP was created with the goal of placing qualifying Wingate SCCP members in an array of longitudinal medication-based research projects at institutions around the Charlotte, North Carolina region. Projects are developed in conjunction with Wingate SCCP faculty advisors and area clinical pharmacy specialists.
METHODS: In order to be eligible for participation in the STEP program, a Wingate SCCP member must accrue a minimum number of points. Points are earned by participating in various Wingate SCCP events. Point values vary based on degree of participation and time commitment. The STEP program is designed so committed Wingate SCCP members are eligible for participation after 1–2 semesters. Once a student has obtained the required point minimum, he or she is considered "active" and may participate in a selected STEP-associated research endeavor. In order to maintain qualification, "active" students must demonstrate a consistent investment in SCCP by accruing a set point minimum per academic semester.
RESULTS: N/A.
CONCLUSION: In addition to being an avenue for students to become involved in practice-based clinical research, the STEP program is a means to become more involved in Wingate SCCP as well as community institutions. Students involved in STEP should feel more comfortable progressing to fourth-year experiential rotations and postgraduate training after participating in clinical research processes.

Hematology/Anticoagulation

53. Evaluation of a heparin-induced thrombocytopenia management protocol. *Zhaniela Orgocka, Pharm.D.*[1], John Koerber, Pharm.D.[1], Maureen Smythe, Pharm.D.[1]; (1) Department of Pharmaceutical Services, William Beaumont Hospital, Royal Oak, MI
OBJECTIVES: To assess the continuing impact of a pharmacist-managed heparin-induced thrombocytopenia (HIT) protocol implemented at our health-system in October 2010.
METHODS: This study is a single-center, retrospective, IRB-approved, chart review evaluation of patients who received a

	Pre-period	Post-1 Period	Post-2 Period
DTI started w/low 4T	28/59 (47.5%)	15/46 (32.6%)	13/46 (28.3%)[a]
DTI started within 12 hours for moderate-high 4T	8/31 (25.8%)	24/31 (77.4%)[a]	23/29 (79%)[a]
Median duration of DTI therapy (hours)	122.8	52.1	44[a]
DTI stopped within 12 hours for (–) platelet factor 4 (PF4)	5/23 (21.7%)	12/26 (51.9%)[a]	14/27 (51.9%)[a]
Median duration (hours) of inappropriate DTI therapy	120.3	46.9	12.5[a]
Major bleeding events	8/61 (13.1%)	3/46 (6.5%)	2/46 (4.3%)
Thrombotic events	15/61 (24.6%)	6/46 (13%)	5/46 (10.9%)
Cost of inappropriate therapy	$237,500	$84,550	$173,850[b]

[a]$p < 0.05$ for post 1 or 2 periods vs pre-period.
[b]Primarily a result of two patients (one with weakly positive PF4 & negative serotonin release assay and one with both negative PF4 & serotonin release assays) in whom pharmacist was unable to obtain provider concurrence with DTI discontinuation.

direct thrombin inhibitor (DTI) between October 2012 and May 2013 for the treatment of HIT. Patient demographics, medication use, laboratory data, 4Ts score, protocol adherence (DTI initiation and cessation), clinical outcomes (bleeding and thrombosis), and the cost of inappropriate DTI therapy were collected. Comparisons to previous data (both pre-protocol and immediately post-implementation/post-1) were performed using chi-square, t-test, and Mann-Whitney tests.
RESULTS: Sixty-one patients were evaluated in the pre-period and 46 patients in each post-period over separate 6-month periods. Demographic data were similar.
CONCLUSION: The pharmacist-managed HIT protocol at our institution continues to produce positive results by limiting inappropriate DTI initiation, starting appropriate DTI therapy in a more timely fashion, and reducing duration of inappropriate therapy. Further education on assay interpretation was an identified area of improvement.

HIV/AIDS

54. Developing a pharmacist-led HIV pre-exposure prophylaxis clinic. *Sam Zakkour, Pharm.D.*[1], Mark T. Sawkin, Pharm.D.[1], Craig Dietz, DO[2]; (1) University of Missouri - Kansas City School of Pharmacy, Kansas City, MO (2) Kansas City CARE Clinic, Kansas City, MO
OBJECTIVES: In July 2012, the FDA approved an indication for the use of Truvada® (tenofovir/emtricitabine) for pre-exposure prophylaxis (PrEP) to reduce the risk of sexually acquired HIV. However, its ability to prevent HIV is highly dependent on medication adherence, an issue that clinical pharmacists are adept at addressing. We describe our experiences with developing and implementing a protocol-based, pharmacist-led HIV PrEP clinic at an urban ambulatory care clinic.
METHODS: A protocol was developed based on guidance from the CDC addressing PrEP eligibility, safety and monitoring requirements, and when to discontinue therapy. Templates and standing orders were created in our electronic medical record to reflect our protocol at each stage of PrEP therapy. Individuals interested in PrEP were referred for a formal screening with general medicine physicians and nurses trained on PrEP and HIV risk assessment. If eligible for therapy, safety labs were ordered and a follow-up visit was scheduled with a clinical pharmacist to discuss lab results and the PrEP Risk Evaluation and Mitigation Strategy. Patient assistance program (PAP) applications were initiated with the clinical pharmacist for all patients, regardless of insurance status. A rapid HIV test will be performed to confirm HIV negative status prior to dispensing medication received through PAP. Pharmacists will then follow up with patients 2 weeks after PrEP initiation, and every 3 months thereafter, to address adherence and side effects, provide risk reduction counseling, repeat safety labs, and to reassess the need for continued therapy.
RESULTS: Two months after the implementation of this clinic, seven patients have been screened, of which five are in the process of obtaining PrEP through PAP.
CONCLUSION: A protocol-based, pharmacist-led HIV PrEP clinic is a feasible expansion of the services pharmacists provide in an urban ambulatory care clinic.

Infectious Diseases

55. Implementation of clinical pharmacist-driven interventions for positive blood culture results. *Sara Revolinski, Pharm.D.*[1], William Peppard, Pharm.D.[2], Angela Huang, Pharm.D.[2], Jessica Cowell, Pharm.D.[2], Anne Daniels, Pharm.D.[2]; (1) Inpatient Pharmacy, Froedtert and the Medical College of Wisconsin, Milwaukee, WI; (2) Froedtert and the Medical College of Wisconsin
OBJECTIVES: It has previously been demonstrated that antimicrobial stewardship pharmacist intervention upon the receipt of positive blood cultures positively influences clinical outcomes for the patient. We believe comparable results can be achieved when clinical pharmacists (CPs) are effectively commissioned to do so in a similar manner.
METHODS: Beginning in October 2013, all positive blood cultures at our institution were called directly to CPs around the clock; prior to this time the calls were made directly to providers. Upon receipt of the notification, pharmacists would review the patient case and then contact the provider to inform of the positive results and to make necessary therapy interventions. Prior to implementation, CPs were educated by the antimicrobial stewardship program on the best empiric and definitive therapy choices based on the cultured organisms, as well as additional therapy considerations such as repeat blood cultures or additional testing requirements; resources were provided via competency and the institution's internal website to assist the pharmacists in this endeavor.
RESULTS: An average of 2.2 calls per day were made, with 36% of calls falling to third shift. Due to increased workload with decreased staff overnight, adjustments to the process were made; however, it remained that all calls were still placed to a CP. CPs, on average, contacted the provider 13 minutes after receiving the results. With CP intervention, time to optimal therapy was significantly decreased and a decrease in length of stay was realized, in comparison to outcomes prior CP involvement.
CONCLUSION: Implementation of a process to include CPs in the notification process for positive blood cultures can have a positive impact on clinical outcomes.

Medication Safety

56. Evaluation of antiretroviral-related errors and interventions by the clinical pharmacist in hospitalized HIV-infected patients. *Nada Ibrahim, Master of Clinical Pharmacy*[1]; (1) Department of Pharmacy, Omdurman Management and Care Unit- VCT OMACU-VCT, Khartoum, Sudan

OBJECTIVES: The aim of the study was to identify antiretroviral-related errors in the prescribing of medication to HIV-infected inpatients and to ascertain the degree of acceptance of the pharmacist's interventions.
METHODS: An observational, prospective, 1-year study was conducted in a 1500-bed tertiary-care teaching hospital by a pharmacist trained in HIV pharmacotherapy. Interactions with antiretrovirals were checked for contraindicated combinations. Inpatient antiretroviral prescriptions were compared with outpatient (hospital records) dispensing records for reconciliation. Renal and hepatic function was monitored to determine the need for dose adjustments.
RESULTS: The prescriptions for 100 admissions (80 patients) were reviewed. Thirty antiretroviral-related problems were identified in 41 patients (51.25%). The most common problem was contraindicated combinations (n = 20; 25%), followed by incorrect dose (n = 10; 12.5%), dose omission (n = 9; 11.25%), lack of dosage reduction in patients with renal or hepatic impairment (n = 6; 7.5% and n = 1; 1.25%, respectively), omission of an antiretroviral (n = 6; 7.5%), addition of an alternative antiretroviral (n = 4; 0.5%) and incorrect schedule according to outpatient treatment (n = 3; 0.375%).Fifteen out of 20 errors were made during admission. A multivariate analysis showed that factors associated with an increased risk of antiretroviral-related problems included renal impairment (odds ratio (OR) 3.95; 95% confidence interval [CI] 1.39–11.23), treatment with lopinavir-ritonavir (OR 3.53; 95% CI 1.61–7.76) and admission to a unit other than an infectious diseases unit (OR 2.50; 95% CI 1.28–4.88). Use of a nonnucleoside reverse transcriptase inhibitor was a protective factor (OR 0.33; 95% CI 0. 13–0.81). Ninety percent of the pharmacist's interventions were accepted.
CONCLUSION: Antiretroviral-related errors affected more than one in five patients. The most common causes of error were contraindicated or not recommended drug–drug combinations and dose-related errors. A clinical pharmacist trained in HIV pharmacotherapy could help to detect errors and reduce the duration of their effect.

57. Pharmacy practice & medication reconciliation. *Lama Al-Rashdan, Master*[1]; (1) Princess Badee'a Training Hospital for Gynecology & Obstetrics, Irbid, Jordan
Pharmacy Practice & Medication Reconciliation (ABSTRACT) I. Presented at the 7th International Conference of the Royal Medical Services, the 4th ICMM PARWG Congress on military medicine, Amman, Jordan, November 4–7, 2014.

58. Establishment of the National Office for Handling and Reduction of Medication Errors and its online reporting system in Egypt. *Zahraa Shehata, BCPS*[1], Nagwa Sabri, Ph.D.[2], Ahmed Elmelegy, M.D.[3]; (1) Hospital Pharmacy Administration, Central Administration of Pharmaceutical Affairs, Egypt; (2) Clinical Pharmacy Department, Faculty of Pharmacy, Ain Shams University, Egypt; (3) Pharmacology, Faculty of Medicine, Ain Shams University, Egypt
OBJECTIVES: Clinical pharmacist is responsible for detection, documentation, and prevention of any medication-related problem including MEs (Medication Errors). The aim of NO HARMe (National Office for Handling and Reduction of Medication errors) is to allow for national collaboration between pharmacists and all health professionals from different places to share their experiences, learn from errors, and prevent future recurrence.
METHODS: A thorough review of literature, similar national systems from U.S., Canada, UK and Netherlands and the guidelines of NCC MERP (National Coordinating Council of Medication Error Reporting and Prevention) was performed to establish NO HARMe and its voluntary online reporting system within the Egyptian drug authority. Throughout 6 months, a pilot of 50 clinical pharmacists from 7 governmental hospitals has received continuous training on MEs detection, categorization, and valid online reporting using the national form. All received reports from June 1 until December 31, 2014 were reviewed and analyzed.
RESULTS: In this time frame, the database included 1,300 reports. The majority of reports were from the inpatient departments (66%), and ICU (23%) with few errors reported from outpatient clinics (11%). Prescribing phase was the most commonly involved in reports representing 54% followed by monitoring (25%) and administration phases (16%). The most frequent error type was incorrect dose (20%). Also, drug interactions, incorrect frequency, and incorrect drug were the top reported error types. Most reports were potential errors or category A (25%) prevented errors or category B (11%) and harmless errors category C and D (51%) while only 13% lead to actual patient harm.
CONCLUSION: Currently NO HARMe is effectively gathering ME reports. It serves as an applicable, simple, and reproducible tool to provide information on common errors, root causes, and patient outcomes. Availability of such information helps in developing recommendations, improving products packaging and naming and enhancing medication safety.

