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Original Research

ADR/Drug Interactions

1. Risk of lactobacillus infection in critically ill adults receiving lactobacillus probiotics. *Zach Ruege, Pharm.D.*; UGA College of Pharmacy, Augusta, GA

INTRODUCTION: Probiotics have been advocated in critically ill patients to mitigate risk for developing Clostridium difficile infection and ventilator associated pneumonia. Critically ill patients display suppressed immune response of the intestinal mucosa and increased digestive tract permeability increasing the likelihood that probiotic bacteria may translocate into the blood and cause opportunistic infection in this population.

RESEARCH QUESTION OR HYPOTHESIS: What is the incidence of lactobacillus infections in critically ill patients that were prescribed probiotics during their intensive care unit (ICU) stay?

STUDY DESIGN: This study is a single-site, retrospective, non-randomized, observational medication use evaluation from January 1st 2014 and December 17th 2015. Adults greater than 18 years of age admitted to an ICU who received at least one dose of Culturelle probiotic (Lactobacillus rhamnosus GG) were included. The primary endpoint was the incidence of culture positive lactobacillus infection following probiotic administration. Secondary endpoints included characterization of Culturelle use, patient risk factors for probiotic related infection, and clinical outcomes.

METHODS: Medical records were reviewed to collect information regarding patient demography, past medical history, location of care, probiotic dosing, and clinical outcomes. Descriptive statistics were performed.

RESULTS: A total of 77 critical care patients received at least one dose of Culturelle during the evaluation period. Before patients were administered their first dose, 10.4% had no risk factors, 16.9% displayed minor risk factors, and 72.7% presented with major risk factors to develop probiotic related infections. Four patients developed infections with positive cultures for Lactobacillus spp. while concurrently on Culturelle (5.16 percent). Of patients that received probiotics and treated in the Surgical ICU, 16.0 percent had a positive culture for Lactobacillus spp. Of those with positive cultures, there was a 50 percent in-house mortality rate.

CONCLUSION: Careful risk benefit analysis should be made before administering probiotics to patients in ICU settings.

2. The prevalence of potential drug-drug interactions in hospital setting: cardiovascular diseases versus comorbidities. *Milena Kovacevic, M.Pharm.*[1], Sandra Vezmar Kovacevic, Ph.D.[1], Branislava Miljkovic, Ph.D.[1], Slavica Radovanovic, M.D., Ph.D.[2], Predrag Stevanovic, M.D., Ph.D.[3]; [1]Department of Pharmacokinetics and Clinical Pharmacy, Faculty of Pharmacy, University of Belgrade, Serbia [2]University Hospital Medical Center Bežanijska kosa, Belgrade, Serbia [3]University Hospital Center Dr Dragiša Mišović, Belgrade, Serbia

INTRODUCTION: Drug-drug interactions (DDIs) are a prevalent cause of adverse drug events in both inpatient and outpatient settings. Many factors were identified as DDIs predictors, with number of prescribers significantly increasing the risk.

RESEARCH QUESTION OR HYPOTHESIS: To evaluate DDIs prevalence and type of harm expected from administration of cardiovascular drugs (CVDs) and co-therapy.

STUDY DESIGN: A retrospective observational study was conducted at the Cardiology ward of the University Clinical Hospital Center Bežanijska Kosa (June-October 2012).

METHODS: Patients with ≥2 medications administered during hospital stay were enrolled. Data were obtained from medical charts. DDI screening was performed using Lexi-Interact®. Clinically significant DDIs were of classes X, D, and C. Statistical analysis was performed using SPSS (ver.22).

RESULTS: The study population (N=317) predominantly consisted of elderly (71.2%; average age 69.8±11 years), and males (55.7%). Over 83% of patients were prescribed ≥5 drugs (population average 8.2±3.7). The majority was admitted for heart failure (37%), the average length of stay was 9.4±5.8 days. Cardiovascular diseases were most prevalent (arrhythmia 47.2%, heart failure 45.3% and angina pectoris 29.8%); followed by diabetes mellitus 26.6%, respiratory 9.5%, renal disease 7.9%, dyslipidemia 7% and gastrointestinal disease 6%. The calculated prevalence of X interactions was 4.4%, D 47.2%, and C 80.7%. In 27.6% and 21.7% of DDIs, adverse effects on renal function or potassium, and bleeding were expected, respectively. Following types of harm expected were: enhanced hypoglycemic effect (10.4%), decreased antihypertensive effect (6.9%), effect on rhythm or heart rate (6.6%), decreased hypoglycemic effect (5.8%) and adverse effects on central nervous system (4.6%).

CONCLUSION: Multimorbidity-driven polypharmacy could significantly impact CVD therapy outcomes, with various adverse effects on renal and cardiovascular system. Also, DDIs can impact blood glucose control and cause adverse effects on central nervous system, which could be more serious in older patients. Comprehensive, collaborative, and patient-centered health care should diminish preventable adverse drug effects caused by DDIs.

3. General practitioners' knowledge and barriers towards adverse drug reaction reporting in Malaysia. *Faiz Ahmed Shaikh, B.Pharm., M.Pharm. (Clinical Pharmacy)*[1], Mohamed Azmi Hassali, Ph.D.[2], Muhammad Qamar, Pharm.D., M.Pharm. (Clinical Pharmacy), BCPS[1], Sohail Ahmad, Pharm.D., M.Sc. (Clinical Pharmacy)[1]; [1]Faculty of Pharmacy, MAHSA University, Malaysia [2]School of Pharmaceutical Sciences, Universiti Sains Malaysia, Penang, Malaysia

INTRODUCTION: Despite the well-established adverse drug reaction (ADR) reporting system set up by Malaysian Adverse Drug Reactions Advisory Committee (MADRAC), the spontaneous voluntary reporting of ADR is plagued by low reporting rates in Malaysia.

RESEARCH QUESTION OR HYPOTHESIS: The objective of this study was to assess the general practitioners' (GPs) knowledge of ADR and barriers to its reporting to MADRAC.

STUDY DESIGN: A postal cross-sectional survey.

METHODS: A 36-item questionnaire was developed, validated and posted along with an explanatory statement to all the registered GPs in Penang, Malaysia. Two weeks later, a reminder letter was sent to all the non-respondents. Data were extracted from the completed questionnaires and analysed descriptively.

RESULTS: Ninety questionnaires were completed, corresponding with an overall response of 19.7% (90/464). Majority (55.5%) of the GPs possessed moderate level of knowledge of ADRs and its reporting. In their current medical practice, almost half (48.9%) of the GPs came across less than 5 cases of ADRs; whereas, 18.9% and 32.2% observed 6 to 10 and more than 10 cases, respectively. Although, most of the GPs (94.4%) were familiar with MADRAC, 84.4% were not aware of its online reporting. The most common reasons that influenced non-reporting were the lack of reporting form (67.8%), professional development activities (60%), and time (44.4%). The study participants suggested simple method of reporting (94.4%), toll free number (90%) and provision of reporting guidelines and bulletins (85.5%) to promote ADR reporting.

CONCLUSION: This study has highlighted the need of continuing professional development (CPD) training of GPs on pharmacotherapy, preferably with extra attention to ADR reporting, is expected to improve ADR reporting to MADRAC. The improved knowledge of Malaysian GPs about ADR and its reporting will be helpful to optimize the nationwide rational medication use and decrease the overall burden on the already-stretched healthcare system.

Adult Medicine

4. Derivation and validation of a 30-day hospital readmission risk index. *Sean McConachie, Pharm.D.*[1], Taylor Franckowiak, Pharm.D.[2], Raymond Yost, Pharm.D., BCPS[3], Joshua Raub, Pharm.D., BCPS[2], Joanne MacDonald, Pharm.D.[4], Kenneth Risko, BSPharm, M.B.A.[4], Candice Garwood, Pharm.D., FCCP, BCPS[5], Elizabeth Petrovitch, Pharm.D., BCPS[1]; [1]Harper University Hospital, Detroit, MI [2]Detroit Receiving Hospital, Detroit, MI [3]Detroit Receiving Hospital, Detroit, MI [4]Detroit Medical Center, Detroit, MI [5]Department of Pharmacy Practice, Eugene Applebaum College of Pharmacy and Health Sciences, Wayne State University, Detroit, MI

INTRODUCTION: Hospital readmissions are common, costly, and often preventable. Readmission prediction indices have the potential for hospitals to stratify patients who are at higher risk for all-cause readmission in order to allocate resources and direct transitions of care interventions.

RESEARCH QUESTION OR HYPOTHESIS: Can the statistical evaluation of patient-specific risk factors for readmission generate a practical readmission risk index?

STUDY DESIGN: A retrospective data extraction and analysis consisting of patients admitted during a derivation phase (July 1, 2014–June 30, 2015) and a validation phase (March and September 2013) was completed.

METHODS: Ninety-three candidate variables were extracted during the chart review of adult patients admitted during the derivation phase. After removing variables via pre-specified methods, a readmission prediction index was derived by backward logistic regression. The discriminative ability of the index was determined using a receiver operator characteristic (ROC) curve. Calibration of the prediction index was assessed with the use of the Hosmer-Lemeshow test.

RESULTS: Twelve months of adult hospital admissions (n=40,668) were collected for the derivation cohort and two months of adult admissions (n=7,820) were collected for the validation cohort. A 12 variable risk prediction equation was generated. The discriminative ability of the derived prediction index as determined by the area under the ROC curve (AUCROC) was calculated to be 0.727 (95% CI 0.721–0.734). The validation cohort produced a calculated AUCROC of 0.717 (95% CI 0.701–0.734). The index was adequately calibrated to predict 30 day readmission.

CONCLUSION: A readmission risk index with good predictive and discriminative ability was derived and validated. This index will be calculated by the health center's electronic medical record to assist identification of patients with an increased risk for readmission with the aim to reduce 30 day hospital readmission rate.

5. Characterization of antibiotic prescribing patterns for chronic obstructive pulmonary disease exacerbations at an academic medical center. *Sarah Petite, Pharm.D., BCPS*, Julie Murphy, Pharm.D., BCPS, FASHP, FCCP; College of Pharmacy and Pharmaceutical Sciences, University of Toledo, Toledo, OH

INTRODUCTION: The Global Initiative for Chronic Obstructive Lung Disease (GOLD) guidelines recommend antibiotics for chronic obstructive pulmonary disease (COPD) exacerbation patients in the non-critical care setting based on the presence of three cardinal symptoms (increase in dyspnea, sputum volume and sputum purulence). Limited data exists describing adherence to GOLD recommendations and the impact on clinical outcomes.

RESEARCH QUESTION OR HYPOTHESIS: Adherence to GOLD antibiotic recommendations is associated with a lower 30-day readmission rate compared to non-adherent therapy.

STUDY DESIGN: Quasi-experimental, retrospective, single-center, cohort study.

METHODS: Adult patients admitted to an internal medicine service from January 1, 2014 through December 31, 2015 for COPD exacerbation were included. Data were collected from date of hospital admission until 30 days post-discharge. Categorical data were analyzed using Chi-square or Fisher's exact test and continuous data were analyzed using Mann-Whitney U test.

RESULTS: Two hundred twenty unique patient encounters were identified. Forty-six patients (20.9%) had a diagnosis of pneumonia and were excluded from analysis. GOLD criteria for antibiotic usage was met for 60 patients (34.4%) and not met for 114 patients (65.5%). The majority of patients (90.2%) were prescribed antibiotics. The most common antibiotic prescribed was a respiratory fluoroquinolone (67.8%). Others included macrolides (20.1%), tetracyclines (2.9%), and aminopenicillins (2.9%). Sixty patients (34.5%) appropriately received antibiotics and 114 patients (65.5%) inappropriately received antibiotics (received with no indication or did not receive with indication). No significant differences were observed between patients receiving appropriate versus inappropriate antibiotic therapy in regards to 30-day readmission rates (15% vs. 18.4%; P=0.57) and hospital LOS (4 days [2–5] vs. 4 days [2–5]; P=0.97).

CONCLUSION: No differences were observed in 30-day readmission rates between patients receiving guideline adherent and guideline non-adherent antibiotic therapy. Overall adherence rates to guideline recommendations were low. Physician education and an electronic medical record order set will be implemented to improve guideline adherence to antibiotic prescribing in COPD exacerbations.

6. Evaluation of enoxaparin versus unfractionated heparin for the prevention of venous thromboembolism in hospitalized patients with liver disease. *Kyle Davis, Pharm.D., BCPS*[1], Eric Dietrich, Pharm.D., BCPS[2]; [1]Department of Pharmacy, Ochsner Medical Center, New Orleans, LA [2]Department of Pharmacotherapy and Translational Research, University of Florida

INTRODUCTION: Patients with liver disease are at increased risk of venous thromboembolism (VTE). The use of pharmacologic prophylaxis may reduce the risk of VTE in at risk hospitalized patients with liver disease. However, the optimal agent to prevent VTE in this patient population has not been identified.

RESEARCH QUESTION OR HYPOTHESIS: To compare the rate of VTE and hemorrhagic events among hospitalized patients with liver disease receiving VTE thromboprophylaxis with enoxaparin or unfractionated heparin (UFH).

STUDY DESIGN: Single center retrospective cohort analysis.

METHODS: Patients 18 years of age or older admitted between January 1, 2013 through December 31, 2015 with a diagnosis of liver disease (identified via ICD-9 codes) receiving VTE prophylaxis with UFH or enoxaparin were included. The primary endpoint was the rate of major bleeding during hospitalization. Secondary outcomes included in hospital VTE and transfusion requirements.

RESULTS: A total of 120 patients were included in the final analysis (mean age: 55.9 ± 9.85 years, males 66.7%). In total 85 (71%) patients received enoxaparin and 35 received UFH (29%). At baseline, patients receiving UFH had higher serum creatinine (2.7 vs 1.08mg/dl, p<0.0001), higher MELD scores (19.97 vs 13.11, p<0.0001), and lower hemoglobin values (10.38 vs 11.53 g/dl, p=0.0072). The rate of major bleeding was not significantly different between the two groups during hospitalization (4.71% vs. 2.86%, p=1). Additionally, no patients experienced fatal bleeding or intracranial hemorrhage and there was no significant difference in the rates of gastrointestinal (GI) or non-GI related bleeding (1.18% vs 0%, p=1; 3.53% vs 2.86%, p=1, respectively). More patients on UFH underwent packed red blood cell transfusions (20% vs 5.88%, p=0.0191). There was no difference in the rate of in hospital VTE (1.18% vs 0%, p=1).

CONCLUSION: No difference was observed in the rate of major bleeding between patients receiving therapy with enoxaparin or UFH.

Ambulatory Care

7. Understandability and actionability of diabetes education materials. *Melissa Lipari, Pharm.D., BCACP*[1], Helen Berlie, Pharm.D., CDE, BCACP[2], Lynette R. Moser, Pharm.D.[3], Yasmin Saleh, Pharm.D.[4], Pang Hang, Pharm.D. Candidate[4]; [1]Pharmacy

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INTRODUCTION: Patients with Type 2 Diabetes have access to a plethora of educational materials. However, evidence of the effectiveness of these materials is limited. Diabetes education material should be both understandable and actionable. The Patient Education Materials Assessment Tool (PEMAT) measures understandability and actionability of both written and audiovisual materials. The purpose of this study was to assess the understandability and actionability of printable diabetes patient education materials.

RESEARCH QUESTION OR HYPOTHESIS: Are online retrievable diabetes patient education materials understandable and actionable when assessed using the PEMAT?

STUDY DESIGN: This was a descriptive study.

METHODS: Printed/printable diabetes education materials were identified through an online search. Materials were included if they were from the following sources: national organizations with materials approved by expert panels, corporations with materials subject to FDA approval, and not-for-profit organizations with inter-professional advisory boards to approve materials. Topics included were basic knowledge of diabetes, hypoglycemia, insulin, and blood sugar goals. Materials were excluded if they were non-printable, contained active links, had a publication date prior to January 2011, were greater than two pages in length or were targeted for children. The patient education materials were evaluated using the PEMAT and statistically analyzed. Descriptive statistics and inter-rater reliability analysis using the Kappa statistic were utilized.

RESULTS: We identified 25 websites, five of which met the inclusion criteria. A total of 13 patient education materials were included. PEMAT scoring revealed that 4 of the 13 materials met the criteria for understandability, and only 1 material met the criteria for actionability.

CONCLUSION: The majority of diabetes patient education materials reviewed scored poorly using the PEMAT tool. Future development of diabetes patient education materials should be designed with the goal of increasing understandability and actionability.

8E. Treatment patterns of patients 80 years of age and older with diabetes in a rural primary care setting. Chase Board, Pharm.D. Candidate, *Emily Huneycutt, Pharm.D. Candidate*, Jennifer Clements, Pharm.D., BCPS, CDE, BCACP; Presbyterian College School of Pharmacy, Clinton, SC

9E. Evaluation of effectiveness of pharmacist-driven education on inhaler technique for hospitalized patients at a community teaching hospital. *Khushbu Thaker, Pharm.D.*[1], Hinal Patel, Pharm.D.[1], Ashmi Philips, Pharm.D.[2], Navin Philips, Pharm.D.[3]; [1]Department of Pharmaceutical Services, Hunterdon Medical Center, Flemington, NJ [2]Ernest Mario School of Pharmacy, Rutgers, The State University of New Jersey, Flemington, NJ [3]Department of Pharmacy, Hunterdon Medical Center, Flemington, NJ

10. Impact of face to face medication therapy management on readmission frequency and interval in illiterate geriatric patients with heart failure and other comorbidities. *Shimaa Elsayed Ahmed, B.Pharm., BCACP, BCGP*; Drug information center, Sherbin Central Hospital, Mansoura, Egypt

INTRODUCTION: Medication therapy management (MTM) in illiterate geriatric patients (IGP)is challenging. In Egypt 2015, Illiteracy was 27.9 %, about .25 % of it exists among geriatrics (≥65 years). Heart failure (HF) represents 66% of total ischemic heart disease cases in Egypt.Geriatrics with HF have a very high readmission frequency in cardiac care units (CCU).

RESEARCH QUESTION OR HYPOTHESIS: Null Hypothesis: There is no impact of face to face MTM on readmission frequency and interval in illiterate geriatric patients with HF and other comorbedities.

STUDY DESIGN: Prospective single center study conducted in a hospital based cardiac care unit over 12-month time period.

METHODS: 200 IGP previously admitted to CCU with HF at least once,were recruited (n=100 each group); Full history was taken, follow up interviews were set to study patients and their care givers with 15 days interval. A follow up sheet and other assisting tools were used in patient's education. 100 patients were set as control : (mean age 70.6 years, 55% females 45% males, 69.5% illiteracy rate) and 100 patient were involved to face to face MTM interviews: (mean age 71.2 years, 51 %females, 49 % males, 67% illiteracy rate). All subjects have disease comorbidities other than HF.

RESULTS: During 12-month study, readmission frequency and intervals between control and MTM groups were analyzed using chi square test of independence and results were significant at ($p>.05$). $X2$ (3, N=200)=18.5, ($p=.00345$).

Readmission frequency & interval	MTM	Control
2 times /5 months	34%	42%
3 times / 4 months l	27%	31%
4 times / 2 months	14%	23%
No readmission	25%	4%

CONCLUSION: This study confirmed that face to face MTM has a significant benefit in reducing readmission frequency and interval in IGP with HF and other comorbidities. As seniors population will be increasing, Implementation of MTM system should be considered especially for IGP.

Cardiovascular

11. Practice patterns for addressing LDL-cholesterol levels below 40 in patients receiving statin therapy. *Haleigh Helsing, B.S.*[1], Perry Taylor, Pharm.D.[2], Dave Dixon, Pharm.D.[3]; [1]Virginia Commonwealth University School of Pharmacy, Powhatan, VA [2]Department of Pharmacy, Virginia Commonwealth University Health System, Richmond, VA [3]Department of Pharmacotherapy and Outcomes Science, Virginia Commonwealth University School of Pharmacy, Richmond, VA

INTRODUCTION: There remains much debate regarding the safety of achieving low levels of low-density lipoprotein cholesterol (LDL-C) with statin therapy. For the first time, the ACC/AHA Cholesterol Guideline recommended clinicians reduce the dose of statin therapy in patients with LDL-C <40 mg/dL.

RESEARCH QUESTION OR HYPOTHESIS: This study evaluated provider adherence to the ACC/AHA Cholesterol Guideline recommendation to reduce the dose of statin therapy in response to LDL-C of <40 mg/dL.

STUDY DESIGN: This was a single-center, retrospective study of subjects with >2 documented LDL-C <40 mg/dL between January 1, 2015 and December 31, 2015.

METHODS: Laboratory data, prescription refill records, and clinical notes from the electronic health record were reviewed to assess whether or not the statin dose was changed during the follow-up period of 6 months after the LDL-C was measured. Eligible subjects included patients > 21 years old, on statin therapy and with an LDL-C <40 mg/dL obtained during an outpatient visit. Additional data collected included: age, LDL-C level and date of lab draw, co-morbidities, race/ethnicity, gender, and prescription refill history.

RESULTS: Of the 300 subjects reviewed, 83 were eligible and had a mean age of 62.9 ± 11.7 years. The majority were male (51.8%) and the population was 49.4% Caucasian, 45.8%

African American, and 4.8% Other. Baseline mean LDL-C was 31.2 ± 6.9 mg/dL. The majority of subjects were high risk as 71% (n=59) had cardiovascular disease and 76% (n=63) had diabetes. Only 7 subjects (8.4%) had their statin dose reduced as recommended by the ACC/AHA Cholesterol Guidelines.
CONCLUSION: Adherence to the ACC/AHA Cholesterol Guideline recommendation to reduce statin doses in those with an LDL-C <40 mg/dL was poor in this high-risk population.

12. Cardiovascular disease prevention in patients with diabetes: Is clinical practice adherent to the guidelines?. Hang Cheung, Pharm.D. Candidate[1], Allison Uniat, Pharm.D. Candidate[1], Noel Chan, Pharm.D. Candidate[1], Mania Radfar, Pharm.D. BCPS[2], Farnoosh Zough, Pharm.D., BCPS[1], *Alireza Hayatshahi, Pharm.D., BCPS*[1]; [1]School of Pharmacy, Loma Linda University, Loma Linda, CA [2]School of Pharmacy, Tehran University of Medical Sciences, Islamic Republic of Iran
INTRODUCTION: In a majority of patients with diabetes mellitus (DM), statins and aspirin are recommended by the American Diabetes Association (ADA) and the American College of Cardiology/American Heart Association (ACC/AHA) to reduce atherosclerotic cardiovascular disease (ASCVD) risks. Moderate or high intensity statins are indicated in DM patients when ASCVD risk factors are present; low dose aspirin is indicated when a DM patient is aged 50 and above and has additional risk factors.
RESEARCH QUESTION OR HYPOTHESIS: Is clinical practice adherent to current guidelines regarding cardiovascular disease prevention in patients with diabetes?
STUDY DESIGN: Retrospective chart review.
METHODS: We screened 1,585 patients hospitalized between January 1, 2016 and June 30, 2016 at Loma Linda University Medical Center; 396 patients aged 18 and above with DM were included for analysis. Outcomes were reported using descriptive analysis.
RESULTS: Among 194 DM patients with previous ASCVD, 66 were on appropriate statins, 66 were on statins of incorrect intensities, 16 missed statin therapy with medical justifications, and 46 without justification. Among this group, 49 were on correct aspirin therapy for secondary prevention, 13 missed aspirin with medical justifications, and 32 without medical justifications. Collectively, 28% were correctly on both statin and aspirin (or clopidogrel) with appropriate doses, while 14% inappropriately missed both statin and aspirin. Among 202 DM patients without previous ASCVD, 45 were on appropriate statins, 38 were on statins of incorrect intensities, 23 missed statin therapy with medical justifications, and 96 without justification. Among this group, 74 were on correct aspirin therapy for primary prevention, 21 missed aspirin with medical justifications, and 107 without medical justifications. Collectively, 11% were correctly on both statin and aspirin (or clopidogrel) with appropriate doses, while 43% inappropriately missed both statin and aspirin therapies.
CONCLUSION: There is a lack of prescriber focus in statin and aspirin utilization for primary ASCVD prevention among DM patients.

13. Depression in patients undergoing treatment for atrial fibrillation: relation to 6-month clinical outcomes. Jane Saczynski, Ph.D.[1], David McManus, M.D., Sc.M.[2], *Sul Gi Chae, Pharm.D. Candidate*[3]; [1]School of Pharmacy, Northeastern University, Boston, MA [2]Departments of Medicine and Quantitative Health Sciences, University of Massachusetts Medical School [3]Northeastern University, MA
INTRODUCTION: One third of all atrial fibrillation (AF) patients experience depression that persists for at least 6 months. Limited data from previous studies suggest that patients who underwent catheter-based pulmonary vein isolation (PVI) showed a reduction in symptoms of depression compared to who were treated with anti-arrhythmic drug (AAD) therapy.
RESEARCH QUESTION OR HYPOTHESIS: To compare levels of depression in between AF patients treated with PVI and patients treated with AAD over a 6-month period.
STUDY DESIGN: Longitudinal prospective cohort study.
METHODS: Study followed 231 AF patients over course of 6 months. Two cohorts of the AAD (n=130) arm and PVI (n=101) arm were recruited through the UMass Memorial Medical Center (UMMC) AF treatment program. 9-item version of the Patient Health Questionnaire (PHQ-9) scores were measured at baseline, 1, 3 and 6 months thereafter via in-person interviews. Two regression models were performed to identify variables independently associated with depression.
RESULTS: 53% of participants were under 65 years old, 35% were female and 94% were Caucasian. 72.29% of the patients had history of hypertension and 38.53% sleep apnea. The first adjustment for baseline PHQ-9 score showed that those who went under PVI on average had a score significantly lower than those who were on AAD at 6 months (B Coefficient; −2.42, <0.00). The second fully adjusted model for all baseline characteristics still showed significant association of PVI cohort with lower PHQ-9 score (B coefficient; −1.98, 0.0008).
CONCLUSION: Patients treated with PVI have lower levels of depression at 6 months compared to patients treated with AAD. The results suggest that special attention to psychosocial health is needed in AAD treated patients.

Community Pharmacy Practice

14. Current knowledge, attitudes, and barriers to implementation of expedited partner therapy (EPT): a survey of West Michigan community pharmacists. *Austin Rykse, Pharm.D. Candidate*[1], Lindsey Westerhof, Pharm.D.[2]; [1]College of Pharmacy, Ferris State Univeristy, Grand Rapids, MI [2]College of Pharmacy, Ferris State University, Grand Rapids, MI
INTRODUCTION: Early treatment of chlamydia and gonorrhea is essential to preventing spread and reinfection. EPT is the practice of healthcare providers treating their patients and sexual partners for chlamydia or gonorrhea with prescription medication without the partner needing to seek his or her own provider evaluation. EPT is a concept that was recently enacted into legislation two years ago in Michigan. We conducted a cross-sectional survey of community pharmacists in Michigan to assess current knowledge, attitudes, and barriers to implementation of EPT.
RESEARCH QUESTION OR HYPOTHESIS: The most common barriers to pharmacists for EPT implementation are liability concerns and unawareness of how to implement EPT.
STUDY DESIGN: Online cross-sectional survey.
METHODS: The survey was sent to 229 community pharmacists in West Michigan. Results were analyzed with descriptive and comparative statistical analysis. Subgroup analysis was performed with both chi-square and Fischer's Exact Test to determine if there were any differences by work experience regarding EPT support and active EPT practice.
RESULTS: The survey received 91 responses. Barriers to implementation of EPT were found to be liability (89%), inability to counsel partners on medications (71%), and not knowing the partner's allergies (62%). Subgroup analysis revealed no statistically significant differences by work experience in EPT support (P=0.35) or active EPT practice (P=0.91). A majority of pharmacists surveyed believe patient handouts and online resources would be helpful for EPT implementation.
CONCLUSION: This survey found that Michigan pharmacists are interested in practicing EPT, but barriers such as liability, communication with both sexual partners, and awareness are preventing them from doing so. Future studies are needed to assess the impact that educational materials may have on EPT implementation.