59. Successful medication information provision: a marriage between nursing and pharmacy. *Delyne Subrayen, B.Pharm., M.Sc. Med Clinical Pharmacy Candidate*[1]; (1) Pharmacy Department, Netcare Sunward Park Hospital South Africa, Gautwng, South Africa
OBJECTIVES: The provision of medication information to a patient in hospital has been a long overlooked aspect of patient care in South Africa. This may be attributed to the limited resources and staff constraints of the healthcare system in South Africa. The provision of medication information can increase patient knowledge and satisfaction. (1)The hospital where this project was undertaken is a 214-bed multidisciplinary private institution in Johannesburg, South Africa. The medication information scores generated from the patient feedback survey were consistently low. Performing a root-cause analysis revealed that nursing staff were not adequately equipped with the knowledge required to provide this information.
METHODS: A medication information committee was formed and involved members of pharmacy and nursing. The ward pharmacist and clinical facilitators provided training to the nursing staff on the provision of medication information. Medication information sheets that are specific for each ward were implemented and empowered nursing staff to provide the information. Project Champions/Drivers were identified in each ward per shift to ensure sustainability and consistency of the project.
RESULTS: The patient survey that is completed during a patients hospital stay was used as a measure of the effectiveness of the project. The initiation of this project has yielded improvements of more than 40% and these improvements have been sustained since July 2014.
CONCLUSION: Successful implementation of a project such as this cannot be undertaken in isolation as collaboration is vital. The enthusiasm and motivation received from the Hospital Management committee has been pivotal in the attainment of the goals set out.

STUDENT, RESIDENT, AND FELLOW RESEARCH-IN-PROGRESS

ADR/Drug Interactions

60. Identifying potential adverse effects in patients as a result of prolonged proton pump inhibitor therapy. *Jamie Reed, Pharm.D.*[1], Marcus Costner, Pharm.D., BCPS[1]; (1) Pharmacy (119), Veterans Health Care System of the Ozarks, Fayetteville, AR

OBJECTIVES: Proton pump inhibitors were previously identified through a retrospective chart review as being overprescribed to outpatient veterans for the treatment and prevention of gastrointestinal diseases. The primary objective of this study is to identify the potential adverse effects these veterans experienced as a result of prolonged proton pump inhibitor therapy. Adverse effects each veteran will be reviewed for are hypomagnesemia, vitamin B12 deficiency, osteoporosis, community acquired pneumonia, and community acquired *Clostridium difficile* infection.
METHODS: A report was generated identifying outpatient veterans with an active proton pump inhibitor prescription from January 2014 to June 2014. A random sampling of 250 veterans were included in the retrospective chart review. Patients were excluded from results if they were deceased. The data collected includes patient age, patient sex, current outpatient acid suppression medication, medication dosage, acid suppression indication, duration of therapy, laboratory values for magnesium, vitamin B12, vitamin D, and *Clostridium difficile* toxin, bone mineral density testing, chest x-rays and prescription history for magnesium supplements, bisphosphonates, and oral vancomycin. The data collected will be analyzed to determine the rate of occurrence of adverse effects in this population.
RESULTS: Only 77.3% of patients were found to have an indication for acid suppression therapy with a proton pump inhibitor. The duration of therapy with proton pump inhibitors ranged from 44 days to 20.8 years. Data is still being collected and analyzed for adverse effects.
CONCLUSION: The average duration of therapy for 247 veterans was 7 years, and chronic use with proton pump inhibitors increases the risk for adverse effects such as hypomagnesemia, vitamin B12 deficiency, osteoporosis, community acquired pneumonia, and community acquired *Clostridium difficile* infection. Since inappropriate use of proton pump inhibitors may have a negative impact on patient safety, future efforts will focus on optimizing proton pump inhibitors in outpatient veterans.

Adult Medicine

61. Impact of the 2013 cholesterol guidelines on outpatient prescribing practices for lipid lowering therapy. *Elyse Weitzman, Pharm.D.*[1], Jacqueline Lucey, Pharm.D.[2], Megan Clarke, Pharm.D.[3], Claire Walter, Pharm.D.[1]; (1) Allegheny General Hospital, Pittsburgh, PA; (2) Clinical, Social, and Administrative Sciences, Duquesne University, PA; (3) Pharmacy, Allegheny General Hospital, PA
OBJECTIVES: To determine the effect of the 2013 cholesterol guidelines on outpatient prescribing practices for lipid lowering therapy in an internal medicine clinic and a cardiology clinic.
METHODS: Patients were considered for inclusion if they presented to an internal medicine or cardiology clinic during the months of June 2013 and June 2014. Patients were included if they were between 40 and 75 years of age and met criteria for statin therapy based on the 2013 cholesterol guidelines. The following data were collected: age, gender, race, history of diabetes, treatment of hypertension, smoking status, lipid panel, systolic blood pressure, history of ASCVD (atherosclerotic cardiovascular disease), and lipid-lowering therapy at the time of the appointment. The primary outcome is the proportion of patients on evidence-based statin therapy in a group of patients prior to the release of the new cholesterol guidelines compared to that in a group of patients 7 months after the release of the November 2013 cholesterol guidelines.
RESULTS: Data collection and analysis is ongoing and anticipated enrollment in each of the arms is 170 patients. Within the June 2013 cohort, 313 patients were reviewed and 174 met criteria for enrollment. For the 2013 cohort: Mean age 65 ± 8 years; 45.4% ASCVD; 85.6% Caucasian; 31.0% prescribed non-statin lipid lowering therapy; 72.4% prescribed statin therapy, of which 61.1% were dosed at an appropriate intensity and 24.6% were concurrently prescribed with an interacting medication. Within the June 2014 cohort, 17 patients have thus far been reviewed and 10 have met criteria for enrollment.
CONCLUSION: Data for primary outcomes and select secondary outcomes will be compared between the June 2013 and 2014 cohorts as well as between the internal medicine and cardiology clinics. Conclusions will be presented in the poster symposium.

62. Assessment of vancomycin dosing and monitoring pre- and post-implementation of a per-pharmacy protocol at an acute care hospital. *Jora Sliwinski, Pharm.D.*[1], Scott Killian, Pharm.D.[2]; (1) Departments of Family Medicine and Pharmacy Practice, Idaho State University, Pocatello, ID; (2) Pharmacy, Portneuf Medical Center, Pocatello, ID
OBJECTIVES: Prior to implementation of a per-pharmacy vancomycin (VAN) monitoring protocol at our institution in June 2012, physicians or pharmacists managed VAN therapy without a standardized protocol. The objectives of this study are to review and assess the effectiveness of implementing per-pharmacy VAN protocols at our institution by assessing the appropriateness of initial VAN doses based on patient weight and renal function, and proportion of therapeutic VAN trough levels according to treatment indication and goal troughs.
METHODS: For phase one, hospital drug records were queried to identify all patients treated with VAN from Dec 15, 2011 to March 31, 2013. Hospital charts were reviewed retrospectively to determine if patients met study inclusion criteria. Starting doses, intervals and troughs were assessed for appropriateness based on treatment indication, patient weight and renal function. A Fisher's exact test was used to compare rates of appropriate dose and achievement of therapeutic troughs before and after protocol implementation.
RESULTS: A total of 163 patients met inclusion criteria for phase one. There was a modest increase in the proportion of patients who were managed by pharmacists after initial protocol implementation. The proportion of patients with an appropriate dose and interval was 35.4% pre-protocol and 29.7% post-protocol ($p = 0.44$). The proportion of appropriate regimens in pharmacy managed patients pre- and post-protocol was 34.9% and 32.5% respectively ($p = 0.79$). The proportion of patients who had a therapeutic first trough was 21.0% pre-protocol and 27.7% post-protocol ($p = 0.33$).
CONCLUSION: Although more patients were managed by pharmacists, appropriate VAN dosing and therapeutic troughs did not improve post protocol. Modifications to the per-pharmacy protocol included increasing the maximum VAN dose and modifications to dosing intervals. A new protocol was implemented January 1, 2015. Data collection to assess the efficacy of the new protocol will assess patients admitted from October 1, 2014 to April 15, 2015.

63. Evaluation of parenteral iron usage in an inpatient setting. *Alyssa Laurich, Pharm.D.*[1], Christina Stafford, Pharm.D., BCPS[1], Jennifer Catlin, Pharm.D., BCPS[1]; (1) CoxHealth, Springfield, MO
OBJECTIVES: The objective of this research is to determine the appropriate use according to the FDA indication of parenteral iron products used in the acute care setting at CoxHealth. The secondary endpoint is to compare iron dextran, iron sucrose, and ferric gluconate in terms of safety, monitoring, adverse effect profile, and cost as well as to determine the feasibility of developing an intravenous iron treatment protocol.
METHODS: The Discern Explorer and Cerner programs were accessed to retrospectively gather data on patients that received iron dextran, iron sucrose, or ferric gluconate parenterally from January 2012 to September 2014. Approximately, 30 patients were reviewed from each treatment group. Patient age, gender, indication for IV iron product, the product used, iron and hemoglobin levels, comorbidities (i.e. CKD/HD status), erythropoiesis-

stimulating agent given, recent blood transfusions, adverse effects, and cost of agents was collected.
RESULTS: Preliminary results include data collected on 15 patients in each treatment group. There were a total of 29 females and 16 males. This data indicated the appropriate and inappropriate use of the parenteral iron products as follows: iron dextran 60% vs 40%, iron 20% vs 80%, and ferric gluconate 36% vs 50% and 14% of the ferric gluconate could not be determined. Data will continue to be collected and reviewed until March 1, 2015.
CONCLUSION: Research in progress. Conclusion is to be determined with final results.

Ambulatory Care

64. Testosterone use and monitoring in the treatment of hypogonadism. *Takova Wallace, Pharm.D.*[1], Garrett Aikens, Pharm.D.[2], Addison Ragan, Pharm.D.[3]; (1) Pharmacy, Central Alabama Veterans Affairs Health Care System, Tuskegee, AL; (2) Pharmacy, Central Alabama Veterans Affairs Health Care System, Montgomery, AL; (3) Pharmacy, Central Alabama Veterans Health Care System, Montgomery, AL
OBJECTIVES: The prescribing and monitoring patterns of testosterone at Central Alabama Veterans Health Care System (CAVHCS) were evaluated in order to provide education and possible interventions in order to improve patient care.
METHODS: A ProClarity report was pulled in August 2014 to include all patients who were currently being treated with testosterone gel formulation. A sample of patients were evaluated for the appropriateness of initial testosterone dosing, per current recommended prescribing criteria as outlined. Additionally, patients were evaluated for safety parameters such as baseline and periodic testosterone and PSA as well as periodic complete blood counts and liver function tests.
RESULTS: There were a total of 72 patients evaluated, 69 of which were prescribed Androgel 1.62% and 3 were prescribed Androgel 1%. One of the primary findings was associated with appropriateness of current prescribing habits. Physicians commonly prescribe Androgel to be given as a one pump once daily, whereas dosing recommendations for men with hypogonadism recommend two to four pumps once daily for 1.62% and 1% Androgel formulations, respectively. From the 75 patients evaluated, 12.5% (9 patients) were found to be initiated on an appropriate dose of testosterone and 87.5% (63) were found be initiated on the widely utilized dosing regimen of once pump once daily, regardless of the concentration of the pump. According to the safety review, patients are being routinely monitored for testosterone levels, PSA, CBC and LFT; however, often times (47% of patients) testosterone dose was not adjusted based on current recommendation for adjusting dosage based on levels.
CONCLUSION: This study demonstrates the need for education regarding the appropriateness of testosterone dosing and the importance of obtaining baseline and periodic testosterone, PSA, CBC and LFT monitoring in patients requiring testosterone therapy for treatment of hypogonadism.