15. Community Pharmacists' interest in and attitude to pharmacy practice research in Ethiopia: a cross-sectional study. *Akshaya Bhagavathula, B.Pharm., Pharm.D.*[1], Eyob Gebreyohannes, M.Sc. (Clinical Pharmacy)[2]; [1]Department of Clinical Pharmacy, University of Gondar-School of Pharmacy, Gondar, Ethiopia [2]University of Gondar- School of Pharmacy, Gondar, Ethiopia

INTRODUCTION: Pharmacy practice-research became an important component in the pharmacy practice. However, no studies were conducted in sub-Saharan Africa to understand the pharmacists' interest and attitude towards pharmacy practice-research.
RESEARCH QUESTION OR HYPOTHESIS: We aimed to assess the community pharmacists' interest and attitude towards pharmacy practice-research in Ethiopia.
STUDY DESIGN: A cross-sectional study.
METHODS: A paper-based survey was conducted among community pharmacists in eight major cities in Ethiopia. A validated 25-item self-administered questionnaire covering interest and attitude related to pharmacy practice-research was distributed. Responses were analysed using descriptive and interfacial statistics.
RESULTS: A total of 389 community pharmacists responded to the survey (response rate- 88.4%). Most of community pharmacists showed a high level of interest in being involved in all aspects of pharmacy practice-research. Seventy percent identified 'research advances within pharmacy field' and more than sixty percent showed interest towards 'generating research ideas' (64%), 'interpreting the research findings' (62%), 'reviewing scientific literatures' and 'giving an oral presentation' (60%). The median summary score for interest was 38 (IQR 20–40) (range possible 11–50). More than half of the respondents showed positive attitude towards pharmacy practice-research with a median overall score of 30 (IQR 18–39), range possible 10–69. Sixty-seven percent of the respondents thought about being involved in research, felt research is important for their career (57.6%), confident to conduct the research (56.2%), and agreed that research is a part of pharmacy practice (48.5%). However, only forty-six percent agreed that they underwent research training. In multivariate analysis, a positive correlation was noticed that female gender had significantly more interest towards research than males [AOR: 1.50, 95% CI: 0.99–2.27; $p<0.05$].
CONCLUSION: Community pharmacists showed high interest towards several areas of research competencies and demonstrated positive attitude towards pharmacy practice-research. Our findings suggests that providing research training to community pharmacists may merit in undertaking research activities and build the research capacity in Ethiopia.

16. Medication therapy management services for patients with mental illness: the evolving role of community pharmacists. Vincent Giannetti, Ph.D.[1], Charles Caley, Pharm.D., BCPP[2], Khalid Kamal, M.Pharm., Ph.D.[1], *Jordan R. Covvey, Pharm.D., Ph.D., BCPS*[1], Jerry McKee, Pharm.D., M.S., BCPP[3], Barbara Wells, Pharm.D., FCCP, FASHP[4], Dean Najarian, Pharm.D., BCPP[5], Erin Gorse, Pharm.D. Candidate[1]; [1]Division of Pharmaceutical, Administrative and Social Sciences, Duquesne University Mylan School of Pharmacy, Pittsburgh, PA [2]University of Connecticut School of Pharmacy, Storrs, CT [3]Community Care of North Carolina, Raleigh, NC [4]Department of Pharmacy Practice, The University of Mississippi School of Pharmacy, University, MS [5]Janssen Scientific Affairs, LLC, Wrentham, MA
INTRODUCTION: A growing body of evidence supports the positive impact of pharmacist-delivered medication therapy management (MTM) for chronic conditions such as diabetes and asthma. However, pharmacist-delivered MTM for patients with mental illness (PMI) is still evolving. Management of psychotropic medication adherence, the need for specialized knowledge, and provision of regular follow-up present unique challenges for community pharmacists.
RESEARCH QUESTION OR HYPOTHESIS: To investigate differences in pharmacist/practice characteristics per level of MTM service provision to PMI.
STUDY DESIGN: Cross-sectional national survey of community pharmacists.
METHODS: Collected data included demographics/training, knowledge/practice and scaled measures of service provision (comfort, confidence, willingness and interest) for PMI. Respondents were stratified into three groups: (i) those not engaged in MTM services to PMI (noMTM), (ii) those delivering MTM not involving PMI (MTM-noPMI), and (iii) those providing MTM that included PMI (MTM-PMI). Descriptive/comparative analyses were conducted using IBM SPSS Statistics 23.0.
RESULTS: Among 204 respondents, there were: 124 (60.8%) in MTM-PMI, 41 (20.1%) in MTM-noPMI, and 39 (19.1%) noMTM. No significant differences in demographic/practice characteristics were found across groups, although MTM-PMI reported work environments with more pharmacists per shift (2.4±7.1) and higher weekly prescription volumes (1469.3±916.8) compared to MTM-noPMI (1.9±1.5; 1364.8±1044.9) and noMTM (1.5±0.7; 1354.7±769.1). MTM-PMI respondents reported personal experiences with mental illness more frequently than the other groups (p=0.023). A total of 99 MTM-PMI (79.8%), 26 MTM-noPMI (65.0%) and 25 noMTM (64.1%) reported completing continuing education in mental illness (p=0.054); only 3.6% overall completed any specialized training in mental illness. MTM-PMI reported higher confidence (17.67 vs 15.64, p=0.001), willingness (19.99 vs 17.87, p=0.001) and interest (19.15 vs 16.87, p=0.009) for MTM service provision compared to noMTM.
CONCLUSION: MTM service provision is not uniformly delivered to PMI by community pharmacists. Issues related to improving MTM offering include evaluation of pharmacy resource allocation, student training and identifying new opportunities for pharmacists to work closely with PMI.

Critical Care

17E. Clinical pharmacy and pharmacology section recruitment exchange – 3 years in the making. *Carrie Griffiths, Pharm.D., BCCCP*[1], Marilyn Bulloch, Pharm.D., BCPS[2], Leslie A. Hamilton, Pharm.D., BCPS, BCCCP[3], Scott Nei, Pharm.D.[4]; [1]Wingate University School of Pharmacy, Wingate, NC [2]Auburn University Harrison School of Pharmacy/University Medical Center, Tuscaloosa, AL [3]The University of Tennessee Health Science Center College of Pharmacy, Knoxville, TN [4]Mayo Clinic Hospital, Rochester, MN

18. Evaluation of the appropriate prescription of stress ulcer prophylaxis in the medical intensive care unit. *Rachael Fuller, Bachelor of Health Science*, Jenna Holzhausen, Pharm.D., Jim Winegardner, Pharm.D.; Department of Pharmacy, Beaumont Hospital – Royal Oak, Royal Oak, MI
INTRODUCTION: Stress ulcer prophylaxis (SUP) is indicated in critically ill patients when risk factors for stress ulcer development are present.
RESEARCH QUESTION OR HYPOTHESIS: This study aimed to evaluate the appropriateness of SUP in patients prescribed protein pump inhibitors (PPIs) or histamine-2 receptor antagonists (H_2RAs) and to identify when SUP was discontinued in relation to when risk factors for stress ulcer development were no longer present.
STUDY DESIGN: Medical records of 242 patients admitted to the medical intensive care unit (MICU) of a large academic medical center between August 1, 2016 and October 1, 2016 were retrospectively reviewed to evaluate the appropriate prescription and discontinuation of SUP therapy.
METHODS: Each patient's SUP therapy was documented and evaluated based upon indication, drug, route, dose, major and minor risk factors, and time to discontinuation. Exclusion criteria included continuation of home PPI or H_2RA therapy, prescription of PPI or H_2RA for indication other than SUP, absence of SUP during MICU stay, ICU stay > 28 days, or expiration < 48 hours after initiation of mechanical ventilation.
RESULTS: SUP was initiated in 62 of 242 patients (25.6%) and included 50 patients on famotidine (80.6%), 2 on omeprazole (3.2%), and 10 on pantoprazole (16.2%). SUP was appropriately initiated in 52 patients (83.9%); 33 were intubated for ≥ 48 hours (53.2%) and 7 had a coagulopathy (11.3%). Of those prescribed

SUP, 53 (85.5%) were initiated on an appropriate dose and 28 (45.2%) had therapy appropriately discontinued within 24-hours of stress ulcer development risk factors no longer being present.
CONCLUSION: SUP was appropriately initiated in the majority of patients based on drug and initial dose selection. However, more than half of patients had inappropriate discontinuation of SUP, suggesting educational initiatives may be warranted.

19. Comparison of orderset and non-orderset antibiotic administration in severe sepsis and septic shock. *Michelle Tomeczkowicz,* [1], Edith Liang, [1], Bryan Menich, Pharm.D.[2], Erin Mancl, Pharm.D.[2]; [1]Midwestern School of Pharmacy [2]Loyola University Medical Center, Maywood, IL
INTRODUCTION: The Center for Medicare and Medicaid (CMS) evaluates institutions on 3 and 6 hour bundle compliance in patients with sepsis, with a goal for initial antibiotics to be completed within the 3 hour bundle. Institution specific initiatives including multidisciplinary education and a sepsis orderset have been implemented. The institution goal is for sepsis antibiotics to be verified within 30 minutes and administered within one hour of order entry.
RESEARCH QUESTION OR HYPOTHESIS: The purpose of this study is to compare institution compliance with sepsis antibiotic administration between patients in whom the sepsis orderset was used and patients in whom the orderset was not used.
STUDY DESIGN: This is a single-center retrospective cohort analysis of patients with severe sepsis or septic shock.
METHODS: Patients had a diagnosis code for severe sepsis or septic shock from July 1–31, 2016. Patients were grouped into those who had initial antibiotics ordered through the sepsis orderset or those who did not have the sepsis orderset used.
RESULTS: There were 236 patients included, of whom 204 received antibiotics using the sepsis orderset and 32 without the orderset. Significantly more patients received antibiotics within the one hour administration goal in the orderset group (74% vs 53%, p=0.022). Time to order verification was similar between groups, while time to administration was faster in the orderset group. Most patients were treated in the emergency room, which also had the fastest time to antibiotics (median 33 minutes). The most common reasons for patients not receiving antibiotics in goal time were unknown, imaging, medication not in pyxis, and lack of access.
CONCLUSION: Sepsis orderset utilization is associated with a higher percentage of patients receiving antibiotics within one hour of order entry. Reasons for patients receiving antibiotics outside the goal time are often unknown, but imaging, medication not in pyxis, and lack of access were most common.

20. Evaluation of hematologic agent use in non-anticoagulant reversal settings. *Sarah Sienko, Pharm.D.*[1], Allycia Natavio, Pharm.D.[2], Mario Villalba, Jr., M.D.[3], Lisa Forsyth, Pharm.D., FCCM[2]; [1]Department of Pharmacy, Parkview Regional Medical Center, Fort Wayne, IN [2]Department of Pharmaceutical Services, Beaumont Hospital – Royal Oak, Royal Oak, MI [3]Department of Surgery – Surgical Critical Care, Beaumont Hospital – Royal Oak, Royal Oak, MI
INTRODUCTION: Recombinant Factor VIIa (rFVIIa), activated prothrombin complex concentrate (aPCC), and four-factor prothrombin complex concentrate (4F-PCC) are commonly used for emergent reversal of anticoagulant-related bleeding. Hematologic agent use in trauma, coagulopathy, and surgery occurs when bleeding is detrimental to patients even in the absence of anticoagulants. Minimal data exists supporting use of hematologic agents for bleeding management in non-anticoagulated patients.
RESEARCH QUESTION OR HYPOTHESIS: The objectives of this study were to characterize the use of hematologic agents in hemorrhage associated with non-anticoagulant reversal settings, and to describe the frequency of thrombosis and patient outcomes.
STUDY DESIGN: This was an Institutional Review Board-approved retrospective cohort study.
METHODS: Patients who received rFVIIa, aPCC, or 4F-PCC for management of bleeding due to trauma, surgery, coagulopathy, and other emergent situations between July 1, 2010 and January 15, 2016 were analyzed. All patients identified through medication reports were reviewed to determine the indication. Patients were excluded if the hematologic agent was administered for anticoagulant reversal, hemophilia, or treatment of pre-existing bleeding disorders. Patient and hematologic agent characteristics, frequency of adverse events, and patient outcomes were evaluated. Descriptive statistics were utilized for data analysis.
RESULTS: Thirty-six patients were evaluated and received the following agents: rFVIIa (69%), aPCC (17%), and 4F-PCC (14%). Mean APACHE-II scores were 32.1 $\pm$ 10.3. Surgical-related bleeding was the most common indication. The mean weight-based doses of rFVIIa, aPCC, and 4F-PCC were 58 micrograms/kilogram, 49 units/kilogram, and 26 units/kilogram, respectively. Four patients received two hematologic agents. The median hospital length of stay was 12.2 days. Thrombotic events occurred in 8 (22%) patients; no related deaths occurred. Hospital mortality was 42%, and the majority of patients who survived were discharged to sub-acute care facilities.
CONCLUSION: The most frequently used hematologic agent was rFVIIa. Hematologic agent use for non-anticoagulant reversal settings was most commonly associated with surgical-related bleeding. Thrombotic events occurred in 22% of patients.

21E. Effect of tissue plasminogen activator administration on international normalized ratio (INR) in patients with acute ischemic stroke. *Erin Davidson, Pharm.D.*[1], Morgan Jones, Pharm.D., BCPS, BCCCP[2], Michael Erdman, Pharm.D., BCPS[3], Samarth Shah, Pharm.D., BCPS[4], Whitney Gross, Pharm.D.[5], John Tyler Haller, B.S.[6]; [1]Department of Pharmacy, Methodist University Hospital, Memphis, TN [2]Department of Pharmacy, Methodist Le Bonheur Healthcare – University Hospital, Memphis, TN [3]Department of Pharmacy, UF Health Jacksonville, Jacksonville, FL [4]Department of Pharmacy, University of Tennessee College of Pharmacy, Methodist University Hospital, Memphis, TN [5]Department of Pharmacy, Methodist University Hospital, Memphis, TN [6]College of Pharmacy, University of Tennessee, Memphis, TN

Education/Training

22. Business perspectives of the pharmacist health coach. *Supurna Bhar, Pharm.D. Candidate*, Bupendra Shah, B.S.Pharm., M.S., Ph.D.; Arnold & Marie Schwartz College of Pharmacy, Long Island University
INTRODUCTION: Health coaching has been shown to empower patients and promote patient accountability. Health coaching has traditionally been offered by non-pharmacist health care professionals but has recently been gaining popularity among pharmacists despite not being insurance reimbursable. There is little data on which business practices make health coaching by pharmacists economically sustainable.
RESEARCH QUESTION OR HYPOTHESIS: This study seeks to examine the business practices of currently practicing pharmacist health coaches ("PHC").
STUDY DESIGN: This is a qualitative, cross-sectional study using the phenomenological approach.
METHODS: Participating PHCs were selected using a combination of purposive and snowball sampling. 8 participants were identified through social media and personal contacts. The study method employed was interviews. Interviews were recorded, transcribed, and coded via content analysis.
RESULTS: Several dominant themes emerged, including business development and steps to becoming a PHC. Practices became economically viable over a period of years and most PHCs initially coached part-time while maintaining a second job. PHCs were satisfied with the cash payment model but recognized that insurance reimbursement required collection of outcomes efficacy

data and standardized training. In order to make their business viable, health coach certification, technology and business training, personal development, and mentorship were required.
CONCLUSION: PHC practices may become economically viable over time with perseverance and proper training. Due to the novelty of health coaching by pharmacists and significant variations in business practices, additional research needs to be conducted on this topic.

23. Longitudinal evaluation of pharmacy student professionalism. *Heidi Eukel, Pharm.D.*[1], Jeanne Frenzel, Pharm.D.[2], Elizabeth Skoy, Pharm.D.[3], Mary Faure, Pharm.D. Candidate[3]; [1]North Dakota State University, Fargo, ND [2]School of Pharmacy, North Dakota State University, Fargo, ND [3]North Dakota State University
INTRODUCTION: Pharmacy students must develop professional attitudes and behaviors in order to successfully deliver patient care.[1,2,] The ACCP Standards of Practice for Clinical Pharmacists includes professionalism and ethics as a standard for the clinical pharmacist's involvement in care.[3] Authors of the Professionalism Assessment Tool (PAT) call for use of the instrument to collect data longitudinally to evaluate pharmacy student professionalism development over time.
RESEARCH QUESTION OR HYPOTHESIS: Pharmacy student professionalism will increase longitudinally throughout the didactic curriculum independent of predicted demographics.
STUDY DESIGN: Quantitative longitudinal survey research.
METHODS: The PAT, a valid and reliable tool, was administered longitudinally from 2013 to 2016. Responses for the class of 2017 (n= 85) were matched and analyzed (Excel, Qualtrics). The major independent variable for analysis was year in pharmacy school. Age, sex, number of degrees, previous pharmacy work experience, student organization membership, and years of undergraduate education were also independent variables. Dependent variables were individual self-evaluated performance domain scores and overall total score. Mean scores for each domain and total scores were compared using an independent sample t-test. The dependent variables' skewness and kurtosis indicated that normality was a strong assumption. All comparisons of demographic differences were performed using one-way ANOVA.
RESULTS: Internal reliability was very strong (0.926–0.954) and longitudinal increases in all 5 domains were achieved. Domains reliability and responsibility, lifelong learning and adaptability, citizenship and professional engagement, and total score showed statistically significant improvement Other demographics didn't significantly contribute to changes. The mean total score in the third professional year increased significantly for students in two or more organizations compared to students in zero or one student organizations (p=0.02). Students' age at time of admission did show an effect on total score (p=0.02).
CONCLUSION: Student self-assessment of professionalism increased longitudinally over the course of a didactic curriculum and was not affected by most predicted demographics.

24. Patient safety knowledge, attitudes and skills of undergraduate pharmacy students at University of Science, Malaysia. *Ahmed Aly, JMHPE, M.Pharm., Ph.D. Candidate*, Zuraidah Yusoff, Ph.D., Saad Othman, Ph.D., Syed Azhar Syed Sulaiman, Pharm.D., Abeer Kharshid, Ph.D. Candidate, Mohamed A. Hammad, M.Pharm., BCPS, Ph.D., Candidate, Abubakar Sha'aban, Ph.D. Candidate; Department of Clinical Pharmacy, School of Pharmaceutical Sciences, Universiti Sains Malaysia, Penang, Malaysia
INTRODUCTION: The enormous number of preventable annual deaths due to medical errors and the growing complexity of healthcare make patient safety (PS) a top-priority. Teaching PS at the undergraduate level can be a gateway for improving PS culture in any community. However, there are, to our knowledge, no published studies that evaluate the current situation of undergraduate students regarding PS in Malaysia. Our study aimed at assessing the PS related knowledge, attitudes and skills (KAS) of undergraduate pharmacy students at the University of Science, Malaysia (USM) to probe the adequacy of their curriculum in addressing its essential concepts.
RESEARCH QUESTION OR HYPOTHESIS: Does the curriculum of undergraduate USM pharmacy students significantly improve their PS KAS?
STUDY DESIGN: A retrospective cohort study.
METHODS: The Patient Safety/Medical Fallibility survey developed by Madigosky et al. (2006) was adapted (with permission) to suit Malaysian pharmacy context. In USM, PS related modules are only offered to third-year and fourth-year students. Therefore, fourth-year students were included in the study as the exposed group while first-year students were included as a control.
RESULTS: Of the 193 consenting respondents, 50.8% were first-year students while 49.2% were fourth-year students. Most (97.9%) of participants denied having any previous PS experience. However, 97% considered learning how to improve PS as an appropriate use of their time. The KAS mean scores of fourth-year students were average, yet still significantly higher than first-year students; [(2.99 ± 1.31 vs. 2.38 ± 1.14) (Z=−3.41, p-value =.001), (3.46 ± 0.22 vs. 3.38 ± 0.23) (Z=−2.28, p-value =.032), and (3.5 ± 0.92 vs. 3.25 ± 0.63) (Z=−2.16, p-value =.031)] respectively. There was a weak significant positive correlation between PS knowledge and attitudes (r_s= .22, p-value=.002).
CONCLUSION: The curriculum significantly improved students' PS KAS, however, there is still room for improvement. Moreover, improving students' PS knowledge positively reflects on their attitudes.

25E. Expansion of pharmacy students' involvement in global health and international clinical rotations. *Alice Chang, Pharm.D. Candidate*[1], Monica L. Miller, Pharm.D.[2], Ellen Schellhase, Pharm.D.[3]; [1]Purdue University College of Pharmacy [2]Department of Pharmacy Practice, Purdue University College of Pharmacy & Eskenazi Health Department of Pharmacy Services [3]Department of Pharmacy Practice, Purdue University College of Pharmacy

26E. Changing pharmacy students' knowledge, skills, and attitudes about medication errors and patient safety. *Jeanne Frenzel, Pharm.D.*[1], Elizabeth Skoy, Pharm.D.[2], Heidi Eukel, Pharm.D.[3]; [1]School of Pharmacy, North Dakota State University, Fargo, ND [2]North Dakota State University [3]North Dakota State University, Fargo, ND

27. Longitudinal evaluation and comparison of student reflections during a critical care rotation. *Chanelle Ajimura, Pharm.D., Candidate*[1], Jennifer Tilleman, Pharm.D.[2], Lee Morrow, M.D., M.Sc., FCCP[3], Mark A. Malesker, Pharm.D., FCCP, BCPS[4]; [1]Pharmacy, Creighton University School of Pharmacy and Health Professions, Omaha, NE [2]Department of Pharmacy Practice, Creighton University School of Pharmacy and Health Professions, Omaha, NE [3]Division of Pulmonary, Critical Care, Creighton University Medical Center, Omaha, NE [4]Creighton University Medical Center, Omaha, NE
INTRODUCTION: The 2016 National Accreditation Standards set by ACPE places a larger emphasis on self-reflection. At our university, reflection is an essential component of Jesuit education. In this process, students are taught to reflect upon positive and negative events daily and integrate these reflections into personal and professional development.
RESEARCH QUESTION OR HYPOTHESIS: This study is comparing student reflections prior to the increased emphasis on self-reflection to after to see if there was an impact on the theme of reflections that the students provided.
STUDY DESIGN: This study evaluates daily blogs written by fourth year pharmacy students on their advanced practice experience to assess common themes of personal reflection. A comparison is made to prior results.

METHODS: During the rotation, students were required to post a daily reflection on a secure blog site about any experience or observation that occurred that day. All reflections were retrospectively categorized into ten themes. Descriptive statistics were used to summarize the most frequent reflection themes. Chi-square testing was used to compare the distribution of reflection categories in the six year period before and after the curricular changes.
RESULTS: Between 2010 to 2016, 84 students posted 2049 self reflections. Anecdotal reporting suggests that each reflection required 2–3 minutes to post. Early reflections were generally brief and consisted of simple facts while reflections later were longer and more introspective. Over the 12 year study period the most common themes were medication topics (32%) and disease-related topics (20%). Under the revised curriculum, students were less likely to reflect upon communication issues ($p<0.001$), interprofessional interactions ($p=0.005$) and disease states ($p=0.007$). In contrast, they were more likely to reflect upon medical procedures ($p<0.001$) and lab testing ($p=0.001$).
CONCLUSION: Although medication and disease topics remained the most common themes, there was a change in the overall distribution during the study.

Emergency Medicine

28. Evaluation of piperacillin-tazobactam use in the emergency department of a rural academic medical center. *Jennifer Okumu, Pharm.D. Candidate – 2017*[1], Kyle DeWitt, Pharm.D., BCPS[2], Meghan Groth, Pharm.D., BCPS[2]; [1]School of Pharmacy and Health Sciences, Albany College of Pharmacy and Health Sciences, Colchester, VT [2]Emergency Department, University of Vermont Medical Center, Burlington, VT
INTRODUCTION: Overuse of broad spectrum antibiotics such as piperacillin/tazobactoam (pip/tazo) has contributed to the emergence of multi-drug resistant bacterial infections. Therefore, use of pip/tazo is generally discouraged for empiric treatment of community-acquired infections.
RESEARCH QUESTION OR HYPOTHESIS: We aimed to characterize the use of pip/tazo in the emergency department (ED) and determine its appropriateness in accordance with the institutional antibiotic guidelines.
STUDY DESIGN: Single-center, retrospective chart review.
METHODS: Patients of all ages who were administered at least one dose of pip/tazo in the ED between January 1 and December 31, 2015 were evaluated. Primary end points were: indication for therapy, and risk of poor outcome secondary to infection (determined by a dichotomized qSOFA score of 1 versus ≥ 2, serum lactate, pre-hospital location, and unit of admission following ED or operating room (OR)). Additional outcomes assessed included total number of doses administered and duration of therapy.
RESULTS: A total of 276 pip/tazo orders were included for review with a mean patient age of 54 ± 24 years. Intra-abdominal infections accounted for 54.7% of all orders, respiratory tract infections 36%, skin and soft tissue 36%, undifferentiated sepsis 25%, and other indications 10%. Patients most commonly presented from the community and had a qSOFA score of $\leq$1 point, 83.7% and 82.6% respectively. Mean serum lactate was 2.3 ± 2.4 mmol/L and was obtained in 59% of ED patients. Eight patients had a serum lactate greater than 4.0 mmol/L documented. Of all patients, 10% required admission to an intensive care unit. The mean number of doses administered was 2.3 ± 3.6 with a mean treatment duration of 1.5 ± 1.5 days.
CONCLUSION: Intra-abdominal infections accounted for the majority of pip/tazo orders in the ED during the study period. Most patients presented from the community and were at low risk for poor outcomes; therefore, empiric use of pip/tazo may not have been indicated.

29E. Retrospective review evaluating dosing strategies of three-factor prothrombin complex concentrate (3F-PCC) in the reversal of factor Xa inhibitors. *Kristi Carter, Pharm.D.*[1], Kaysey Cloud, Pharm.D.[1], Lauren Yancy, Pharm.D. Candidate[2], Patricia Newcomb, Ph.D., R.N., CPNP[1], Subhash Aryal, Ph.D.[3]; [1]Texas Health Harris Methodist Hospital Fort Worth, Fort Worth, TX [2]Texas Tech University Health Sciences Center – School of Pharmacy, Dallas, Texas, Dallas, TX [3]Biostatistics & Epidemiology, UNT Health Science Center, Fort Worth, TX

30E. Retrospective evaluation of 4-factor prothrombin complex concentrate use at a regional community hospital. *Collin Owczarzak, Pharm.D.*, Shannon Allcron, Pharm.D., BCPS, BCCCP, Janelle Seitz, Pharm.D., MSPAS, Kristan Vollman, Pharm.D., BCPS; Owensboro Health Regional Hospital, Owensboro, KY

Gastroenterology

31. Medication adherence evaluation in patients with chronic liver disease. *Milica Culafic, M.Sc. ClinPharm*[1], Sandra Vezmar Kovacevic, Ph.D.[1], Nikola Gosnjic, M.Pharm.[2], Marina Filipovic, M.Pharm.[2], Katarina Vucicevic, Ph.D.[1], Branislava Miljkovic, Ph.D.[1], Djordje Culafic, M.D., Ph.D.[3]; [1]Department of Pharmacokinetics and Clinical Pharmacy, Faculty of Pharmacy, University of Belgrade, Serbia [2]Department of Pharmacokinetics and Clinical Pharmacy, Faculty of Pharmacy – University of Belgrade [3]Clinic of Gastroenterology and Hepatology, Clinical Center of Serbia; School of Medicine, University of Belgrade, Serbia
INTRODUCTION: Achieving a high level of medication adherence is a primary determinant of optimal therapeutic outcome. Data on the extent of adherence among chronic liver-disease patients are limited.
RESEARCH QUESTION OR HYPOTHESIS: To determine the level of adherence and to identify factors associated with nonadherence in this specific patient population.
STUDY DESIGN: A prospective study was conducted in an outpatient Clinic for Hepatology, Clinical Center of Serbia, through a period of four months.
METHODS: Data were gathered from the pharmacist-patient interview using validated Morisky scale 8 (MMAS-8), Simplified Medication Adherence Questionnaire (SMAQ), and The Beliefs about Medicines Questionnaire (BMQ). Statistical analysis (PASW Statistics 18.0), using correlation denoted association between covariates; regression analysis described predictors for adherence success or failure.
RESULTS: were considered to be statistically significant if the p-value was ≤0,05. Results: Among 100 patients included in the study (53 males), only 36% (SMAQ) and 55% (MMAS-8) of patients were adherent to their regimen ($p=0.032$, CI=0.95). A *good level* of therapeutic *adherence* observed by the researcher ($p<0.001$) and patients receiving the support of family caregivers in medication management ($p=0.042$) were the predictors of a high adherence (MMAS≥6). Conversely, medication nonadherence was perceived in patients taking more than three medicines, full-time employment individuals and the presence of hypolipidemic drug treatment. Non-adherent patients scored higher on negative beliefs about medicines as measured on BMQ-overuse scale and BMQ-harm scale (≥12).
CONCLUSION: Our results indicate that one-half of patients evaluated by MMAS-8, and two-third of patients assessed using SMAQ show failure to medication adherence. Negative beliefs about harmful potential of medicines and general overuse beliefs corelated to a lower level of adherence. Pharmacists should take more proactive role in assisting liver-disease patients in adherence-enhancing strategies.