65. Impact of a pharmacist-only clinic vs a pharmacist-led multidisciplinary clinic on tobacco cessation rates in a homeless population. *April Bills, Pharm.D. Candidate 2016*[1], Kevin Giang, Pharm.D. Candidate 2016[1], Sabrina La Spisa, Pharm.D. Candidate 2016[1], Kelsey Buckley, Pharm.D., BCACP[2], Laura Tsu, Pharm.D., BCPS, CGP[1], Rebekah McKinley, Pharm.D.[1], Nicole Kitts, Pharm.D.[1]; (1) Department of Pharmacy Practice, Midwestern University College of Pharmacy, Glendale, AZ (2) Midwestern University College of Pharmacy-Glendale, Glendale, AZ
OBJECTIVES: Tobacco usage rates among the homeless population are higher than the national average. The primary objective of this study is to determine the effectiveness of pharmacist-only education with pharmacotherapy vs pharmacist-led multidisciplinary approach with pharmacotherapy toward the rate of follow-up with a smoking cessation program in the homeless population.
METHODS: This is a prospective, cohort study of homeless patients seen by the pharmacist-only clinic vs the pharmacist-led multidisciplinary clinic. Patients are recruited to this study on-site at the Central Arizona Shelter Services, Inc. (CASS) clinic in Phoenix, Arizona. Two recruitment methods (direct patient invitation and Health Outreach through Medicine and Education [H.O.M.E.] clinic screenings) are used to identify up to 140 patients throughout the entire project, with the number of recruited patients per night varying based on patient interest and eligibility. Patients are eligible to participate in the study if they meet the following criteria (i) resident of CASS as a homeless patron, (ii) current smoker, and (iii) interested in tobacco cessation. Eligible patients will receive counseling, motivational interviewing, two weeks of NRT (gum or lozenge), and will be referred to Arizona Smokers' Helpline (ASHLine). Continued follow-up will be conducted by ASHLine with reports given to evaluate effectiveness of the initial recruitment and referral.
RESULTS: Table 1 includes baseline information collected between clinics starting 10/21/2014 through 12/9/2014.Table 1: Preliminary data collected to date (1/14/2015)

	Pharmacist only	Pharmacist-led multidisciplinary
Number of Clinics Completed	3	2
Number of Patients Seen	36	23
Number of Patients Enrolled in ASHLine	5	3
Average number of prior quit attempts	2.3	
Average number of smoking years	5.9	

CONCLUSION: Completion of this study will help determine if patients are more likely to continue tobacco cessation therapy when directed by a single discipline (pharmacy) vs multiple disciplines (pharmacy, medical, and clinical psychology).

66. Determining current patient medication list utilization. *Anne Misher, Pharm.D.*[1], Jill S. Borchert, Pharm.D., BCPS, FCCP[2], Mary Ann Kliethermes, Pharm.D.[1], Spencer Harpe, Ph.D.[1], Jennifer D'Souza, Pharm.D., CDE, BC-ADM[2], Lea E. dela Pena, Pharm.D., BCPS[2]; (1) Department of Pharmacy Practice, Midwestern University Chicago College of Pharmacy, Downers Grove, IL (2) Department of Pharmacy Practice, Dreyer Medical Clinic & Midwestern University Chicago College of Pharmacy, Downers Grove, IL
OBJECTIVES: Accurate medication lists can help improve patient safety by reducing medication errors; however, limited literature describes what information a medication list should contain. The aims of the study will be to determine how patients and health care providers are currently utilizing the medication lists generated from the electronic medical record (EMR), collect information to optimize the contents of medication lists and collect patient and provider insight for improving medication list.
METHODS: A patient survey, health care provider survey and focus group will be conducted at Dreyer Medical Clinic. A pharmacist survey will be conducted at Midwestern University Chicago College of Pharmacy. Adult patients will be included if they are English speaking, currently prescribed at least 6 medications and have an appointment with a clinical pharmacist. Survey questions will assess information gained from medications lists, desired medication list contents, preferred ordering

of medications on the medication list and participant demographics. The focus group will be conducted by the pharmacy resident according to the Duke Guidelines on How to Conduct a Focus Group. Data collected through the survey portions of the study will be assessed using descriptive statistics and comparisons between groups will be compared by means of Wilcoxon rank sum and chi square. Responses from the focus group will be transcribed and organized into categories and then assessed for similarities and differences among participants.
RESULTS: Data collection has begun and is anticipated to end in March 2015. Results to date indicate pharmacists are using medication lists to know which medications their patients are taking (100% of survey responders, n = 19) and why patients are taking medications (69% of survey responders, n = 19). Pharmacists prefer medications listed either alphabetically or by medical condition.
CONCLUSIONS: Conclusions are pending further results.

67. Evaluation of the impact of pharmacist education on patient comprehension of insulin use and injection technique. *Jenny Leung, Pharm.D.*[1], Sarah Muench, Pharm.D., CDE[1], Janna Fett, Pharm.D., BCACP[1], Sara Dadayan, Pharm.D., CDE[1], Colleen Lauster, Pharm.D., BCPS, CDE[1]; (1) Beaumont Hospital, Royal Oak, Royal Oak, MI
OBJECTIVES: Insulin is increasingly being prescribed to improve glycemic control, but research has found gaps in patient knowledge of insulin therapy and injection technique. Guidelines recommend reviewing insulin therapy and injection technique with patients annually. In our outpatient DM Clinic, pharmacists provide drug therapy recommendations and patient education, but there is not a standardized process for insulin education. The objective of this IRB-approved study is to evaluate the impact of an insulin education program on patients' knowledge of insulin therapy and injection technique.
METHODS: Enrollment is offered to adults in DM Clinic using insulin. During the DM clinic visit, investigators give consented patients a baseline multiple-choice insulin comprehension questionnaire and also use an evaluation checklist to assess injection technique. After completing the baseline assessments, subjects receive one-on-one insulin education from a pharmacist. This session covers side effect management and injection technique. Subjects complete the questionnaire and injection technique assessment again immediately after the session to evaluate if pharmacist education has improved patient knowledge. To assess patients' retention of knowledge, comprehension questionnaires are conducted again 4 weeks after the baseline assessment via telephone and injection technique is reevaluated at each subject's next clinic visit. Additional data collected includes subjects' diabetes duration, time on insulin therapy, and prescribed insulin regimens. Paired t-tests will be used to assess if a statistical difference exists between the percentage of correct answers on the baseline questionnaire and checklist compared to those conducted at each post-education time point.
RESULTS: Enrollment and data collection are currently ongoing, with eight patients enrolled thus far. The initial subjects include 6 (75%) males and 2 (25%) females, of which 3 (37.5%) use insulin pens only, 3 (37.5%) use insulin vials only, and 2 (25%) use both.
CONCLUSION: Final results and conclusions are anticipated prior to May 2015.

Cardiovascular

68. Effects of long-term proton pump inhibitor use in those receiving dual antiplatelet therapy after percutaneous coronary intervention. *Jennee Nickleson, Pharm.D. Candidate*[1], Penelope Bland, Pharm.D. Candidate[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
OBJECTIVES: Limited data exists regarding whether the extended use of proton pump inhibitor (PPI) therapy increases risk of adverse drug events (ADEs). While their short-term adverse event profile is considered minimal, PPIs have been associated with bone fractures, gastrointestinal infections, and nutritional deficiencies. In a preliminary sample of veterans receiving dual antiplatelet therapy (DAPT) after percutaneous coronary intervention (PCI), administration of PPIs longer than 12 months occurred in >80% of cases. We studied whether significant ADEs are associated with the long-term use of PPIs in a post-PCI population receiving DAPT.
METHODS: This was a retrospective analysis of veterans who underwent PCI from 2012–2013. Patients receiving PPI with DAPT were compared to a control group of patients on DAPT without PPIs. The incidence of fractures, *Clostridium difficile*, pneumonia, and nutritional deficiencies were evaluated.
RESULTS: Ninety-six patients were included (mean age, 64 ± 8.4). Sixty-two (65%) were prescribed PPI therapy. More ADEs occurred in those receiving PPIs than in controls (p = NS).

Adverse Event	PPI (n = 62)	No PPI (n = 34)	p Value
Bone fracture	4 (6.5%)	1 (2.9%)	0.06
Clostridium difficile	2 (3.2%)	0	0.54
Pneumonia	3 (4.8%)	4 (11.8%)	0.24
Hypoalbuminemia	18 (29%)	9 (26.5%)	1.00
Hypomagnesemia	39 (63%)	18 (53%)	0.33

One patient was found to have B12 deficiency. However, only 22 patients were screened for this throughout the course of PPI therapy. Most patients received PPI therapy for >12 months (82.2%) of which 19 (37.2%) lacked compelling indications for use.

CONCLUSIONS: Use of extended PPI therapy for longer than 12 months is a common practice in the post-PCI population. However, this practice has the potential for ADEs. Therefore, the need for continued use of PPI therapy for GI prophylaxis beyond 12 months should be reassessed once DAPT is discontinued.

69. A mixed treatment comparison analysis of anti-anginal agents in chronic, exertional angina. *Rhynn J. Malloy, Pharm.D., BCPS*[1], Tiffany Ip, Pharm.D., BCPS[1], Danielle Honein, Pharm.D., BCPS[1], Milka Njoroge, Pharm.D., BCPS[1], Jennifer L. Donovan, Pharm.D.[2]; (1) Department of Pharmacy, UMASS Memorial Medical Center, Worcester, MA (2) MCPHS University, Worcester, MA
OBJECTIVES: In the management of chronic stable angina, beta-blockers, calcium channel blockers and nitrates are commonly used to control symptoms. There is lack of evidence supporting the appropriate choice of an anti-anginal agent used alone or in combination with another agent in patients with chronic angina. The objective of this meta-analysis is to determine the relative efficacy of anti-anginal drugs administered as monotherapy or in combination in patients with chronic exertional angina.
METHODS: A comprehensive literature search was conducted in MEDLINE (1945-October 2014) and EMBASE (1974-October 2014) to identify treatment comparisons of various anti-anginal agents for the management of chronic exertional angina. Articles were included if they were English-language, randomized controlled trials that compared efficacy of antianginal drugs, used as monotherapy or in combination, in a human population with chronic exertional angina. Included drugs were drawn from the most recent chronic angina guidelines in the European Heart Journal. Articles were excluded if they did not assess exercise tolerance, did not include >100 patients, or did not assess patients for >7 days. Data will be screened, evaluated, and entered into Aggre-

gate Data Drug Information System (ADDIS), version 1.16.3, software package to build a Markov Chain Monte Carlo analysis.
RESULTS: The combined MEDLINE and EMBASE searches yielded 1,416 articles. After applying the initial exclusion criteria, 78 articles have been identified for further review; those with a JADAD score >3 will be entered into ADDIS for analysis.
CONCLUSION: Upon completion of article selection, the primary endpoint of exercise tolerance will be analyzed via ADDIS and further development of secondary endpoints will be completed and presented at the meeting.

70. Heparin dosage requirements during hypothermia vs normothermia in cardiac arrest survivors. *Kristin Howard, Pharm.D.*[1], Quinn Czosnowski, Pharm.D., BCPS[1], Michelle Deckard, RN, MSN, ACNS-BC, CCRN-CMC[2]; (1) Department of Pharmacy, IU Health Methodist Hospital, Indianapolis, IN (2) Department of Nursing, IU Health Methodist Hospital, Indianapolis, IN
OBJECTIVES: The objective of this study is to determine intravenous unfractionated heparin (IV UFH) requirements necessary to attain goal aPTTs during targeted temperature management (TTM, 33°C) vs normothermia (36–38°C).
METHODS: Adult patients undergoing TTM at IU Health Methodist Hospital between January 1, 2013 and December 31, 2014 were included for analysis in this retrospective chart review if they had orders for therapeutic IV UFH with aPTTs at baseline and during TTM. Data was identified via a TTM database and chart review. Mean patient heparin doses throughout TTM were categorized into one of three ranges and assessed by the percentage of time aPTT values were within the goal aPTT range, supratherapeutic or subtherapeutic. Data from study patients was compared to a matched control group also receiving UFH but not undergoing TTM for comparison.Data collected includes patient demographic information, in-hospital or out-of-hospital cardiac arrest, co-morbid conditions, baseline coagulation tests, aPTTs throughout TTM, baseline and daily hemoglobin/hematocrit, death during hospitalization, heparin protocol used, anticoagulant(s) prior to admission, intensive care unit and hospital lengths of stay, and major bleeding events. Data specific to heparin includes indication, duration of therapy, bolus dose, initial infusion rate, and cumulative infusion rates required during TTM and for 48 hours following re-warming. Descriptive statistics and student's t-test will be utilized for continuous variables, with Chi-square or Fisher's exact test for categorical variables.
RESULTS: Of the 132 patients who underwent TTM at Methodist Hospital in 2014, 31 (23.5%) received therapeutic IV UFH. With the inclusion of 2013 patients, full data collection is still ongoing.
CONCLUSIONS: Study results and conclusions will be presented at the 2015 ACCP Virtual Poster Symposium.