32. Evaluation of antibiotic use in a gastroenterology department: a glimpse by clinical pharmacist. *Milica Culafic, M.Sc. ClinPharm*[1], Sandra Vezmar Kovacevic, Ph.D.[1], Nina Zdravkovic, M.Pharm.[2], Marija Jovanovic, Ph.D.[3], Zeljko Vlaisavljevic, Ph.D.[4], Branislava Miljkovic, Ph.D.[1], Djordje Culafic, M.D., Ph.D.[5]; [1]Department of

Pharmacokinetics and Clinical Pharmacy, Faculty of Pharmacy, University of Belgrade, Serbia [2]Department of Pharmacokinetics and Clinical Pharmacy, Faculty of Pharmacy [3]Department of Pharmacokinetics and Clinical Pharmacy, Faculty of Pharmacy, University of Belgrade, Belgrade, Serbia [4]Clinic of Gastroenterology and Hepatology, Clinical Center of Serbia [5]Clinic of Gastroenterology and Hepatology, Clinical Center of Serbia; School of Medicine, University of Belgrade, Serbia

INTRODUCTION: Overuse of broad-spectrum antibiotics is constant clinical and financial burden on the health care system. Therefore, pharmacoeconomic analysis of antibiotic use is of the utmost importance.

RESEARCH QUESTION OR HYPOTHESIS: To evaluate the usage patterns and costs of inpatient antibiotic therapy in a clinical setting where there is no regular clinical pharmacy input.

STUDY DESIGN: A retrospective study was conducted during a period of three months at a Gastroenterology and Hepatology Clinic, Clinical Center of Serbia.

METHODS: Data were gathered from patient's medical history and through a chart review if at least one antibiotic was prescribed during hospitalization. The results of antibiogram and clinical data (i.e. age, gender, comorbidities) were collected. Total therapy cost and appropriateness of the antibiotic usage were evaluated. Descriptive statistics and Pearson correlation were applied to analyze data using PASW Statistics 18.0 (SPSS Inc Chicago, Illinois). Results were considered to be statistically significant if the p-value was ≤0,05.

RESULTS: Out of 99 patient's documentation reviewed, the total direct cost of antibiotic therapy was 14.737 EUR, of which intravenous administration cost accounted for 11.775 EUR (79.9%). Median antibiotic consumption per patient was 2.62. Statistically, a significant correlation was detected between total therapy cost and total antibiotic cost ($p<0.001$). The most frequently prescribed antibiotic was metronidazole (69.69%). Carbapenems influenced the hospital budget significantly, with 6.499 EUR (44.10%). The majority of patients (82.82%) received additional antibiotic, with no clear evidence to justify its use.

CONCLUSION: Our study demonstrated an impact of antibiotic use as a major economic burden for the hospital, albeit only direct costs were analyzed. The clinical pharmacist should take a proactive role to avoid the excessive antibiotic use and unfounded costs, to create and promote up-to-date local antibiotic guidelines and furthermore to encourage a switchover from intravenous to oral therapy at the earliest appropriate time.

Geriatrics

34. Comparison of delirium detection rates in dementia vs. non-dementia elderly population using FAM-CAM in the emergency department. *Heeseon Yeon, Pharm.D. Candidate*, Jane Saczynski, Ph.D.; School of Pharmacy, Northeastern University, Boston, MA

INTRODUCTION: The Family Confusion Assessment Method (FAM-CAM) has been validated in outpatient populations but has not been tested in populations with dementia or in hospitalized patients.

RESEARCH QUESTION OR HYPOTHESIS: To compare delirium detection rates using the Family Confusion Assessment.

METHODS: (FAM-CAM) in caregivers of dementia patients versus those of non-dementia patients against a gold standard interviewer rating, Confusion Assessment Methods (CAM).

STUDY DESIGN: An observational study Methods: The study enrolled 108 elderly patient/family member dyads who presented to Emergency Department at the University of Massachusetts Memorial Health Care. Upon admission, the research staffs used the Informant Questionnaire on Cognitive Decline in the Elderly (IQCODE) to assess dementia in the patients. Two interviews were conducted to assess delirium in the patients as follows: each patient was interviewed by a trained rater using the CAM, and each family caregiver was guided through the FAM-CAM questionnaires.

RESULTS: The average age of enrolled patients was 81 years old. IQCODE identified 51% of patients as having dementia. The prevalence of delirium was 28% according to both the CAM and the FAM-CAM. The sensitivity of the FAM-CAM was 60.8% (CI= 41–81%) in patients with dementia and 42.8% (CI=6–80%) in patients without dementia. The specificity of the FAM-CAM was 74.3% (CI=59–88%) in patients with dementia and 90.1% (CI=82–99%) in patients without dementia.

CONCLUSION: The sensitivity was 20% higher in dementia patients, which shows that FAM-CAM performs better than CAM at recognizing delirium in dementia patients and supports validation of its use in high-risk patient population with Delirium Superimposed on Dementia (DSD). The FAM-CAM offers critical knowledge of family caregivers on patient's baseline cognitive and physical function, therefore has great potential to help health care clinicians identify delirium during their patient assessment. Future studies with a larger sample size of different races and with education of caregivers on delirium-associated symptoms are encouraged.

Health Services Research

35. The relationships between comprehensive medication review (CMR) completion rates with Medicare Part C and Part D performance measures. *Armando Silva Almodovar, Pharm.D.*[1], Ashley Coleman, Pharm.D.[2], David Rhys Axon, M.Pharm.[3], Terri Warholak, Ph.D.[4], Milap C. Nahata, Pharm.D., M.S.[5]; [1]Institute of Therapeutic Innovations and Outcomes, The Ohio State University College of Pharmacy, Columbus, OH [2]Medication Management Program, The Ohio State University College of Pharmacy, Columbus, OH [3]Department of Pharmacy Practice and Science, The University of Arizona College of Pharmacy, Tucson, AZ [4]Department of Pharmacy Practice and Science, University of Arizona, College of Pharmacy, Tucson, AZ [5]Ohio State University College of Pharmacy, Columbus, OH

INTRODUCTION: In 2007, the Centers for Medicare and Medicaid (CMS) instituted performance measures to assess Medicare insurance providers. There is a dearth of information on the relationship between comprehensive medication review (CMR) completion rates and other performance measures.

RESEARCH QUESTION OR HYPOTHESIS: Is there a relationship between CMR completion rates and other Medicare performance measures?

STUDY DESIGN: This was a retrospective study of insurance plan performance measures in 2016 and 2017 obtained from the CMS Website. Part C measures were control of blood pressure and diabetes. Part D measures included medication adherence for diabetes, renin-angiotensin system (RAS) antagonists and statins, high-risk medication use, and CMR completion rate.

METHODS: A total of 1,249 plans provided Medicare Part C and/or Part D services, 364 were excluded for not reporting CMR completion rates. The remaining 451 plans (2016) and 434 plans (2017) were analyzed via Spearman (Rho) correlation coefficients.

RESULTS: The 2016 data indicated a medium and large, positive correlation between diabetes medication adherence and glucose control (rho: 0.471, $p<0.001$), and blood pressure medication adherence and control (rho: 0.576, $p<0.001$), respectively. Small, inverse correlations between CMR completion rate and high-risk medication use in the elderly (rho: −0.266, $p<0.001$), adherence to diabetes medication (rho: −0.114, $p=0.016$), adherence to blood pressure medication (rho: −0.107, $p=0.023$), and adherence to statin medications (rho: −0.112, $p=0.017$) were observed. The 2017 data showed a medium, inverse correlation between CMR completion rate and high-risk medications use in the elderly (rho: −0.307, $p<0.001$), a medium positive correlation between diabetes medication adherence and diabetes control (rho: 0.468, $p<0.001$), and a large, positive correlation between blood pressure medication adherence and control (rho: 0.500, $p<0.001$).

CONCLUSION: These findings suggested higher medication adherence rates were associated with greater diabetes and blood pressure control. Additionally, higher CMR completion rates were associated with reduced high-risk medication use among Medicare patients.

Hematology/Anticoagulation

36. Evaluation of three-factor prothrombin complex concentrate versus four-factor prothrombin complex concentrate for the urgent reversal of oral anticoagulation. *Shawna Truong, B.S.*[1], Julie Snyder, B.S., Pharm.D., BCPS, BCCCP[2], Laura Celmins, B.S., Pharm.D., BCPS, BCCCP[2]; [1]USC School of Pharmacy, Los Angeles, CA [2]Emergency Department, Antelope Valley Hospital, Lancaster, CA

INTRODUCTION: Prothrombin complex concentrate (PCC) is a human blood plasma product, of which two of the available types are three-factor (3F-PCC) and four-factor (4F-PCC). These agents are often used to reverse warfarin or the direct oral anticoagulants in patients with major bleeding or requiring urgent surgery. In this study, an evaluation of 3F-PCC and 4F-PCC was performed to assess their comparative efficacy.

RESEARCH QUESTION OR HYPOTHESIS: Are optimal medication therapy and patient outcomes comparable between 3F-PCC and 4F-PCC?

STUDY DESIGN: A retrospective chart review was performed on adult patients with an initial INR over 1.5 who were admitted and received 3F-PCC or 4F-PCC between January 2012 and August 2016.

METHODS: The primary outcome was successful reversal of anticoagulation at first INR post-PCC administration, defined as INR $\leq$ 1.5. Secondary outcomes included time to INR reversal, amount of blood products administered, length of stay, and adverse events. Numerical variables were assessed with a student t-test and a chi-squared test was used for nominal variables.

RESULTS: Altogether, 22 patients who received 3F-PCC and 33 patients who received 4F-PCC were included. The majority of patients were taking warfarin prior to PCC administration. Fourteen patients who received 3F-PCC (64%) had an INR $\leq$ 1.5 versus 26 patients (79%) who received 4F-PCC at first INR check (p=0.354). The average time to INR reversal was 11.4 hours versus 14.15 hours (p=0.979) for 3F-PCC versus 4F-PCC. The length of stay was significantly shorter for 4F-PCC versus 3F-PCC (7 versus 5 days, p=0.017). There were no adverse events reported in either group.

CONCLUSION: Overall, there was no difference in successful INR reversal or time to INR reversal in patients who received 3F-PCC versus 4F-PCC.

37. Evaluation of warfarin requirements in hospitalized, obese patients admitted with a therapeutic INR. *Katie B. Tellor, Pharm.D., BCPS*, Amanda C. Bultas, Pharm.D. Candidate, Steffany N. Nguyen, Pharm.D. Candidate, Anastasia L. Armbruster, Pharm.D., BCPS, Nicholas A. Greenwald, Pharm.D. Candidate, Abigail M. Yancey, Pharm.D., FCCP, BCPS; St. Louis College of Pharmacy, St. Louis, MO

INTRODUCTION: Despite well-established empiric dose adjustments for drug and disease-state interactions, the impact of body weight on warfarin maintenance dosing remains unclear. Existing data trend towards higher requirements to achieve a therapeutic international normalized ratio (INR), due to increased volume of distribution and clearance associated with increasing body mass index (BMI).

RESEARCH QUESTION OR HYPOTHESIS: Is there a difference in the total weekly dose (TWD) requirements of warfarin in patients admitted with therapeutic INRs, stratified by BMI?

STUDY DESIGN: Retrospective chart review.

METHODS: Patients were included if admitted with a therapeutic INR (goal 2.0–3.0). Exclusion criteria included: age <18 years, pregnancy, and warfarin for deep vein thrombosis prophylaxis. The primary outcome was mean TWD based on body weight classification: underweight (BMI <18 kg/m^2), normal/overweight (BMI 18–29.9 kg/m^2), obese (BMI 30–39.9 kg/m^2), and morbidly obese (BMI $\geq$ 40 kg/m^2). Data was extracted from two community hospitals in reverse chronologic order starting July 2015 through June 2013 until both study institutions evaluated 100 patients in each BMI classification or until all patients had been evaluated per weight class.

RESULTS: A total of 585 patients were included in the analysis (26 underweight patients, 200 normal/overweight patients, 200 obese patients and 159 morbidly obese). There was a statistically significant difference in TWD between groups as determined by one-way ANOVA (p<0.05). A Tukey post hoc test revealed a statistically significantly higher TWD in the morbidly obese (41.5mg) compared to underweight patients (25.6mg, p<0.05), normal/overweight patients (28.8mg, p<0.05) and obese patients (32.4mg, p<0.05). There were no statistically significant differences between the other groups.

CONCLUSION: Based on the results of this study, morbidly obese patients may require higher TWD to maintain a therapeutic INR.

38. Major bleeding with apixaban in atrial fibrillation: patient characteristics, management, and outcomes. *Sarah Eisho, Pharm.D.*[1], Nouran M. Salem, Pharm.D., M.B.A.[1], Janet L. Hoffman, Pharm.D.[1], John M. Koerber, Pharm.D.[1], Maureen A. Smythe, Pharm.D., FCCP[2]; [1]Department of Pharmaceutical Services, Beaumont Hospital – Royal Oak, Royal Oak, MI [2]Eugene Applebaum College of Pharmacy and Health Sciences, Wayne State University, Detroit, MI

INTRODUCTION: Clinical trial data and surveillance claims data suggest that major bleeding events with apixaban are not a significant safety concern. Apixaban use in practice is increasing and clinicians have to address major bleeding events.

RESEARCH QUESTION OR HYPOTHESIS: To identify patient characteristics, bleed management, bleed outcomes, and safety improvement opportunities in apixaban patients with major bleeding.

STUDY DESIGN: A retrospective cohort study in a single health-system.

METHODS: An electronic medical record search identified apixaban patients with hemorrhage, atrial fibrillation, and transfusion through International Classification of Diseases codes from January 2013 to May 2016. Internal adverse event reports were searched. Patients meeting major bleed criteria (based on International Society on Thrombosis and Haemostasis definition) and a temporal relationship to apixaban were included and underwent data extraction including patient characteristics, bleed management, and bleed outcomes. Descriptive statistics were used.

RESULTS: Fifty patients were identified with an average age of 78.9 $\pm$ 9.8 years. Gastrointestinal bleeding occurred in 72% and intracranial hemorrhage in 14%. Common patient characteristics included history of hypertension (94%), anemia (68%) and concomitant antiplatelet use (68%), often without documented indication. Renal impairment (CrCl < 25 ml/min) was present in 10% of patents. Diagnostic testing for the bleed was performed in 82%, procedures were required in 20%, packed red blood cells were used in 82%, reversal agent administration and transfer to hospice each occurred in 6%. Mortality during the index admission was 0%. Anticoagulation remained on hold at discharge for 66% of patients.

CONCLUSION: Major bleed patients were elderly, with history of hypertension and anemia, and on concomitant antiplatelet therapy. Apixaban major bleeding events were not life-threatening and rarely required a reversal agent. Ensuring a need for combination anticoagulant/antiplatelet therapy, avoiding use in dialysis, and improved documentation of the anticoagulation plan during transitions of care were identified opportunities to improve safety.

39E. Effectiveness and safety of direct oral anticoagulants and warfarin among patients with sickle cell disease: a retrospective cohort study. *Eric Gaskill, Pharm.D. Candidate*[1], Megan Roberts, Pharm.D.[2], Julie Kanter, M.D.[3], Nicole Bohm, Pharm.D.[1]; [1]Medical University of South Carolina, Charleston, SC [2]Medical University of South Carolina, Charleston [3]Medical University of South Carolina

HIV/AIDS

40. Effect of HIV-1 Tat and methamphetamine on drug efflux proteins within the blood brain barrier. *Sulay Patel, B.Pharm., M.S.*, Kurt Hauser, Ph.D., MaryPeace McRae, Pharm.D., Ph.D.; Department of Pharmacotherapy and Outcomes Science, Virginia Commonwealth University, Richmond, VA

INTRODUCTION: Despite aggressive therapy, HIV infection results in central nervous system (CNS) neurodegenerative alterations in ≈60% of infected individuals and may be partially due to poor CNS penetration of antiretrovirals. Injection drug abuse exacerbates HIV-associated pathologic CNS changes, but the interactive effects of HIV and methamphetamine on factors affecting CNS antiretroviral penetration are not well known. Blood-brain barrier localized efflux transporters are responsible for extrusion of antiretrovirals out of the brain.

RESEARCH QUESTION OR HYPOTHESIS: The HIV-1 viral protein Tat and methamphetamine effects on efflux transporter expression (P-glycoprotein and multidrug resistance protein 1 (MRP1)) and transporter-mediated activity within hCMEC/D3 (human Brain Microvascular Endothelial Cells) were examined.

STUDY DESIGN: P-glycoprotein and MRP-1 protein expression and activity were examined following 24-h methamphetamine and/or Tat exposure.

METHODS: hCMEC/D3 were treated with Tat (100nM), methamphetamine (10mM) or Tat+methamphetamine. P-glycoprotein and MRP-1 expression was evaluated by immunoblotting. Additionally, Tat and methamphetamine effects on transporter function were examined by measuring cellular accumulation of rhodamine123, (P-glycoprotein substrate) and atazanavir (P-glycoprotein and MRP-1 substrate) ± P-glycoprotein and MRP-1 inhibitors, verapamil (100mM), and MK-571 (30mM), respectively. GraphPad Prism v7.0 was used for statistical analysis.

RESULTS: Intracellular rhodamine123 accumulation was increased with methamphetamine ($p = 0.044$), and Tat+methamphetamine ($p=0.018$) versus controls, suggesting P-glycoprotein inhibition. Tat and methamphetamine treatments did not alter atazanavir accumulation. However, inhibition of P-glycoprotein ($p=0.001$) and P-glycoprotein+MRP-1 ($p< 0.0001$) increased atazanavir accumulation compared to control and MK-571 alone. P-glycoprotein and MRP-1 protein expression was not altered.

CONCLUSION: Methamphetamine containing treatment inhibited P-glycoprotein-dependent rhodamine123 efflux in hCMEC/D3 cells, without affecting protein expression levels. Interestingly, atazanavir failed to accumulate in methamphetamine-exposed cells. Because atazanavir can be transported by both P-glycoprotein or MRP-1, we propose that simultaneous inhibition of efflux transporters increases atazanavir accumulation within the brain.

41. Influence of age and time in treatment on antiretroviral therapy adherence. *Esther Laso, Pharmacy*[1], Jacqueline Martín, Pharmacy[2], Alvaro Corral, Pharmacy[2], MPaz Valverde, Pharmacy[1], Antonia Oliva, Pharmacy[2], MJose Otero, Pharmacy[1]; [1]Pharmacy Service, University Hospital of Salamanca, Spain [2]Pharmacy Service, University Hospital of Salamanca, Salamanca, Spain

INTRODUCTION: Optimal adherence to antiretroviral therapy (ART) is critical to positive health outcomes in patients with HIV. Determination of the factors that hinder adherence has great interest to develop intervention strategies.

RESEARCH QUESTION OR HYPOTHESIS: To compare 2005 and 2015 adherence population to ART of HIV-infected patients. To evaluate the influence of age and time in therapy on treatment adherence.

STUDY DESIGN: Retrospective review of medical records of HIV-infected outpatients treated in the Pharmacy Service of a Spanish hospital. Variables collected were adherence to ART, age and length of therapy.

METHODS: Adherence of each patient was calculated by the dispensation records during six months previous to October 2005 and October 2015. It was grouped: >70%, 70–79.9%, 80–89.9%, 90–94.9% and ≥95%. Age was categorized as 15–29, 30–49 and > 50 years; and time in therapy was registered as continue variable. Data were analyzed with Matlab®.

RESULTS: 220 patients at 2005 and 365 at 2015 were reviewed (69% and 77% of the population, respectively). Mean global adherence level improved from 92% at 2005 to 94% at 2015, and patients with optimal adherence increased from 63% to 74%. Elderly subgroup grew 30% during this period. Patients had being in therapy for 5.72 ± 3.45 years at 2005, while this length increased at 2015 to 10.59 ± 7.16. Regarding age, young patients showed the lowest adherence, at 2005 and 2015; nevertheless they achieved the highest increase in the mean adherence level (15%). Elderly patients had the best compliance at both measures. Regarding time in therapy, adherence at 2005 declined gradually over the time, while in 2015 it increased.

CONCLUSION: Mean global adherence level has improved over these years, but a quarter of population doesn't achieve optimal adherence. Strategies to improve adherence should focus to young people, as well as at the beginning of ART.

Infectious Diseases

42. Evaluation of empiric prescribing for pneumonia in a surgical intensive care unit. *Hannah Turner, Pharmacy Student*[1], Spencer Laehn, Pharm.D.[2], William Peppard, Pharm.D., BCPS, FCCM[2]; [1]Pharmacy Department, Froedtert Hospital and Medical College of Wisconsin, Milwaukee, WI [2]Pharmacy Dept, Froedtert Hospital and Medical College of Wisconsin, Milwaukee, WI

INTRODUCTION: Historically Infectious Disease Society of America (IDSA) hospital-acquired pneumonia (HAP) guidelines have not been well representative of the trauma/surgical ICU patient population. These patients often have extended hospitalizations with minimal previous healthcare contact. Recently published ISDA HAP guidelines underlined the importance of empiric antibiotic regimens based on hospital and unit specific resistance patterns.

RESEARCH QUESTION OR HYPOTHESIS: Are current empiric HAP prescribing patterns at Froedtert Medical Lutheran Hospital (FMLH) trauma/surgical ICU (SICU) adequate, yet not overly broad coverage for HAP patients based on unit resistance patterns?

STUDY DESIGN: Retrospective chart review of a 21 bed adult SICU at a large academic medical center in Eastern Wisconsin analyzed culture positive HAP between 2008 and 2016.

METHODS: All methicillin-resistant *Staphylococcus aureus* (MRSA) cultures were included, non-MRSA cultures were selected randomly in a 1:2 fashion. Descriptive statistics are reported.

RESULTS: A total of 27 MRSA and 55 non-MRSA HAP patients were analyzed. Of the non-MRSA arm, 51/55 (92.7%) were empirically covered correctly. The 4 pathogens not empirically covered include: 1/4 *H. influenzae,* 1/4 *Pseudomonas*, 1/4 *Acinetobacter*, 1/4 *P. mirabilis*. Empiric anti-MRSA agents were started in 29/55 (52.7%) of non-MRSA patients. The empiric use of cefepime or piperacillin/tazobactam would have covered 54/55 (98.2%) of non-MRSA patients, the 1 pathogen not covered being *Stenotrophomonas maltophilia*. Of the MRSA arm 23/27 (85.2%) were empirically covered correctly. The 4 pathogens not empirically covered include: 2/4 MRSA, 1/4 *K. Pneumoniae*, 1/4 *Pseudomonas*. The empiric use of cefepime or piperacillin/tazobactam plus and anti-MRSA agent would have covered 27/27 (100%) of MRSA patients.

CONCLUSION: Empiric use of either cefepime or piperacillin/tazobactam as the gram negative agent of choice would improve empiric HAP coverage. Improved stratification of MRSA patients should be determined to spare over utilization of anti-MRSA agents.

43. Decade in review: a community based antibiogram of urinary cultures and ESBL incidence in Ottawa, Ontario (2006–2015). *Roland Halil, Pharm.D., ACPR, BScPharm, BSc(Hon)*;

Department of Family Medicine, University of Ottawa, Bruyere Academic Family Health Team, Ottawa, ON, Canada
INTRODUCTION: First line choices for treatment of urinary tract infections (UTI) show evolving patterns of resistance. Rising rates of extended spectrum beta-lactamase (ESBL) strains are associated with increased mortality, morbidity and health care costs. Locally produced antibiograms may be useful in detecting local resistance and promoting improved antibiotic stewardship.
RESEARCH QUESTION OR HYPOTHESIS: Have the local resistance patterns in urinary isolates changed over the past decade, particularly for ESBL strains of bacteria?
STUDY DESIGN: Retrospective analysis of electronic medical record (EMR) data from a single, urban, academic family health team in Ottawa, Ontario, Canada.
METHODS: EMR data (PS-Suite™ v5.5.207) was searched for urinary cultures and sensitivities from Jan 1st, 2006 to Dec 31st, 2015. Patient age, gender, prevalence of organism, percent sensitivity to antibiotics tested, and presence of ESBL strains were reported. A weighted average of percent sensitivities was calculated for each antibiotic.
RESULTS: There has been a significant increase the incidence of ESBL strains over the past 10 years by absolute number and percentage, in keeping with national trends. Nitrofurantoin is still highly effective against E.coli but sensitivity is waning. This may be more ideal for empiric treatment in our clinic based on local sensitivity patterns compared to SMX/TMP. SMX/TMP is still highly effective against Klebsiella but sensitivity rates overall have fallen below the standard 80% threshold. First generation cephalosporins dramatically lost efficacy against E.coli in 2011–2012, for reasons unknown.
CONCLUSION: The rate of increase of ESBL incidence requires stricter limits on antibiotic use. Production of local antibiograms are feasible and may enhance antibiotic stewardship. SMX/TMP and Nitrofurantoin are still drugs of choice for empiric treatment of uncomplicated UTI, although nitrofurantoin could be first line. Fluoroquinolone use should be restricted to prevent resistance. Future studies will examine the correlation between rising ESBL strains and recent antibiotic use and hospitalizations.

44E. Evaluation of empiric antifungal therapy practices in patients with gastrointestinal perforations. *Abby Tyson, Pharm.D.*[1], Erin Meilton, Pharm.D.[1], Tara Tokar, Pharm.D.[1], Tamara McMath, M.P.H.[2], Christy Collins, Ph.D.[3]; [1]Department of Pharmacy, OhioHealth Riverside Methodist Hospital, Columbus, OH [2]Academic Research, OhioHealth Research Institute, Columbus, OH [3]OhioHealth Research & Innovations Institute Riverside Methodist Hospital, OhioHealth Riverside Methodist Hospital, Columbus, OH

45E. Comparative effectiveness of ceftaroline and daptomycin as first line therapy for patients with bacteremia or sepsis admitted to hospitals in the United States veterans health care system. *Marilyn Mootz, B.S., Pharm.D. Candidate*[1], Rachel Britt, Pharm.D., Candidate[2], Grace C. Lee, Pharm.D., BCPS[2], Kelly Reveles, Pharm.D., Ph.D.[2], Natalie Boyd, Pharm.D., M.S.[2], Kirk Evoy, Pharm.D.[2], Christopher Frei, Pharm.D., M.S.[2]; [1]The University of Texas at Austin College of Pharmacy, Austin, TX [2]The University of Texas at Austin College of Pharmacy and University of Texas Health Science Center School of Medicine, San Antonio, TX

46. Evaluating clinical outcomes and antimicrobial prescribing associated with multidrug resistant Acinetobacter baumannii in pulmonary versus non-pulmonary infections. *Linda Lumintaintang, Pharm.D. Candidate*, Nilomi Shah, Pharm.D. Candidate, Geraldine Cadalin, Pharm.D. Candidate, Anh Dang, Pharm.D. Candidate, Lee Nguyen, Pharm.D.; School of Pharmacy, Loma Linda University, Loma Linda, CA
INTRODUCTION: Acinetobacter baumannii (ACB) is a multidrug resistant (M.D.R) bacteria, which most frequently causes nosocomial infections. Multidrug resistance is defined as an acquired non-susceptibility to at least one agent in three or more antimicrobial categories. ACB has become a challenging organism to treat due to limited options.
RESEARCH QUESTION OR HYPOTHESIS: This study was designed to evaluate outcomes and antimicrobials employed in the treatment of pulmonary and non-pulmonary M.D.R-A. baumannii infections.
STUDY DESIGN: Retrospective.
METHODS: This study included hospitalized patients between 18–89 years of age with a positive culture for M.D.R-ACB who required treatment during 01/01/2013–12/31/2015. The groups were divided based on pulmonary (PUL) or non-pulmonary (NON) sources. Patients were excluded if they did not meet inclusion criteria. Therapy response included complete response, partial response, and non-response. Non-response included failure, relapse, and death. Time-to-clinical stability was defined as return of altered mental status and abnormal vital signs to normal baseline values. The primary outcome was therapy response. Secondary outcomes included length of hospitalization (LOS), 30-day all-cause in-hospital mortality, a description of antimicrobials implemented, achievement of clinical stability (ACS), and time-to-clinical stability (tCS).
RESULTS: One hundred and eleven patients were included in the study (PUL, N=56; NON, N=55). Clinical response (complete+partial) was lower in the PUL vs NON group, (65% vs 83%, p=0.04). The LOS and mortality were similar between groups (LOS[mean days±SD], PUL:22±17 vs NON:22±26, p=ns; Mortality, PUL:25% vs NON:16%, p=ns). ACS and tCS were lower in the NON group (ACS, PUL:34% vs NON:58%, p=0.01; tCS[mean days±SD], NON: 7±10 vs PUL 14±13, p=0.002). The most common empiric antibiotics used were beta-lactamase inhibitor combinations (42%). The M.D.R-ACB were 4% and 17% susceptible to piperacillin-tazobactam and imipenem.
CONCLUSION: Drug resistance limits therapeutic options and may play a role in clinical response, such as achieving clinical stability and time to clinical stability in pulmonary infections caused by ACB.