Community Pharmacy Practice

71. ACCP Analysis of quality-related events and true errors in telepharmacy. *Jessica Vickers, Pharm. D.*[1], R. W. Force, Pharm.D.[1], A. Hayes, Pharm.D.[1]; (1) College of Pharmacy, Idaho State University, Pocatello, ID
OBJECTIVES: Telepharmacy is a viable option for rural communities lacking traditional community pharmacy (TCP) service. The error rates in telepharmacy may differ from TCP. To evaluate this, we developed a reporting system to document error rates in telepharmacy and compared them with literature-based rates in TCP and established telepharmacies.
METHODS: A data collection system was created to identify the locations and types of quality-related events (QRE) and true errors. QRE included errors that occurred at any point up to the patient's receipt of the prescription. True errors were defined as those discovered after patient receipt of the medication. Data collection was based on non-punitive self-report; pharmacy staff were educated on the process. Errors were categorized (green/yellow/red) based on the potential for harm. Statistical process control charts were developed to track error rates over time. Comparisons will be made with literature-based estimates of error rates in TCP and telepharmacy settings.
RESULTS: The initial data collection period was 10/13/14–12/26/14. During this period, 8 true errors occurred in 7,308 prescriptions (0.11%); 90 (1.23%) QRE were recorded. Of the QRE and true errors, 48% were unlikely to cause harm, 24% were possibly harmful, and 26% were likely to cause harm. Statistical process control charts have so far indicated a stable process over time. An additional 3 months of data will be reported at the virtual poster session in May.
CONCLUSION: Based on preliminary data, the error rates observed in this telepharmacy setting are comparable to those reported in the literature.

Critical Care

72. Evaluation of a pharmacist assessed confusion assessment method for the intensive care unit (CAM-ICU) vs a nursing assessed CAM-ICU. *Livia Mackley, Pharm.D.*[1], Jennifer Catlin, Pharm.D., BCPS[2], Karrie Derenski, Pharm.D., BCNSP, CNSC[1], Amy Lewis, Ph.D.[3], Michelle Seratt, BSN, RN, CCRN-K[4]; (1) Pharmacy Services, CoxHealth South Medical Center, Springfield, MO; (2) CoxHealth, Springfield, MO; (3) Breech School of Business, Drury University, Springfield, MO; (4) Nursing Education, CoxHealth, Springfield, MO
OBJECTIVES: The CAM-ICU is a validated tool to assess delirium in intensive care unit (ICU) patients. It has a pooled sensitivity of 76–80% and pooled specificity of 96%. It also has an inter-rater reliability between 0.75 and 0.96; however, reliability has not been tested between pharmacists and nurses. The primary objective of this study is to compare a pharmacist assessed CAM-ICU to a nursing assessed CAM-ICU in a tertiary health care center medical intensive care unit.
METHODS: This is a prospective single center non-inferiority study comparing a pharmacist assessed CAM-ICU and a nursing assessed CAM-ICU. One hundred patients 18 years or older admitted to the medical ICU for greater than or equal to 48 hours are being assessed daily for their level of consciousness using the Richmond Agitation and Sedation Scale (RASS) and delirium using the CAM-ICU. All cognitive assessments by pharmacists and nurses are being conducted independently in a blinded fashion. The CAM-ICU scores between pharmacists and nursing will then be compared for inter-rater reliability.
RESULTS: A pre-survey was conducted prior to study implementation assessing feasibility, acceptance, and baseline knowledge of delirium. The same survey will be given after completion of the study. Preliminary data indicates on a 5-point scale of 1 being strongly disagree and 5 being strongly agree, pharmacists feel less confident in assessing a patient for delirium with an average score of 3.0 vs nurses with an average score of 4.0. Pharmacists feel more confident providing pharmacological interventions with an average score of 4.2 vs nursing with an average score of 3.6. The pharmacist assessed and nursing assessed CAM-ICU data collection is underway.
CONCLUSION: Estimated completion date of the study protocol will be April 30, 2015.

73. Impact of hydrocortisone continuous infusion vs bolus dose on glycemic control in critically ill subjects. *Laura Zane, Pharm.D.*[1], Christy Forehand, Pharm.D., BCPS[2], April Quidley, Pharm.D., BCPS, FCCM[2]; (1) Department of Pharmacy, Vidant Medical

Center, Greenville, NC; (2) Vidant Medical Center, Greenville, NC

OBJECTIVES: Corticosteroids are used for adrenal insufficiency in critically ill patients, but cause hyperglycemia. Despite limited evidence, the 2012 Surviving Sepsis Campaign guidelines recommend using continuous infusion (CI) hydrocortisone at a dose of 200 mg/day to minimize hyperglycemia. The objective of this study is to compare subjects who received hydrocortisone CI vs bolus dose (BD) to determine if there is a difference in glycemic control and variability.

METHODS: This single center, retrospective, matched study will evaluate critically ill adults who received CI or BD hydrocortisone. Subjects (n = 100 per group) will be matched on history of type 2 diabetes and intensive care unit. This will provide 80% power to detect a 5% difference in mean BG with an alpha <0.05 based on an expected standard deviation of 11.5 mg/dL. Exclusion criteria are pregnancy, type 1 diabetes mellitus, or missing blood glucose (BG) level within 6 hours of hydrocortisone administration. The primary endpoint is difference in mean BG levels and insulin requirements. Secondary endpoints include: variability in BG levels, mortality, ICU and hospital length of stay, type and route of insulin administered, and hypoglycemia (BG < 60 mg/dL). Descriptive statistics, Student's t-test, the Mann-Whitney U test, Fisher's exact test, or chi-square will be used as appropriate to evaluate background, primary and secondary endpoints.

RESULTS: Interim data (n = 16) suggest no difference in mean BG with hydrocortisone CI vs BD (147.2 mg/dL vs 139.3 mg/dL) or variability in BG (30.9 vs 38 mg/dL). The CI subjects had higher median daily insulin requirements (14 [0–314] vs 0 [0–88] units) as well as ICU and hospital length of stay. No differences in mortality or hypoglycemic events were noted.

CONCLUSIONS: The CI group had higher baseline BG levels, which may explain the higher insulin requirements. More data is needed and further results may change institutional practice.

Education/Training

74. Student perceptions of Interprofessional Education (IPE) during an accelerated pharmacy curriculum. *Blaine Johnson, Pharm.D. Candidate*[1], Cheryl Hayes, Pharm.D., MBA, MJ, BCPS[1]; (1) Roosevelt University College of Pharmacy, Schaumburg, IL

OBJECTIVES: This study was designed to determine attitudes and perceptions of students in an accelerated Doctor of Pharmacy program toward Interprofessional Education (IPE) prior to and subsequent to IPE experiential activities. There is increasing mandate across many health care professions to incorporate IPE into curriculum. Overall, this study aims to measure changes in attitude and understanding of students' roles in interprofessional practice before and after completion of 80 hours of focused IPE experiences over two terms.

METHODS: Sixty-nine second year pharmacy students completed the validated Student Perceptions of Physician-Pharmacist Interprofessional Clinical Education (SPICE) instrument assessing attitudes and perceptions toward interprofessional collaboration before an introductory IPE experience. The SPICE instrument utilizes a five-point Likert scale and addresses interprofessional teamwork and team-based practice, roles/responsibilities for collaborative practice, and patient outcomes from collaborative practice.

RESULTS: Data revealed students agreed/strongly agreed that health outcomes are improved when patients are treated by a team of professionals from different disciplines (94%) and that physicians and pharmacists should collaborate in teams (96%). Similarly, students agreed/strongly agreed that during their education, medical and pharmacy students should be involved in teamwork in order to understand their respective roles (96%) and that patient satisfaction is improved when patients are treated by a team of professionals from different disciplines (94%). However, 16% of students responded that their role within the interdisciplinary team was not clearly defined and 20% responded that they did not understand the roles of other professionals within the interdisciplinary team.

CONCLUSION: Preliminary results demonstrate that students have an appreciation for the value of IPE, however, display less familiarity regarding the role of a pharmacist on an interdisciplinary team. Additionally, students view the incorporation of IPE in pharmacy curriculum as very important to both their education and optimal patient outcomes. Further surveys are planned after students experience additional exposure to IPE experiences.

75. Assessment of the impact and sustainability of residency projects. *Yi Zhou, Pharm.D., BCPS*[1], Troy Gulden, Pharm.D.[1], Melanie Kuester, Pharm.D., BCPS[1], Christina White, Pharm.D., MBA, BCPS[1], Deanna Kania, Pharm.D., BCACP, BCPS[1]; (1) Richard L. Roudebush VA Medical Center

OBJECTIVES: Completing a successful project during a 1-year residency can be a daunting task and may pose challenges to residents, preceptors, and the residency sites. The purpose of this project is to identity traits of successful research, barriers in designing residency projects, and to propose a new process in selecting research projects that will benefit the facility and the residents.

METHODS: During phase one, all residency projects from 1997–2013 at the Indianapolis VA Medical Center (VAMC) were evaluated (n = 67). The following data were collected: type of research, originality of research ideas, number of outcomes, time period of data collection, number of residents and preceptors involved, sample size, limitations, and whether the project led to a new position, new clinical practice, or publication.

RESULTS: After data analysis, projects that were impactful had a shorter data collection window (<24 months), larger sample size (n > 200), and at least 2.5 preceptors. Barriers to successful research projects consisted of limited time and limited preceptor guidance. The second phase of the project is to conduct a survey of past Indianapolis VAMC residents as to their residency research experiences and its impact on their career and to propose and implement strategies aimed at developing research projects that provide meaningful and impactful results. Initial strategy ideas include initiating a tiered preceptor model, pairing of residents, reviewing research projects for continuation, creating large-scale quality improvement projects with a narrow focus, and starting the timeline earlier.

CONCLUSION: It is anticipated that these findings will assist the facility in creating an outline for the development of research projects that when followed are more likely to result in impactful projects for the facility and result in less stress for the residents and project preceptors.

Emergency Medicine

76. Emergency department patients – who is going to fall? *Nikki Bhogal, Pharm.D.*[1], Hyunjoo Lee, M.D.[2], Loan Kim Hoang, M.D.[2], Samantha Cohen, Pharm.D.[3], Saadia Akhtar, M.D.[2]; (1) Department of Pharmacy/St. John's University, Mount Sinai Beth Israel, Manhattan, NY; (2) Department of Emergency Medicine/Icahn School of Medicine, Mount Sinai Beth Israel, Manhattan, NY; (3) Department of Emergency Medicine/St. John's University, Mount Sinai Beth Israel, Manhattan, NY

OBJECTIVES: To identify risk factors associated with falls in the ED and to determine if high-risk fallers are being identified.

METHODS: This is a retrospective case-control study of patients at least 18 years old who presented to the ED between January 2012 and August 2014. The cases ("fallers"), identified by a fall incident report, had a fall documented in their medical chart that occurred either in or on their way to triage or at some point during their ED stay. An identical number of

controls ("non-fallers") were chosen from the days that each faller fell. Each patient was assessed for possible risk factors, pertinent past medical history, and administration of fall risk medication during the ED stay (see Table 1). Whether or not a fall risk assessment was completed in the ED was noted. Factors were assessed by Pearson's chi-square test with Bonferroni correction.
RESULTS: 190 patients were assessed. A greater proportion of fallers presented with alcohol/drug abuse history ($p = 0.001$), intoxication/overdose ($p = 0.001$), altered mental status ($p = 0.001$), seizure disorder ($p = 0.024$), and hypotension ($p = 0.043$). Non-fallers more commonly reported a cardiovascular history ($p = 0.048$) and the use of ambulatory aids ($p = 0.015$). There was no significant difference in the use of fall risk medications between the groups (see Table 1). Fifty-eight percent of fallers were not assessed for fall risk while in the ED. A greater proportion of fallers were predicted to fall (83% of fallers vs 37.9% of non-fallers, $p = 0.001$).
CONCLUSION: An increased risk of fall in the ED was associated with the presence of intoxication or overdose, altered mental status, seizure disorder, hypotension, and alcohol or drug abuse history. Identification of these risk factors early on at triage may decrease the risk of falls in the ED.