47. Risk factors for Clostridium difficile-associated diarrhea in Taiwanese hospitalized patients. *Ying-Chun Chen, B.S., R.Ph.*, Yu-Ting Su, B.S., R.Ph., Hsiang-Lin Chou, Pharmacy Student, Yi-Feng Shen, Pharmacy Student, Yu-Yuan Chien, Pharmacy Student, Chi-LienHsiao, M.S., R.Ph.; Department of Pharmacy, Shuang Ho Hospital, Taipei Medical University, New Taipei City, Taiwan
INTRODUCTION: Strategies toward appropriate antibiotic use are important in order to control the incidence of Clostridium difficile-associated diarrhea (CDAD) in hospitalized patients. However, the real relationship between patterns of antibiotic use and CDAD remains unclear in Taiwan.
RESEARCH QUESTION OR HYPOTHESIS: To identify the risk factors and the specific antibiotic exposure for hospital-acquired CDAD development.
STUDY DESIGN: A retrospective case-control study conducted in Shuang-Ho Hospital (SHH), Taiwan.
METHODS: Medical records of hospitalized patients from January 1, 2013 through September 30, 2016 were reviewed for evaluation on possible risk factors associated with CDAD in SHH. Patients with presence of gastrointestinal symptoms and laboratory confirmed positive C. difficile toxin assays were identified as the case group. The control group included toxin-negative individuals who were matched to the case group for age and sex in a ratio of 1:1.
RESULTS: A total of 82 patients were included. No significant differences were found between the case group (n=41) and the control group (n=41) in regards to age (74 vs. 72 years old), sex (male 54% vs. 54%), length of stay (23 vs. 25 days), underlying diseases and enteral feeding (63.41% vs 70.73%). The use of ceftriaxone (OR 4.29; 95% CI 1.26 to 14.60) was identified as a risk factor for CDAD development, while the use of piperacillin/tazobactam (OR 0.37; 95% CI 0.15 to 0.90) was less relevant to

CDAD. Among other suspected drugs, flomoxef (OR 2.24), clindamycin (OR 1.90), cephalexin (OR 1.76), H_2-blockers (OR 1.51), antifungals (OR 1.41) and levofloxacin (OR 1.37) all demonstrated a trend toward increased risk of CDAD with no statistical significance.
CONCLUSION: The study found the patients who received ceftriaxone were four times at risk for developing CDAD, which mirrors the previous studies from western countries and Japan. Interestingly, in this study, the use of piperacillin/tazobactam tended to cause more antibiotic-associated diarrhea than CDAD.

48E. Dosing weight-based antimicrobial agents in obese patients: a focused literature review of pharmacokinetic and clinical data across obesity classifications. *Brian Aston, Bachelors of Pharmaceutical Science*; University of Pittsburgh School of Pharmacy, Pittsburgh, PA

49E. Evaluation of Hepatitis C Treatment in Elderly Patients. *Mandee Noval, Pharm.D. Candidate*[1], Jennifer Andres, Pharm.D.[2]; [1]School of Pharmacy, Temple University, Philadelphia, PA [2]Department of Pharmacy Practice, Temple University School of Pharmacy, Philadelphia, PA

50. Derivation of predictors of clinical effectiveness of colistin for the treatment of serious gram-negative infections. Kaleen Hayes, Pharm.D. Candidate[1], Kerry Moore, Pharm.D. Candidate[1], *Troy Albrecht, Pharm.D., Candidate*[1], Andrea Evankovich, Pharm.D. Candidate[2], Christopher Ensor, Pharm.D.[3], Carlo Iasella, Pharm.D.[3]; [1]Department of Pharmacy and Therapeutics, University of Pittsburgh School of Pharmacy, Pittsburgh, PA [2]School of Pharmacy, University of Pittsburgh, Pittsburgh, PA [3]University of Pittsburgh, Pittsburgh, PA
INTRODUCTION: Use of IV colistin for serious gram-negative infections has increased in recent years due to further emergence of resistant bacteria, but it is unknown how escalating resistance affects clinical outcomes. This retrospective analysis evaluated the utility of IV colistin and derived predictors of its clinical effectiveness in patients in a large academic medical center.
RESEARCH QUESTION OR HYPOTHESIS: It is hypothesized that increasing gram-negative bacterial drug resistance will be a predictor of mortality.
STUDY DESIGN: Single-center, retrospective cohort study.
METHODS: Medical records and microbiology data of 183 patient-visits with the receipt of IV colistin between Jan 1, 2010 and December 31, 2015 at UPMC Presbyterian Hospital were evaluated. The primary endpoint was hospital mortality. Bacterial resistance was evaluated by categorizing bacterial isolates as defined by the European Centre for Disease Prevention and the Centers for Disease Control and Prevention. Descriptive statistics, univariate parametric and nonparametric analyses were used for normal and non-normally distributed data, respectively. Univariate and multivariate regression were used to derive relevant predictors of mortality.
RESULTS: 166 patients representing 183 unique patient-visits were evaluated. On univariate analysis, increasing resistance was not found to be a statistically significant predictor of mortality. In a multivariate regression model, congestive heart failure and abdominal site of infection were found to be predictive of mortality (OR 2.60, 95% CI 1.12–6.03 p=0.026) and (OR 7.41, 95% CI 2.01–27.36 p=0.003), respectively. White race was found to be protective (OR 0.43, 95% CI 0.19–0.93 p=0.033). In the same model, dialysis and gender were not predictive of mortality.
CONCLUSION: In patients with gram-negative infections who were treated with IV colistin, congestive heart failure and abdominal site of infection were predictive of mortality, while white race was protective. Increasing resistance was not a statistically significant predictor of mortality.

51. Feasibility of creating respiratory antibiograms for common bacteria causing pneumonia in intensive care units. *Brian Potoski, Pharm.D.*[1], Lloyd Clarke, B.S. (Hons)[2]; [1]School of Pharmacy, Department of Pharmacy and Therapeutics, University of Pittsburgh, Pittsburgh, PA [2]Department of Pharmacy, University of Pittsburgh Medical Center, Presbyterian Campus, Pittsburgh, PA
INTRODUCTION: Antibiotic options for Gram-negative bacteria are limited, however antibiogram data may guide empiric antibiotic selection. Recent guidelines on antimicrobial stewardship and Hospital- and Ventilator- associated pneumonia (HAP/VAP) have endorsed unit/population specific antibiograms for guiding therapy, yet data on stratifying antibiograms by culture site are lacking.
RESEARCH QUESTION OR HYPOTHESIS: We sought to determine whether creating ICU antibiograms by respiratory culture site was feasible, and whether comparisons to hospital-wide antibiograms reveal relevant differences not otherwise detected.
STUDY DESIGN: Retrospective, single-center, observational study.
METHODS: The microbiology database was queried for common Gram-negative bacteria causing HAP/VAP for calendar year 2016. Cumulative hospital-wide, ICU specific, and ICU respiratory antibiograms were created in accordance with recommendations from the Clinical & Laboratory Standards Institute (CLSI). Re-inclusion criteria was set at 7 days. Statistical comparisons were made across respective antibiogram species if isolates ≥ 30.
RESULTS: ICU antibiograms were created for 6 ICU's. Bacteria reaching CLSI threshold for comparisons included *Pseudomonas aeruginosa* (5/6 ICU's); *Escherichia coli* (4/6 ICU's); and *Klebsiella pneumoniae* (3/6 ICU's). Only Pseudomonas reached sufficient numerical thresholds for statistical comparisons between ICU respiratory and ICU all-site antibiograms in 33.3% (2/6) of ICU's (Medical and Cardiothoracic). For broad-spectrum antibiotic comparisons in Medical- and Cardiothoracic- ICU's, all-site ICU antibiograms were 42.8% (3/7) and 100% (7/7) different ($p \leq 0.05$) from hospital-wide antibiogram data, respectively. However, comparing specific ICU all-site to ICU respiratory antibiograms, concordance was in 28.6% (2/7) and 42.8% (3/7) of broad-spectrum antibiotics for Medical- and Cardiothoracic-ICUs, respectively.
CONCLUSION: Unit specific antibiograms stratified by respiratory culture site may identify relevant differences in antibiotic susceptibilities not evident by the conventional all-site method. Limitations to this approach include time-intensiveness, and small isolate sample sizes that limit validity and clinical utility. It is unclear whether site-specific antibiograms may improve empiric antibiotic selection appropriateness. Future investigation is warranted.

52. Evaluation of antibiotic de-escalation and ordering practices in a community teaching hospital. Ashmi Philips, Pharm.D.[1], *Daniel Fitzgerald, Pharm.D.*[2], Rani Madduri, Pharm.D.[3], Mini Varghese, Pharm.D.[3], Navin Philips, Pharm.D.[4]; [1]Ernest Mario School of Pharmacy, Rutgers, The State University of New Jersey, Flemington, NJ [2]Pharmacy Department, Hunterdon Medical Center, Flemington, NJ [3]Hunterdon Medical Center, Flemington, NJ [4]Department of Pharmacy, Hunterdon Medical Center, Flemington, NJ
INTRODUCTION: Antibiotic stewardship encompasses a variety of initiatives to judiciously utilize antimicrobial agents. Our institution has implemented a three-day stop order for all intravenous antibiotics to prompt re-evaluation of treatment. The purpose of this study is to evaluate adherence to this initiative.
RESEARCH QUESTION OR HYPOTHESIS: How frequestly are antibiotics being de-escalated on day three of therapy?
STUDY DESIGN: Retrospective chart review.
METHODS: This is a retrospective review from July to September 2016. The primary outcome is how frequently antibiotics are being de-escalated on day three. The secondary outcome is frequency of resulting missed doses. Patients will be included if they are at least 18 years of age and received empiric intravenous

piperacillin-tazobactam for three days. Exclusion criteria are if they are admitted to behavioral health or maternity units. Data collection utilizing the following data: age, gender, renal function, site of infection, culture and sensitivity results, and if infectious diseases was consulted. De-escalation will be identified as narrowing of antibiotic coverage based on culture results, noting the day of antibiotic therapy that the change was made
RESULTS: Seventy patients were included in the study. The results for the primary outcome showed that 34% of de-escalation events occurred on day 3 of therapy, 33% on day 5, 22% on day 6, and 11% on day 8. The analysis for the secondary outcome showed that 8 patients (11%) had at least 1 dose missed due to the stop order.
CONCLUSION: Appropriate de-escalation events occurred when cultures became available, or when clinically appropriate. In some instances, expired orders lead to missed doses. Infectious diseases consult was associated with an 8.5% increase in appropriate de-escalation events, and a 5.7% decrease in missed doses. Going forward, a recently implemented clinical surveillance program in our hospital may help track antibiotic orders that require de-escalation. Re-education of our physicians regarding appropriate evaluation of antimicrobial therapy at day three should be implemented.

53E. Evaluation of liposomal amphotericin B dosing on renal outcomes in a tertiary care. Mary K. McNulty, Pharm.D. Candidate[1], *Julia Shlensky, Pharm.D.*[2], Christopher K. Finch, Pharm.D., BCPS, FCCM[3], Jennifer Twilla, Pharm.D., BCPS[4]; [1]College of Pharmacy, University of Tennessee Health Science Center, Memphis, TN [2]Department of Pharmacy, Methodist Univeristy Hospital, Memphis, TN [3]University of Tennessee, College of Pharmacy, Memphis, TN [4]Department of Pharmacy, Methodist University Hospital, Memphis, TN

Medication Safety

55E. Outcomes from an inpatient proton pump inhibitor stewardship program. *Rebekah A. Wahking, Pharm.D., M.B.A. Candidate*[1], Rachel E. Hanners, Pharm.D.[1], Sean M. Lockwood, M.D.[2], Randal L. Steele, Pharm.D.[1], Kelly W. Davis, Pharm.D., BCPS[1]; [1]Lexington VA Medical Center, Lexington, KY [2]Department of Medicine, Lexington VA Medical Center, Lexington, KY

56. Impact of transitions of care pharmacists in reducing medication errors for pneumonia patients. *Laressa Bethishou, Pharm.D.*[1], Noah Fang, Pharm.D.[2]; [1]Department of Pharmacy Practice, Chapman University School of Pharmacy, Irvine, CA [2]Department of Pharmacy, Stanford Health Care, Stanford, CA
INTRODUCTION: With the focus on patient safety, many organizations, including The Joint Commission, place significant emphasis on medication reconciliation around transitions of care. At Stanford Health Care, a service line of Transitions of Care (ToC) Pharmacists was introduced to maintain and communicate accurate medication information during care transitions.
RESEARCH QUESTION OR HYPOTHESIS: The purpose of this study was to describe the impact of the ToC pharmacist in reducing medication errors on discharge.
STUDY DESIGN: Retrospective chart review was conducted on patients discharged with a pneumonia diagnosis between December 2015 to Feb 2016.
METHODS: Patients were stratified based on whether they received TOC pharmacist medication review vs. standard of care. Errors were identified by comparing the patient discharge medication list to the physician discharge summary, home and inpatient medication lists. Errors rates were compared and stratified by error type. Pharmacist interventions were quantified.
RESULTS: Of the 125 patients discharged with pneumonia, 69 patients' medication lists were reviewed by ToC pharmacists, while 56 patients received standard of care. In the ToC intervention group, 6 errors were identified for 5 patients, which equates to an error rate of 7.2%. In the standard of care group, 85 medication errors were identified for 36 patients (64.3% error rate). The difference was statistically significant ($P < .0001$) and corresponds to an 88.8% relative decrease. The most common error recorded was incorrect medication/dose/frequency. During this time, the ToC pharmacist also documented 71 interventions.
CONCLUSION: ToC pharmacist interventions led to a statistically significant decrease in medication errors for pneumonia patients. The most documented interventions included access/formulary issues and incorrect frequency/dose/duration of therapy. Continued metrics and interventions are being collected to assess the impact of the ToC pharmacist on patient outcomes.