77 Adjunct analgesic use in the emergency department for acute pain. *James Priano, Pharm.D.*[1], Brian Faley, Pharm.D., BCPS[1], Gabrielle Procopio, Pharm.D.[1], Kevin Hewitt, M.D.[2], Joseph Feldman, M.D.[2]; (1) Ernest Mario School of Pharmacy, Rutgers, The State University of New Jersey, Piscataway, NJ (2) Department of Emergency Medicine, Hackensack University Medical Center, Hackensack, NJ
OBJECTIVES: Multimodal analgesia is common practice in the post-operative setting, but the utility of adjunct medications in the emergency department is less clear. The primary objective is to analyze emergency department (ED) provider ordering habits for adjunct non-opioid pain medication for opioid-naïve patients who require intravenous (IV) morphine or hydromorphone for acute pain. Secondary objectives are to assess time to opioid rescue dose, pain scores, total opioid consumption in morphine equivalent units (MEUs), and ED length of stay (LOS) between groups.
METHODS: A retrospective chart review of opioid-naïve adult patients who presented to the emergency department and received IV morphine or hydromorphone for acute pain is underway.
RESULTS: Preliminary data is available on 102 patients. In the overall cohort, adjunct medications were ordered on 38% of patients. Adjunctive medications were ordered on 27% and 49% of patients who initially received IV hydromorphone or IV morphine, respectively. Patients who initially received IV hydromorphone received more opioid compared to patients who initially received IV morphine (7.36 vs 4.15 mg MEU, $p < 0.0001$). Initial pain score reduction on the Numeric Rating Scale (NRS) did not differ between patients who initially received IV hydromorphone vs IV morphine (4.15 vs 3.26, $p = 0.285$). In the overall cohort, patients who received adjunct analgesics had a significantly shorter ED LOS than those who did not (324 vs 414 minutes, $p = 0.0286$).
CONCLUSION: A small proportion of patients eligible to receive adjunct medications in the ED actually do. Adjunct medication use in the emergency department may decrease ED LOS. Further studies are warranted to assess the potential impact of adjunct medications of patients with acute pain in the emergency department.

Endocrinology

78. Evaluation of hyperglycemia correction insulin in non-critically ill patients before and after an updated standardized subcutaneous insulin order set. *Luke Hvass, Pharm.D.*[1], Hailey Anderson, Pharm.D.[1], Jennifer H. Austin, Pharm.D.[1]; (1) University of Chicago Medicine, Chicago, IL
OBJECTIVES: To optimize the management of inpatient hyperglycemia, the University of Chicago Medicine utilizes a standardized insulin order set. In an attempt to increase adherence of administration of correctional insulin, additional instructions were added to the order set that prompted nurses to provide correctional insulin, regardless of whether the patient was eating or not, if hyperglycemic. The primary objective of this study is to evaluate the effectiveness of utilizing administration comments to increase adherence to correctional insulin.
METHODS: Patients with orders for correction factor insulin were identified through the electronic medication administration record (eMAR) from June 1 through June 7, 2014 (post order set update) and compared to a historic cohort during the same week in 2013 (pre order set update). Patients' blood glucose (BG) values, correction factor insulin administration, and reasons why correction factor insulin was not administered were collected. The primary objective is to determine the proportion of BG levels where insulin was indicated and not administered. Secondary objectives are to analyze the reasons why insulin was not given and determine the average BG when correction insulin doses were indicated but not administered.
RESULTS: Preliminary results of 20 patients with correction insulin orders show that a total of 69 BG levels were drawn. Of these, 49 BG levels warranted correction insulin. On 13 occasions (26.5%) insulin was not administered. Documented reasons of why insulin was not given when indicated include: patient refusal ($n = 4$), NPO status ($n = 2$), patient unavailable ($n = 1$), and no comments ($n = 6$).
CONCLUSIONS: Based upon preliminary data, the utilization of correctional insulin is suboptimal, indicating the need for additional patients to be reviewed to analyze the clinical significance of this change and if the results remain consistent for a broader patient population. The additional data has been requested, and will be ready for presentation by early May, 2015.

Health Services Research

79. The analysis of pharmacotherapy at hospital admission and discharge. *Ivana Marinoviæ, Master of Pharmacy*[1], Vesna Baèiæ Vrca[1], Sreæko Marušiæ[2]; (1) Department of Clinical Pharmacy, University Hospital Dubrava, Zagreb, Croatia; (2) University Hospital Dubrava, Department of Clinical Pharmacology, Zagreb, Croatia
OBJECTIVES: In order to develop a program that includes medication reconciliation at the Clinic of Internal Medicine, research on the analysis of pharmacotherapy at the admission and discharge has been started and will be conducted for 6 months
METHODS: Patients being admitted to the Clinic of Internal Medicine are interviewed and the Best Possible Medication History (BPMH) is created. BPMH is compared to the prescribed therapy at the time of hospital admission and discharge. In communication with physicians, we identify and resolve all unintentional discrepancies. We also evaluate the potential seriousness of these discrepancies. In order to optimize pharmacotherapy, residents of clinical pharmacy are doing interventions during hospital admission.
RESULTS: During the 2-month period, 70 patients were enrolled in research. 37 unintended discrepancies were identified and classified according to type of discrepancy. The most common type of discrepancy was omission of drug (59,5%). Most discrepancies (48,7%) had the potential to result in severe discomfort or clinical deterioration (class 3). **Conclusion:** Our analysis has shown high incidence of unintentional discrepancies with the potential to result in severe discomfort or clinical deterioration (class 3). Residents of clinical pharmacy made a large number of interventions in order to optimize the therapy. We evaluated patients' knowledge and understanding of medications in use and the rate of patients' adherence to medication which indicate the need for introducing counselling at discharge from hospital. Reference: Cornish PL, Knowles SR, Marchesano R, et al. Unintended

medication discrepancies at the time of hospital admission. Arch Intern Med 2005;165:424-9.
CONCLUSION: Our analysis has shown high incidence of unintentional discrepancies with the potential to result in severe discomfort or clinical deterioration (class 3). Residents of clinical pharmacy made a large number of interventions in order to optimize the therapy. We evaluated patients' knowledge and understanding of medications in use and the rate of patients' adherence to medication which indicate the need for introducing counselling at discharge from hospital. Reference: Cornish PL, Knowles SR, Marchesano R, et al. Unintended medication discrepancies at the time of hospital admission. Arch Intern Med 2005;165:424-9.

Hematology/Anticoagulation

80. Evaluation of standard vs high-dose enoxaparin for venous thromboembolism prophylaxis in morbidly obese medical patients. *Bryan Gendron, Pharm.D. Candidate*[1], Michelle Herrmann, Pharm.D., BCPS[2], April Quidley, Pharm.D., BCPS, FCCM[2]; (1) Eshelman School of Pharmacy, University of North Carolina, Chapel Hill, NC; (2) Vidant Medical Center, Greenville, NC
OBJECTIVES: Obesity increases the risk of venous thromboembolism (VTE) and alters the pharmacokinetics of agents used for prophylaxis. The study objective is to evaluate the safety and efficacy of dosing enoxaparin 40 mg once daily vs twice daily for VTE prophylaxis in medically ill, hospitalized, morbidly obese patients. We hypothesize that enoxaparin 40 mg twice daily will decrease the occurrence of VTE in this patient population.
METHODS: This retrospective study included adults patients receiving prophylactic enoxaparin while admitted to the internal medicine, hospitalist or family medicine service between 7/1/2012 and 7/31/2014 with BMI ≥40 kg/m^2, length of stay ≥48 hours, and a creatinine clearance >30 mL/min. Patients were excluded if admitting diagnoses included VTE, use of treatment dose anticoagulation at admission, pregnant, had recent or ongoing bleeding, or had major surgery or trauma within six weeks. Enrolled patients were divided into groups based on whether they received standard dose enoxaparin (40 mg once daily) or high-dose enoxaparin (40 mg twice daily). The primary study endpoint is the rate of VTE between groups, and the secondary endpoint is the rate of bleeding based on its presence on the hospital discharge summary. 400 patients will be included to provide 80% power to detect an 11% difference in the rate of VTE. VTE and bleeding rates between groups will be compared using Fisher's Exact or Chi square tests, as appropriate. This study has been approved by the Institutional Review Board.

PRELIMINARY RESULTS:

	Enoxaparin 40 mg once daily (n = 200)	Enoxaparin 40 mg twice daily (n = 37)
VTE event rate	4.00%	2.70%
Bleeding event rate	1.00%	2.70%

CONCLUSIONS: Preliminary results indicate a possible difference in VTE rates between groups, but additional data are needed for final analysis.

HIV/AIDS

81. Adherence to antiretroviral therapy in pediatric patients. *Amaya De Basagoiti*[1], Ainhoa Belaustegi[1], Idoia Bilbao[1], Unai Gonzalez[2], Leocadio Rafael Lopez-Gimenez[1], Goizane Ros[1], Javier Casas[1], Monike De Miguel[1], Begoña San José[1]; (1) Pharmacy Department, Cruces University Hospital, Barakaldo, Spain; (2) Pharmacy Department, Hospital Psiquiatrico de Zamudio, Zamudio, Spain
OBJECTIVES: Adherence to antiretroviral therapy (ART) in pediatric patients is determinant for treatment effectiveness. To evaluate ART adherence in ≤18 years old HIV infected patients treated in our hospital.
METHODS: Observational comparative study of adherence to ART in ≤18 years old HIV infected patients in 2009 and 2013. Adherence was estimated by prescription refill history, considering good adherence when ≥95% of the expected. Demographic and laboratory data were taken from patients' clinical chart.
RESULTS: Ten patients were included (50% females). In 2009 5 were <12 years old and adherent to ART, 2 had a once a day (QD) regimen and one of them had detectable viral load (VL).Within the adolescents (≥12 years), they all had a twice a day (BID) regimen and undetectable VL. Only 2 were adherent.In 2013 just one patient was <12 years old, had a BID regimen and was adherent with undetectable VL. In the adolescent group, 3 were non-adherent, 4 had a QD regimen (1 non-adherent) and VL was detectable in 2 patients (1 non-adherent).Comparing both years, 5 adolescents had improved their adherence by 2013, 3 of them changed from non-adherent to adherent status. Of these, 3 had changed from BID to QD. 2 patients drastically dropped their adherence from 100% to 40% and from 97% to 35%. The first patient passed from childhood to adolescence, changed from a QD to a BID regimen and VL went from 281 to 4430 (copies/mL).The second maintained undetectable viral load.Median adherence in <12 years old patients were 98 and 95% and 82.9 and 79.5% in adolescents. In the QD regimen, it was 98 and 97% and 89.5 and 78% in BID regimen in 2009 and 2013 respectively.
CONCLUSION: Despite the limited number of patients, results suggests that factors like age or dosing regimens are related to treatment adherence. It is necessary to implement adherence-improving strategies, especially in adolescents.

Infectious Diseases

82. Evaluation of the safety and efficacy of a tobramycin nomogram in cystic fibrosis patients. *Britta Staubes, Pharm.D.*[1,2], Nicole L. Metzger, Pharm.D., BCPS[1,2]; (1) Emory University Hospital, Atlanta, GA; (2) Mercer University College of Pharmacy, Atlanta, GA
OBJECTIVES: Cystic fibrosis (CF) patients at Emory University Hospital (EUH) receiving tobramycin for an acute exacerbation are dosed by pharmacists based on a CF nomogram. Patients are typically initiated on 10 mg/kg/dose every twenty-four hours with subsequent doses adjusted based on pharmacokinetic calculations. The primary objective of this study is to evaluate the efficacy of the tobramycin dosing nomogram in attaining therapeutic peak concentrations from the initial dosing regimen. Secondary outcomes include the prevalence of attaining target trough concentrations, attaining combined therapeutic peak and trough concentrations, and the incidence of nephrotoxicity.
METHODS: A retrospective electronic medical record review was conducted for all adult patients from January 1, 2010 to December 16, 2014 with a diagnosis of CF who received tobramycin. Patients were included if they received an intravenous tobramycin dose ≥10 mg/kg with at least two serum tobramycin concentrations. Patients were excluded if dosing deviated from the nomogram. Descriptive statistics were used to assess the primary and secondary endpoints. The chi-square or Fisher's exact test will be used to compare patient specific factors.
RESULTS: Three hundred twenty-two patients were screened with 190 patients fulfilling inclusion criteria. Forty-one percent of patients had a therapeutic tobramycin peak concentration with the first dosing regimen, 61% had a therapeutic tobramycin trough concentration with the first dosing regimen, and 22% had therapeutic peak and trough concentrations. About 10% of patients experienced an increase of serum creatinine by 1.5 times above baseline over a seven-day period and 5.5% had an increase of at least 0.3 mg/dL within forty-eight hours.

CONCLUSION: Preliminary results indicate the need to re-evaluate the empiric dosing nomogram.

83. Evaluating the effect of a levofloxacin formulary restriction protocol on urinary tract infections within a community hospital antimicrobial stewardship program. *An Nguyen, Pharmacy Student*[1]; (1) School of Pharmacy, Loma Linda University, Loma Linda, CA

OBJECTIVES: This study evaluated the effects of a levofloxacin restriction program in patients with urinary tract infections (UTI). The primary outcome is to evaluate hospital length of stay (LOS) during the pre/post-restriction period based on empiric antibiotic therapy. The secondary outcomes included defined daily doses (DDD), drug acquisition cost and effectiveness of empiric therapy during the pre/post-restriction period.

METHODS: All patients admitted to St. Jude Medical Center with a diagnosis of cystitis or pyelonephritis during the time period of 01/01/2013 and 09/01/2014 were evaluated. The levofloxacin restriction program was implemented on 11/01/2013. The inclusion criteria included: 1) all hospitalized patients >17-years-old, 2) received an ICD-9 code of 599.0 or 590-590.9 with a urinary pathogen (≥100K CFU/ml) growing from the urine culture, and 3) received either levofloxacin or ceftriaxone during the pre-/post-restriction period. Exclusion criteria included: 1) if they expired within 2-days of initiating the study medication, 2) received combination fluoroquinolone and beta-lactam therapy, 3) received other medication(s) that may treat the UTI, or 4) cultured pathogens that are extended spectrum beta-lactamase producers.

RESULTS: (Preliminary) Ninety-five patients had been evaluated and had met the inclusion criteria. The LOS in the post-restriction period was slightly less than the pre-period, median days: 2 vs 3 days, p = 0.98. Effective empiric antibiotic therapy was similar in both groups, 94% effective. A 5-fold reduction in DDDs was seen when comparing the four-months prior to and after the implementation of the restriction program, 1497.5 vs 305 DDDs. The reduction in DDD translated to an acquisition cost reduction of $7143 to $1455.

CONCLUSION: Acceptance of the levofloxacin restriction program can be seen by the reduction in levofloxacin utilization. Patient care was not hindered by program as seen with LOS and effective empiric therapy. Further data collection is needed to better understand the effects of the levofloxacin restriction program.

84. Assessing clinical outcomes of prolonged infusion piperacillin-tazobactam utilization in patients with *Pseudomonas aeruginosa* pneumonia at a community hospital. *Amy Kang, B.S.*[1], Nguyen Ta, B.S.[1], Liem Hoang, B.S.[1], Crystal Lestari, B.S.[1], Lee Nguyen, Pharm.D.[2]; (1) Loma Linda University; (2) St. Jude Medical Center

OBJECTIVES: This study investigated clinical outcomes in patients that received prolonged infusion (PI) vs standard infusion (SI) piperacillin-tazobactam (PTZ) for the treatment of *Pseudomonas aeruginosa* (PA) pneumonia. The primary outcomes were percentages of achieved clinical stability and days to clinical stability. Secondary outcomes were hospital length of stay (LOS) and all-cause mortality.

METHODS: All patients admitted to St. Jude Medical Center with PA pneumonia during the time period of April 1, 2008 and June 30, 2014 were evaluated for this study. The inclusion criteria were as follows: (1) received either standard or prolonged infusion PTZ for ≥2 day, (2) received a diagnosis ICD-9 code of 482.1 (PA pneumonia), and (3) PTZ started within 3 days of PA infection. Exclusion criteria include: (1) patients expired within 2 days of initiating PTZ, (2) PA isolate was resistant to PTZ, (3) received <2 days of PTZ, (4) received concomitant beta-lactam therapy that is effective in treating PA, and (5) received hemodialysis or diagnosed with cystic fibrosis.

RESULTS: Two hundred and twenty-two patients with PA pneumonia were identified with 53 patients meeting the inclusion criteria. The average age for the group was 67.5 years. The percent of patients achieving clinical stability was higher in the PI group, (PI: 70% vs SI: 67%, p = 0.8). The number of days to clinical stability was similar in both groups, (PI: 5.28 vs SI: 5.32 days, p = 0.98). The PI group had lower LOS durations (PI: 16 vs SI: 24 days, p = 0.2), and lower mortality rates (PI: 5% vs SI: 6%, p = 1.0).

CONCLUSION: Prolonged infusions of PTZ are becoming more widely accepted as a means to maximize the pharmacodynamic attributes of beta-lactams. This study suggests that prolonged infusion PTZ for PA pneumonia can potentially improve patient care. Further data collection is needed to better understand the effects of prolonged infusion PTZ.

85. Guideline compliance and clinical outcomes among patients with *Staphylococcus aureus* bacteremia with and without infectious diseases consultation. *Kevin Buehrle, Pharm.D.*[1], Zhe Han, Pharm.D., BCPS[1], Jennifer Pisano, M.D.[1], Natasha N. Pettit, Pharm.D., BCPS (AQ-ID)[1]; (1) University of Chicago Medicine, Chicago, IL

OBJECTIVES: *Staphylococcus aureus* bacteremia (SAB) is associated with significant mortality. Previous studies have shown that Infectious Diseases consultation (IDC) for patients with SAB improves management and decreases morbidity and mortality. The purpose of this study was to evaluate the effect of IDC on the management of SAB and resulting clinical outcomes to potentially support automatic IDC for all patients with SAB.

METHODS: This retrospective chart review included adult patients (>18 years) with SAB admitted to the University of Chicago Medicine from December 1, 2012 to October 1, 2014. Exclusion criteria included refusal of appropriate therapy, leaving the hospital against medical advice, and noncompliance with antibiotic therapy. The primary outcome compared adherence to IDSA guideline recommendations as a composite between patients who received IDC and those who did not; components included echocardiography, removal of implanted prostheses/catheters, follow-up blood cultures, and initiation/de-escalation of appropriate antimicrobial therapy. Secondary outcomes evaluated adherence to individual components of the primary outcome, as well as clinical outcomes, including time to microbiologic clearance, recurrence of bacteremia, all-cause in-hospital mortality, and length of stay. Patients were identified with a report including all patients with *Staphylococcus aureus* in a blood culture provided by the microbiology lab.

RESULTS: This study included 178 adult patients who had *Staphylococcus aureus* isolated from a blood culture. The average age of included patients was 59 years; 67 (37.6%) were female, 125 (70.2%) received IDC, and 76 (42.7%) of the *Staphylococcus aureus* isolates were resistant to methicillin. Outcome results pending further data collection and analysis.

CONCLUSION: Pending data collection and analysis.

86. Pharmacist involvement on positive culture review post emergency department discharge. *Natalia Tarasiuk, Pharm.D.*[1], Nehal Hashem, Pharm.D.[1], Don Berkow, M.D.[1], John Granger, M.D.[1]; (1) Lancaster General Health, Lancaster, PA

OBJECTIVES: The objective of this study is to analyze pharmacist impact on positive cultures and antimicrobial therapy review for patients discharged from the emergency department by assessing for optimal antimicrobial therapy.

METHODS: This is a single-center, observational cohort from November 2013 to February 2015. Patients 18 years or older with positive cultures and discharged with antimicrobials are included. Patients discharged to extended-care facilities or hospice and patients receiving antimicrobials for sexually transmitted diseases are excluded. The primary endpoint is to evaluate the mean time to optimal antimicrobial therapy with pharmacist review vs standard of care. Baseline demographics will be collected in addition to: culture source and organism, antimicrobial prescribed, primary care provider, time of culture, time of modification. Patients collected prospectively receive a phone-call follow up. The study

will use ANOVA model to assess the primary endpoint and categorical analyses where appropriate.
RESULTS: A total of 218 patients were evaluated to date in the prospective and retrospective cohorts. A total of 189 (87.1%) patients were females. A total of 33.8% (n = 73) of patients presented with symptoms of urinary tract infection; 8.8% (n = 19) with a respiratory infection; 8.3% (n = 15) with sore throat; 6.9% (n = 15) with SSTI, 6.9% (n = 15) with fever; 21.3% (n = 46) with abdominal pain; and 42.1% (n = 91) with another indication. Positive urine cultures accounted for 83.3% (n = 180) of all cultures evaluated. Antimicrobial dosing was appropriate in 95.3% (n = 205) of prescriptions; frequency was appropriate in 94% (n = 202); and duration was appropriate in 43.3% (n = 93). There were 22 dug-bug mismatches that warranted a change in therapy. Optimal therapy was achieved in 30.7% (n = 66) of patients. A total of 83 patients were counseled on their antimicrobial therapy post discharge.
CONCLUSION: Based on our current results, there is an opportunity for pharmacists to help promote appropriate selections and duration of antimicrobials in an ED setting.

87 Evaluation of antimicrobial therapy for skin, soft tissue, bone, and joint infections. *Suzanne Molino, B.S.*[1], Elizabeth O'Gara, Pharm.D.[2], Jason Lancaster, Pharm.D., MEd[1]; (1) School of Pharmacy, Northeastern University, Boston, MA; (2) Lahey Hospital & Medical Center, Burlington, MA
OBJECTIVES: Primary objective: evaluate the variation of antimicrobial prescribing patterns in the management of skin, soft tissue, bone, and joint (SSTBJ) infections. Secondary objectives: development and evaluation of institution-specific criteria for antimicrobial management of SSTBJ infections.
METHODS: Patients admitted to an inpatient internal medicine service at a 350-bed tertiary academic medical center will be screened for inclusion over a 24-month time period. Patients 18 years or older with a suspected or confirmed admission diagnosis of SSTBJ infection were included. Patients were excluded if they were discharged, designated as comfort measures only, or expired within 48 hours of admission. All categorical variables will be summarized using frequency counts. All continuous variables will be summarized using means with standard deviation (SD) or medians with interquartile range (IQR). Nominal variables will be reported using the Chi-square test and continuous variables using ANOVA.
RESULTS: Completed data on 52 patients has been collected thus far: mean age 64 years (range 24-93), 65% male gender, 13% had documented methicillin-resistant *S. aureus* (MRSA) colonization or infection within the last 12 months, 27% were diagnosed with a skin infection within 90 days prior to admission, and 75% were diagnosed with cellulitis upon admission. Vancomycin, with or without cefepime, ampicillin-sulbactam, or ceftriaxone were the most commonly prescribed antibiotics for empiric use, while cephalexin and amoxicillin-clavulanate were the most commonly prescribed antibiotics upon discharge. Inappropriate empiric therapy targeted against MRSA or *P. aeruginosa*, without the presence of risk factors, occurred in 16% and 57% of patients, respectively. Forty percent of patients were treated with three or more antibiotics during their inpatient stay with mean treatment duration of 16 days (range: 0–65 days).
CONCLUSION: Interim analysis demonstrates that a large percentage of patients are receiving broad-spectrum empiric antibiotics without a clear indication and for a duration that exceeds current guideline recommendations.

88. Impact of antimicrobial de-escalation protocol implementation on pharmacist-driven antimicrobial interventions in an acute-care hospital. *Shelby Allen, Pharm.D.*[1]; (1) Department of Pharmacy, Sacred Heart Hospital, Pensacola, FL
OBJECTIVES: Primary

- To increase staff pharmacists' interventions in antimicrobial therapySecondary
- To reduce use of top broad spectrum antimicrobials
- To increase staff pharmacists knowledge on antimicrobial stewardship principles
- To increase staff pharmacists' comfort level in intervening with antimicrobial therapy

METHODS: Horizon Meds Managertm, a program by McKesson Technology Solutions, allowed for documentation of pharmacist-reported interventions and monitoring of reported interventions within an automated report. Interventions specifically regarding antimicrobial de-escalation were extracted from the report and monitored during the entire 6-month time frame. After a 3-month period of monitoring interventions, a de-escalation protocol for pharmacists with an educational competency was distributed. Pharmacist-driven antimicrobial de-escalation interventions were then monitored for a 3-month period following the protocol implementation.
RESULTS: Due to inefficient documentation of prior-protocol interventions, current results are pending for the 3-month prior period. As more appropriate documentation methods are utilized, results 1 month post-protocol have been populated and include a quantity of twenty-four pharmacist driven interventions regarding specifically de-escalation of vancomycin, clindamycin, piperacillin-tazobactam, and meropenem.
CONCLUSION: In closely monitoring pharmacist-driven interventions, the pharmacy department has identified several areas of improvement in pharmacist-driven interventions regarding de-escalation of antimicrobials, further improving patient care.

Managed Care

89. Pharmacist-led interventions in high-risk MSSP patients. *Jessica Binz, Pharm.D.*[1], Dawn Pettus, Pharm.D.[2]; (1) Care Management Pharmacy Department, Triad HealthCare Network, Greeensboro, NC; (2) Care Management, Triad HealthCare Network, Greensboro, NC
BACKGROUND: Triad Healthcare Network (THN), an accountable care organization, assists patients with multiple health related needs. The THN Care Management team provides care to high-risk patients in the patients' homes.
OBJECTIVES: Determine the effect of pharmacist interventions on the achieved ACO quality performance measures and medication adherence in the target population.
METHODS: This study was conducted from November 2014 through March 2015. Targeted medication reviews were conducted for all complex high-risk Medicare Shared Savings Program (MSSP) patients. The targeted medication reviews were based on five quality metrics: aspirin use in diabetes (DM), aspirin use in ischemic vascular disease (IVD), ACE inhibitor or ARB (ACEI/ARB) use in coronary artery disease (CAD), beta-blocker (BB) use in heart failure (HF), and LDL lowering therapy in CAD. Targeted medication recommendations were communicated to the provider. An at home comprehensive medication review (CMR) was scheduled for each patient who participated in the study. During the CMR, the pharmacist assessed the current medication regimen, adherence, and identified therapy that should be maximized, inappropriate drug therapy, drug interactions, and side effects. Throughout the study, the following items were tracked: quality performance measures met, medication recommendations, inconsistencies, adherence changes, and time dedicated to MTM related activities. Upon conclusion of the study period, the types of interventions, cost savings, patient perceived benefit, and approved medication recommendations were evaluated.
RESULTS: 321 patients were reported on the complex high-risk patient list for the THN MSSP population. Through the targeted medication review 9 patients with DM were not on aspirin, 18 patients with IVD were not on aspirin, 64 patients with CAD were not on ACEI/ARB, 24 patients with HF were not on a BB, and 68 patients with CAD were not on LDL lowering therapy.Research is ongoing.
CONCLUSION: N/A

Medication Safety

90. Pharmacist-conducted medication histories for high-risk patients in a community hospital: a pilot study. *Heather Hestekin, Pharm.D.*[1], Kathleen Cross, Pharm.D., MBA[1], Joy Bonde, Pharm.D.[1]; (1) Department of Pharmacy, Saddleback Memorial Medical Center, Laguna Hills, CA

OBJECTIVES: Having an accurate prior-to-admission (PTA) medication history is paramount in reducing the risk of medication errors and increasing patient safety throughout transitions of care. The present study examines the efficacy and feasibility of pharmacist PTA medication histories compared to standard practice in patients at high risk for medication misadventures. We hypothesize that pharmacist-conducted medication histories will have significantly fewer discrepancies and yield a favorable return-on-investment (ROI).

METHODS: This is a single-center, prospective pilot study of 183 patients at a 262-bed community hospital. High risk is defined as any of the following: active or history of AMI, CHF, COPD; ≥10 chronic medications; ≥65 years old; active DVT/PE; receiving anticoagulation/anti-platelets; or receiving insulin/oral hypoglycemic medications. Following nursing collection of the PTA medication history, pharmacists interview subjects within 24 hours of admission to obtain the PTA medication history and allergy information. The histories obtained by the nurse and pharmacist are compared for discrepancies. The number of discrepancies, discrepancy type and severity, allergy documentation, and pharmacist intervention acceptance rate are evaluated. Pharmacist interventions are documented in a web-based pharmacy documentation system that calculates cost savings.

RESULTS: A preliminary data analysis of 20 subjects is reported. Pharmacists identified a mean of 10 ± 4.4 medications compared to 7.95 ± 3.9 by nurses, and 1.55 ± 2 allergies including reaction compared to 1.25 ± 1.7 by nurses. There were a mean of 6.15 ± 3.1 discrepancies on nursing-collected PTA medication histories compared to a mean of 0.05 ± 0.2 discrepancies by pharmacists. The most common discrepancies were errors of omission, and most discrepancies were of significant severity. The final statistical analyses and ROI calculation will be completed by April 2015 and presented.

CONCLUSION: Based on preliminary data, pharmacist-conducted PTA medication histories are more complete and may yield a favorable ROI compared to current practice.

Oncology

91. Dose rounding bevacizumab and rituximab to the nearest vial size to achieve drug cost savings. *Omik Patel, Pharm.D.*[1], Lyndall Calhoun, RPh[1]; (1) Department of Pharmacy, CoxHealth, Springfield, MO

OBJECTIVES: The primary purpose of this study is to assess the cost savings achieved to a health-system from initiating a dose rounding protocol for bevacizumab and rituximab. Secondary objectives will be to assess the cost savings achieved to a patient, as well as comparing the difference in revenue to the health system before and after implementing dose rounding.

METHODS: This is a prospective studying being conducted over a 6 month time period, where patients who receive at least one dose of bevacizumab or rituximab are included for analysis. Doses of bevacizumab and rituximab are adjusted either up or down to the closest vial strength if the rounded dose is within a 5% range of the calculated dose. Acquisition costs of the two drugs will be compared before and after rounding, and this data will then be used to determine annual savings to the health-system. A comparison of how much a patient was billed prior to rounding and after dose rounding will be assessed. Lastly, a comparison of the resultant revenue difference to the health-system using data from a subset of the study population will be assessed.

RESULTS: Preliminary data after six weeks of initiating a dose rounding protocol has shown an average drug acquisition cost savings of approximately $13,419.78. Extrapolating this data to 6 months shows an estimated savings of $58,153.55, and $116,304.76 for one year. Comparison of patient charges before and after rounding showed an average savings of $1,700 for bevacizumab and $700 for rituximab. Revenue data has not yet been collected from the billing department.

CONCLUSION: Dose rounding of bevacizumab and rituximab has the potential to achieve significant cost savings for our institution, as well as our patients. If applied to other monoclonal antibodies, these savings can be tremendous.

92. Novel immunotherapeutics and cytochrome P450. *Sarah Wheeler, Pharm.D.*[1], R Donald Harvey, Pharm.D., FCCP, BCOP[2]; (1) Department of Pharmaceutical Services, Emory University Hospital, Atlanta, GA; (2) Winship Cancer Institute of Emory University, Atlanta, GA

OBJECTIVES: Recently, promising novel anticancer immunotherapy agents have been developed that have demonstrated high response rates through up regulation of immune responses. These agents may cause systemic immune-related adverse events, with potential clinical implications for use of concurrent agents metabolized by cytochrome P450 (CYP) and other pathways. In using these medications, it is important to understand that agents such as ipilimumab and anti-PD-1 antibodies have potential to further impair CYP-mediated metabolism in the setting of cancer-related inflammation. The converse is also true in that there is potential for patients that respond well to immune-modifying agents to return to a normal CYP phenotype. Both situations have implications for dosing of concurrent and subsequent therapies. The objective of this study is to help elucidate the clinical impact of CYP down-regulation on frequency adverse events in patients on concurrent CYP and immune-modifying therapy.

METHODS: A retrospective chart review of 150 patients receiving immune-modifying therapy either as monotherapy, or combination therapy from March 2011 to September 2014 was performed. Collected data includes age, gender, height, weight, immunotherapy dose, and CYP450 substrates being used during and after immunotherapy. Lab values, signs, and symptoms indicative of an immune related, or medication related adverse events were also collected.

RESULTS: Data collection is ongoing, with initial results showing a high prevalence of concurrent CYP substrate use in patients receiving immunotherapy. At this point in data collection there is a low rate of clearly attributable adverse events to concurrent CYP substrate use; however, there is also a low rate of immunologic adverse effects.

CONCLUSION: A low rate of immune related adverse events may confer a relatively minimal effect of immunotherapy on CYP substrate metabolism, further evaluation is warranted. Limitations of this study include retrospective evaluation, lack of subjective adverse event documentation, and potential for undocumented dose/medication changes.

93. Systematic review of time to response (TTR) in phase III metastatic cancer trials. *Taylor Butler, Pharm.D.*[1], Paula Lopez-Trigo, Pharm.D. Candidate[2], Thomas Butler, M.D.[3]; (1) Department of Pharmacy Practice, Nova Southeastern University, Palm Beach Gardens, FL; (2) College of Pharmacy, Nova Southeastern University, Palm Beach Gardens, FL; (3) Mitchell Cancer Institute, University of South Alabama, Mobile, AL

OBJECTIVES: Palliative chemotherapy is indicated in the treatment of advanced malignancy to improve the quality of life of these patients. A delicate balance exists between benefit and risk with palliative chemotherapy, as judged by the prescribing clinician with data on efficacy vs toxicity of chemotherapy. Symptoms of progressive malignancy may persist during treatment making it difficult to determine whether a deterioration in status is a result of ineffective treatment or side effects of chemotherapy. Time to

response (TTR) may allow for more educated decisions in relation to continuation of treatment modalities. Despite the potential value of TTR in decision-making in these complex scenarios, not all articles report this information. The purpose of this review is to examine Phase III clinical trials for metastatic solid tumors to evaluate the frequency TTR is reported.
METHODS: A PubMed search was conducted using the terms "metastatic lung cancer", "metastatic breast cancer", and "metastatic colorectal cancer". The search field was limited to 'Clinical Trial, Phase III' and publication dates within the last 10 years. Trials using radiation or surgery alone, subanalyses, and long term follow-up articles were excluded. Each clinical trial was reviewed for reported outcomes.
RESULTS: 663 articles were evaluable. To date, 40 articles have been reviewed. 20 articles were excluded and 2 out of 20 articles (10%) evaluated reported TTR. Primary objectives in these studies were overall survival (n = 16; 80%), response rate (n = 3; 15%), and progression-free survival (n = 1; 5%). Quality of life was measured in 11 out of 20 articles (55%). All 20 articles utilized cytotoxic chemotherapy. In addition to cytotoxic chemotherapy, small molecules (n = 3; 15%), biologics (n = 2; 10%), radiation (n = 2; 10%), and hormonals (n = 1; 5%) were used.
CONCLUSION: Pending final results. Anticipated completion of data collection is April 1, 2015.

Pain Management/Analgesia

94. Effectiveness of intravenous vs oral acetaminophen in post-operative patients. *Chelsea Durnil, Pharm.D.*[1], Kellie Knight, Pharm.D., BCPS[1]; (1) Department of Pharmacy, IU Health Methodist Hospital, Indianapolis, IN
OBJECTIVES: This study evaluated the effectiveness of intravenous (IV) vs oral acetaminophen in post-operative pain management in terms of reducing concomitant opioid usage and achieving pain scores at a patient defined pain goal.
METHODS: This is a retrospective analysis of post-operative patients >18 years of age who received oral acetaminophen post-operatively between January 1, 2011 and June 30, 2011 and IV acetaminophen post-operatively between January 1, 2012 and June 30, 2012. The cumulative opioid dose (in morphine equivalents) and percentage of pain scores at goal, during the first 48 hours post-op, were determined for each patient in both groups. Other parameters collected included: age, weight, sex, type of surgery, baseline AST/ALT, opioid use prior to admission, and whether additional pain medications were given.
RESULTS: A total of 100 patients were included in each group. Patients in the IV acetaminophen group received, on average, higher cumulative opioid doses than the oral acetaminophen group (153.3 mg vs 60 mg, $p < 0.005$) and a higher cumulative dose of acetaminophen (3450 mg vs 2925 mg, $p < 0.005$). The percentage of pain scores at the patient specified pain goal were higher in the IV acetaminophen group (77% vs 45%, $p = 0.291$), although this was not statistically significant.
CONCLUSION: Patients who received IV acetaminophen did achieve lower pain scores, however, the use of IV acetaminophen failed to reduce the amount of concomitant opioids needed to manage post-operative pain. Patients in the IV group received a higher cumulative dose of acetaminophen. Additional studies are needed to assess the significance of the opioid sparing effects of IV acetaminophen and the impact it has on post-operative pain. Prescribers should be aware of the limited effect IV acetaminophen may have over oral acetaminophen.

95. Analyzing pain medication use and adherence in patients with myotonic dystrophy (DM) and facioscapulohumeral dystrophy (FSHD). *Bryan Fitzgerald, Pharm.D. Candidate*[1], Amy Parkhill, Ph.D.[1]; (1) St. John Fisher College, Rochester, NY
OBJECTIVES: Myotonic dystrophy (DM) and facioscapulohumeral dystrophy (FSHD) are two of the most common muscular dystrophies in adults. It has been reported that patients with these two disorders may suffer from pain and inadequate pain management. The purpose of this study is to analyze the current use of pain medications and develop a survey to assess pain medication use and adherence in this patient population.
METHODS: Patients registered in the National Registry for DM and FSHD at the University of Rochester were surveyed on pain medication use and the most significant problem of their disease. After analysis of these surveys, an additional survey was created that contained questions specifically on pain medication use, adherence, and general questions about the patients' pain. Questions for the survey were devised from previous studies on medication adherence, questionnaires on medication adherence and beliefs, and questions from the Brief Pain Inventory.
RESULTS: In the first survey, pain medication was used by 34% of the survey respondents (n = 519/1527). Specifically, NSAIDs were used by 23.5% and opioids were used by 4% of survey respondents. In a separate survey, pain was reported as the most burdensome problem by 8% of patients (n = 27/355). This was greater than problems related with balance (n = 10/355), fatigue (n = 20/355), or gastrointestinal distress (n = 8/355).
CONCLUSION: Despite the low reported response that pain was the most significant problem associated with their disease, the prevalence of pain medication use indicates that further study into the impact of pain and pain medication use in this patient population is warranted. Specifically, investigating questions about adherence, use, and beliefs toward pain medication will lead to an increased understanding of pain and its treatment in this patient population. This knowledge can lead to the ability of pharmacists to optimize pain management and to reduce adverse reactions to pain medications.

Pediatrics

96. Antimicrobial resistance patterns and treatment response in outpatient pediatric urinary tract infections. *Manar Lashkar, Pharm.D., BCPS*[1], Katalin Koranyi, M.D.[2], Amy Leber, Ph.D.[2], Milap C. Nahata, M.S., Pharm.D., FCCP[1]; (1) Ohio State University College of Pharmacy, Columbus, OH; (2) Nationwide Children's Hospital, Columbus, OH
OBJECTIVES: Urinary tract infection (UTI) is a common pediatric condition that may cause many complications if not appropriately treated. However, limited data are available to demonstrate changes in microbial susceptibility patterns along with specific patient demographic data, antimicrobial dosage regimens utilized and clinical outcomes achieved in children.Our primary objectives were: to identify pathogens and resistance patterns of uropathogens in the outpatient settings; to evaluate antimicrobial regimens utilized in different age groups; and, to evaluate the clinical response including efficacy and adverse events in children.
METHODS: Study subjects (age birth to 17 years old) who had UTI during 2013 were identified using urine culture results from clinical microbiology laboratory. The following variables were collected from their medical health records: patient characteristics, culture results, antimicrobial therapy, clinical and laboratory data and therapy outcomes.
RESULTS: One hundred children with UTI were included in the study. 88% of subjects were female and the median age was 6.8 years (range 0.2–17.9 years). *Escherichia coli* (*E. coli*) was the most common isolated organism (79%) followed by coagulase negative *Staphylococcus* species (6.7%), *Proteus mirabilis* and *Klebsiella pneumoniae* (3% and 2%, respectively). *E. coli* was sensitive to third generation cephalosporins (100%) followed by nitrofurantoin (95.7%) and ciprofloxacin (90%). The drugs prescribed empirically included cefdinir (65%), sulfamethoxazole-trimethoprim (18%), ciprofloxacin (6%) and nitrofurantoin (2%). 82% of infections were resolved with empirical antibiotics chosen and 11% of antibiotics were tailored to culture and sensitivity results.

CONCLUSION: *E. coli* was the most prevalent uropathogen in children and was most sensitive to third generation cephalosporins and nitrofurantoin. The most commonly prescribed antimicrobial was cefdinir and the least prescribed was nitrofurantoin.

97. Design and implementation of a sickle cell acute vaso-occlusive crisis (VOC) protocol in a pediatric emergency department. *Jenna Lee, Pharm.D.*[1], Janesha Thomas, Pharm.D.[1], Evangeline Brown, M.D.[1]; (1) Sacred Heart Hospital, Pensacola, FL

OBJECTIVES: Vaso-occlusive crises (VOC) are one of the most common and painful acute manifestations of sickle cell disease, often requiring several emergency department visits per year. Research shows that individuals are at an increased risk of early death if hospitalized with VOC more than three times per year. The objective of this study is to introduce an evidence-based VOC protocol in a pediatric emergency department in an effort to decrease unnecessary hospital admissions and to improve quality of care for patients.

METHODS: The electronic medical record system will identify pediatric patients who present to the emergency department with VOC. The following patient specific data will be collected: age, gender, ethnicity, utilization of protocol, time to opioid administration, opioid agent and dose, IV fluid and rate, NSAID and dose, reported home medications, pain scores, disposition, length of stay, and return emergency department visit (within 5 days). Pain scores, average length of stay, and return emergency department visits will be calculated for those patients in whom the protocol was used and for those that the protocol was not used.

RESULTS: From November 1, 2014 through January 1, 2015, the pediatric emergency department saw 17 sickle cell acute VOC encounters. Of those 17 encounters, seven were admitted to the hospital. The average length-of-stay for those seven patients was 4.8 days and four of the encounters were from two patients who returned to the emergency department within five days of discharge.

CONCLUSION: Currently, this institution admits nearly half of their VOC patients. Through the implementation of an evidence-based VOC protocol, it is believed that admission rates will decrease as well as return emergency department visits.

Pulmonary

98. Efficacy and safety of inhaled aztreonam lysine treatment. *Idoia Bilbao*[1], Amaya De Basagoiti Goizane Ros[1], Leocadio Rafael Lopez-Gimenez[1], Begoña San José[1], Laura Serrano[1], Saioa Sautua[1], Javier Casas[1], Monike DeMiguel[1]; (1) Pharmacy Department, Cruces University Hospital, Barakaldo, Spain

OBJECTIVES: Treatment with inhaled aztreonam lysine is a new alternative in patients with cystic fibrosis. To perform a retrospective study of the efficacy and safety of inhaled aztreonam lysine in patients with cystic fibrosis.

METHODS: The efficacy endpoints were mean percent change from baseline to week 24 in Forced Vital Capacity (FVC)% and Forced Expiratory Volumen in 1 second (FEV1)%, number of exacerbations requiring antibiotics and negative cultures or variation in sputum *Pseudomonas* or *Burkholderia* density after 6 months of treatment. Safety was assessed using the number of treatment-related side effects and the development of aztreonam-resistances.

RESULTS: Five patients were included: three with a chronic pseudomonas infection, one *Burkholderia* infection and one with infection of both microorganisms. They were treated with inhaled aztreonam lysine 75 mg using an Altera Nebulizer® System 3 times daily, in repeated cycles of 28 days on therapy followed by 28 days off. Aztreonam lysine was combined with colistin in four patients and with ceftazidime in the other. Mean percent changes in FVC% and FEV1% were assessed only in three patients: in one were -1% and -3%, in other 15% and 9% and in the last one 35% and 44% (this patient had a pulmonary transplant). Exacerbations were present in all of them (one, three, and six exacerbations, respectively). Nobody had negative sputum. Density of *Pseudomonas* or *Burkholderia* in sputum was not increased. Adverse events were not reported. At baseline, one patient had an isolate of *Burkholderia* with intermediate susceptibility to aztreonam and other had a resistant isolated bacterium. Aztreonam resistant bacteria were present in cultures obtained during aztreonam lysine inhaled treatment in both patients.

CONCLUSION: In our patients, inhaled aztreonam lysine was safe and effective. Development of resistance during inhaled aztreonam therapy should be further study and studies with large number of cases would be necessary for a better evaluation.

99 Relationship of asthma control test with pulmonary function tests in adult asthma patients. *Sohail Ahmad, Pharm.D.*[1], Nahlah Elkudssiah Ismail, Ph.D. (UK)[1], Ahmad Izuanuddin Ismail, MBBChBAO (Dub) MRCP (Ire) AM (Mal) FCCP (USA)[1], Mohd Arif Mohd Zim, MBBS(Ire), Bch, BAO, MMed (UM)[1], Waqas Akram, Pharm.D.[1]; (1) Faculty of Pharmacy, Universiti Teknologi MARA, Puncak Alam, Malaysia

OBJECTIVES: This study aimed to determine the level of asthma control and relationship of Asthma Control Test (ACT) with pulmonary function tests in two Respiratory Specialist Clinics, Universiti Teknologi MARA (UiTM) Selayang, and Sungai Buloh; both located in Selangor, Malaysia.

METHODS: In this correlational study, 55 adult asthmatic patients were enrolled who visited the respiratory clinics between August 1, 2014 and December 31, 2014. Only those patients were selected who subjected to pulmonary function tests (FVC, FEV1, PEF, FEV1/ FVC, FEF25-75, MEF75, MEF50, MEF25 and FET100) by means of spirometry (CosMed) ® and completed the ACT questionnaire (Malay version). The clinical and functional criteria for diagnosis of asthma as established by Global Initiative for Asthma (GINA) were used. The patients' ACT score and pulmonary function test values were analyzed for Pearson's Product Moment Correlation (r) by using Statistical Package for Social Sciences (SPSS) ®.

RESULTS: In this present study, among all patients, 8 (14.5%) patients categorized as mild asthmatic; 10 (18.2%) mild persistent asthmatic; 23 (41.8%) moderate persistent asthmatic and remaining 14 (25.5%) enrolled patients as severe asthmatic. The mean score of asthma control test was 17.58 ± 4.25 (17.58/25). The ACT score showed a significant strong positive correlation ($r = 0.546$, $p < 0.05$) with forced vital capacity (FVC), whereas the correlations were moderate ($r = 0.367$, $p < 0.05$) for forced expiratory volume in 1 second (FEV1) and weak ($r = 0.207$, $p < 0.05$) for peak expiratory flow (PEF). The correlation of ACT with other variables of spirometry (i.e. FEF25-75, MEF75, MEF50, and MEF25) showed weak and insignificant correlations.

CONCLUSION: The level of asthma control and FVC, FEV1, and PEF showed positive correlation. This relationship should be explored further with greater sample size and different study settings, so that better assessment of control and severity of asthma can be achieved and maintained.

Rheumatology

100. Evaluation of the impact of a clinical pharmacy rheumatology clinic on the adherence of oral disease modifying anti-rheumatic drugs. *Alice Lee, Pharm.D.*[1], Thao Vuong, MBA, Pharm.D., BCACP[1], Sahar Karimi, Pharm.D., BCPS, CGP, AE-C[1], Margaret Fisher, M.D.[1]; (1) Kaiser Permanente of the Mid-Atlantic States, VA

OBJECTIVES: This retrospective cohort study aims to assess the impact of a clinical pharmacy rheumatology clinic on medication adherence and persistence for patients newly starting on oral disease modifying anti-rheumatic drug (DMARD) therapy compared to patients not enrolled in such a clinic.

METHODS: Patients greater than or equal to 18 years old who were enrolled in this clinical pharmacy rheumatology clinic between March 1, 2014 and March 1, 2015 will be included in the study. Patients who started oral DMARD therapy between March 1, 2013 and March 1, 2014 prior to the development of the clinic will serve as the controls. The control group will be matched with intervention group by age, gender, oral DMARD, and geographic distribution in a 1:1 ratio. The primary outcomes include (1) proportion of days covered at 12 months after new oral DMARD initiation and (2) medication retention rates at 3, 6 and 12 months after oral DMARD initiation in patients enrolled in the clinical pharmacy rheumatology clinic vs patients not enrolled in such a clinic. The secondary outcomes include (1) the rate of biologic initiation at 6 and 12 months for patients on non-biologic oral DMARD therapy and (2) reasons for oral DMARD discontinuation.

RESULTS: This study is currently in progress. Based on the retrospective review of 80 charts, the preliminary intervention group demographics demonstrate that the majority of the patients had the primary diagnosis of rheumatoid arthritis (n = 48, 60%). Methotrexate was the most commonly prescribed oral DMARD (n = 59, 59%).

CONCLUSION: By March 2015, it is anticipated that this study will provide further data regarding oral DMARD adherence and persistence in patients enrolled in a clinical pharmacy rheumatology clinic vs patients receiving standard care.