57. Evaluation of a pharmacy compliance tool on the adherence to the endothelin receptor antagonists risk evaluation and mitigation strategy requirements. *Mahmoud Ammar, Pharm.D., BCCCP, BCPS*, Marigel Constantiner, M.S., BCPS, CGP; Cleveland Clinic, Cleveland, OH
INTRODUCTION: Macitentan and ambrisentan are associated with high risk of teratogenicity thus the FDA required a Risk Evaluation and Mitigation Strategies (REMS) for these medications when dispensed in a hospital setting. Due to complex nature of these strategies a detailed workflow process to optimize adherence to these requirements was implemented.
RESEARCH QUESTION OR HYPOTHESIS: Compare the adherence rate to macitentan and ambrisentan REMS requirements prior to and post-implementation of the new workflow process.
STUDY DESIGN: Retrospective, non-interventional, chart review, cohort study.
METHODS: Patients were included into two cohorts, pre-implementation cohort defined as patients who received therapy prior to implementation of the compliance tool and post-implementation cohort defined as patients who received therapy post implementation of the compliance tool. The compliance workflow includes utilizing an electronic in-basket message system that would notify a regulatory adherence pharmacist that an order for these agents has been placed. The pharmacist would then follow up on these orders to ensure requirements have been fulfilled. Patients were included if they were adult patients and received macitentan or ambrisentan at Cleveland Clinic. Data was analyzed with descriptive statistics.
RESULTS: Ninety-six patients met inclusion criteria and were reviewed. Forty-seven patients (49%) were included in pre-implementation cohort and 49 patients (51%) were included in post-implementation cohort. Overall, 46 patients received macitentan (48%) and 50 patients (52%) received ambrisentan. Prior to implementation of the new workflow, 40 patients (85%) met REMS requirements and 7 patients (15%) did not meet REMS requirement. Post implementation of the new workflow, 49 patients (100%) met REMS requirements. Non-compliance was higher in patients who continued therapy from home versus those who initiated therapy during admission (15% vs. 0%).
CONCLUSION: Systems must implement and evaluate appropriate workflow process that is achievable and efficient to meet their individual needs. The new workflow process at our institute achieved 100% compliance rate to REMS requirements for endothelin receptor antagonists.

58. The impact of a computerized Medication Reconciliation System used in outpatient setting. *Hsiu-Yu Chien, Master*, Ying-Chih Huang, Master, Shao-Yi Wu, Bachelor; Department of pharmacy, Taipei Medical University- Shuamg-Ho Hospital, New Taipei City, Taiwan
INTRODUCTION: Medication error that occurs at transition points in patient care is a significant problem. Many studies discussed the impact of medication reconciliation upon hospital admission. However, there was little focus on evaluating the performance of medication reconciliation when patient was

discharged form hospital and then followed-up in outpatient clinic, especially for patients with multiple specialist outpatient clinic visits.
RESEARCH QUESTION OR HYPOTHESIS: This study is to evaluate the efficacy of a computerized Medication Reconciliation System using in outpatient setting for patients recently discharged from hospitals.
STUDY DESIGN: This is a single-center, retrospective observational study conducted in a regional hospital in Taiwan. To evaluate the efficacy of computerized Medication Reconciliation System in outpatients who take antihypertensive agents, lipid lowering agents, anti-diabetic agents, or high-alert medications defined by The Institute for Safe Medication Practices.
METHODS: The computerized Medication Reconciliation System which provides a list of patient's discharge medications was implemented in the institutional outpatient clinics in July, 2013. Patients discharged from inpatient setting and followed in the outpatient clinics in April 2013 and April 2016 were recruited. The number and type of medication discrepancies were evaluated by pharmacists, and the medication discrepancy rate were compared between the 2 study periods.
RESULTS: Total of 1417 prescriptions (536 patients) in April 2013 and 813 prescriptions (317 patients) in April 2016 were reviewed. When analyzed by the number of medication, there were 129 (9.1%) and 20 (2.5%) discrepancies identified in April 2013 and April 2016 ($p<0.001$). And analyzed by the number of prescription, there were 89 (16.6%) and 16 (5%) discrepancies identified in April 2013 and April 2016 ($p<0.001$). The most common type of discrepancy is omission.
CONCLUSION: This is the first study focused and analyzed the computerized Medication Reconciliation System in the outpatient setting. The result shows the medication discrepancy rate was significant decreased after introducing the system to prevent related medication errors.

Nephrology

59. Knowledge, attitudes and practices of healthcare professionals towards early referral and using statins in non-dialysis CKD patients. *Abeer Kharshid, Ph.D. Candidate*, Syed Azhar Syed Sulaiman, Pharm.D., Ahmed Aly, JMHPE, M.Pharm., Ph.D., Candidate; Department of Clinical Pharmacy, School of Pharmaceutical Sciences, Universiti Sains Malaysia, Penang, Malaysia
INTRODUCTION: The latest Kidney Disease Improving Global Outcomes (KDIGO) clinical practice guideline for lipid management in Chronic Kidney Disease (CKD) recommended statins for most of non-dialysis CKD patients. Healthcare professionals (HCPs) are the mainstay of appropriate CKD guidelines implementation. This study aimed at assessing HCPs' knowledge regarding CKD and inspecting their referral attitude and perceptions towards statins use in non-dialysis CKD patients.
RESEARCH QUESTION OR HYPOTHESIS: What is the knowledge level of HCPs regarding CKD, their attitude in respect of early referral and perception towards statins use in non-dialysis CKD patients?
STUDY DESIGN: Observational cross-sectional.
METHODS: A cross-sectional design was employed using a self-administered questionnaire constructed and validated before the study. The questionnaire was distributed to HCPs at two accredited hospitals in Riyadh, Saudi Arabia over three months in 2016.
RESULTS: Of the 187 consenting participants, 48.1% were pharmacists, 40.6% were physicians, and 11.2% were medical students. Female respondents slightly exceeded males, 56.7%, vs. 43.3% respectively. Around two-thirds of the participants were >30-year old and had at least 5-year of experience. About 40% of participants chose medical journals as their fundamental source for updated CKD information. More than 87% of respondents reported their dissatisfaction with available CKD CME programs. Almost 93% of participants appreciated the benefit of early referral of CKD patients to nephrologists and 84.5% believed that non-dialysis CKD patients might benefit from using statins. The overall knowledge scores of participants were average with no significant differences based on participants' age, gender, profession, experience or income. However, male gender, older age, specialist physicians, longer experiences and highest salaries were related to higher scores.
CONCLUSION: There is room for improvement of HCPs' knowledge regarding CKD patients and the use of statins in this cohort. HCPs hold a positive attitude towards early referral of CKD patients to nephrologists and appreciate the considerable value of statins use in improving CKD patients' outcomes.

Neurology

60. Bone health lifestyle behaviours among adults with and without epilepsy. *Haya Fernandez, B.Sc.*[1], Martin Cooke, Ph.D.[2], Tejal Patel, Pharm.D.[1]; [1]School of Pharmacy, University of Waterloo, Kitchener, ON, Canada [2]Department of Sociology and Legal Studies School of Public Health and Health Systems, University of Waterloo, Waterloo, ON, Canada
INTRODUCTION: People with epilepsy (PWE), especially those aged 50 and over, have an increased risk of fracture relative to people without epilepsy (PWOE). Behaviours that are beneficial to bone health in the general population include weight-bearing physical activity, and adequate vitamin D and calcium intake. The prevalence of these is not known in the Canadian population of older PWE.
RESEARCH QUESTION OR HYPOTHESIS: What are the differences in the behaviours that impact bone health between PWE and PWOE aged 50 and over?
STUDY DESIGN: A secondary data analysis of the Canadian Community Health Survey (CCHS); an annual nationwide cross-sectional survey administered by Statistics Canada. The 2010 survey investigated epilepsy diagnosis and is the focus of this study.
METHODS: Data on weight-bearing physical activity, sun exposure, dietary choices and fracture occurrence for adults aged 50 and older were analyzed. Chi square, t test, ANOVA, Mann-Whitney and Kruskal-Wallis analyses, based on the type of data, were used to compare bone beneficial behaviours in PWE and PWOE.
RESULTS: There was no significant difference in sun exposure (69.6% of PWE reported spending time in the sun vs. 74.2% of PWOE; $p=0.382$) or in proportion of participants who made dietary choices based on calcium content (68.2% of PWE vs. 58.1% PWOE; $p=0.231$) or osteoporosis concern (40.9% of PWE vs. 37.3% PWOE, $p=0.441$). However, PWE engaged in weight-bearing physical activity less often (57 times over 3 months vs. 76; $p<0.001$) and for shorter duration (2.7% of PWE spent 1 hour/session exercising vs. 8.4% of PWOE; $p<0.013$). Of PWE, 4.2% reported a fracture in the past 12 months compared to 2.3% in PWOE ($p=0.111$).
CONCLUSION: PWE engaged in significantly less weight-bearing exercises and for less duration than PWOE; further investigation is required to examine the causes for this difference.

Nuclear Pharmacy

61. Evaluation of radiochemical purity of technetium-99m mertiatide and technetium-99m tetrofosmin stored at 30 degrees Celsius during the shelf-life. *Stephanie Pitman, Pharm.D. Candidate*[1], Neil Hartman, B.Pharm., M.Sc., Ph.D.[2], Russell Soanes, M.Pharm.[2]; [1]Purdue University, IN [2]Barts Health NHS Trust, London, United Kingdom
INTRODUCTION: The summaries of product characteristics for technetium-99m mertiatide and technetium-99m tetrofosmin recommend refrigeration of radiolabelled products at 5 +/- 3°C after manufacturing. Radiopharmaceutical delivery vehicles are typically designed to limit radiation exposure but not refrigerated, leaving products unrefrigerated during transport to end-point hospitals.
RESEARCH QUESTION OR HYPOTHESIS: Will these products remain stable and maintain radiochemical purity (RCP) when stored at 30°C for 12 hours?

STUDY DESIGN: One kit of each product was prepared within manufacturer reconstitution limits on three dates. The products were placed in a water bath warmed to 30°C. The products were subject to RCP testing in triplicate at times 0, 2, 4, 6, 8, 10, and 12 hours after preparation.
METHODS: Thin layer chromatography (TLC) was used to determine RCP. A radiochromatogram scanner was used to trace the radioactivity profile of each TLC strip, and then a chromatography integrator was used to quantify the areas of radioactive peaks in order to calculate RCP. In order to meet the minimum requirements for clinical use, RCP must be greater than 90% for technetium-99m tetrofosmin and greater than 94% for technetium-99m mertiatide. The mean RCP with a 95% confidence interval was calculated for each time point.
RESULTS: For technetium-99m mertiatide, 57 of 60 quality control tests met the minimum RCP. For technetium-99m tetrofosmin, 62 of 63 quality control tests met the minimum RCP. For all four tests that failed, the other strips tested at the same time passed, suggesting operator error. The lower limit of the 95% confidence interval for mean RCP at each time point did not fall below the minimum percentage required to pass. The RCP did not appear to decrease over time for either product.
CONCLUSION: Both products remain stable at 30°C for up to 12 hours, suggesting unrefrigerated transport would not affect stability or RCP.

Oncology

62E. Influence of tyrosine kinase inhibitors on renal function and evaluation of current monitoring procedures at the Cincinnati Veterans Affairs Medical Center (VAMC). *Susan Drees, Pharm.D.*[1], Gabrielle Sawyer, Pharm.D.[1], Courtney Schultz, Pharm.D.[2]; [1]Inpatient Pharmacy (119), Cincinnati VAMC, Cincinnati, OH [2]Outpatient Pharmacy (119), Cincinnati VAMC, Cincinnati, OH

63. Evaluation of the cisplatin-induced human peripheral blood mononuclear cells oxidative stress and nephrotoxicity: the influence of hydrogen peroxide. *Júlia C. F. Quintanilha*[1], Marília B. Visacri[2], Vanessa M. Sousa[3], Larissa Brito Bastos[1,2,3], Camila de Oliveira Vaz[1], João Paulo de Oliveira Guarnieri[1], Carina Malaguti[3], Anibal E. Vercesi[3], Carmen P. Lima[3], Priscila G. Mazzola[1,2,3], Patricia Moriel[3]; [1]University of Campinas (UNICAMP) [2]University of Campinas, Campinas, Brazil [3]University of Campinas
INTRODUCTION: The most effective treatment for head and neck cancer is radiotherapy along with high doses of cisplatin as chemotherapy, but its use is restricted because of the cisplatin's toxicity, mainly nephrotoxicity, that is caused principally by oxidative stress.
RESEARCH QUESTION OR HYPOTHESIS: Nephrotoxicity induced by cisplatin is related with human peripheral blood mononuclear cell oxidative stress? This relationship is stronger with some specific reactive oxygen specie?
STUDY DESIGN: It was a prospective clinical and observational study at a hospital in Brazil.
METHODS: Before and after five days of the first cisplatin administration were collected blood of twenty-four patients to the realization of the MitoSox Red, H_2DCF-DA and Amplex Red tests to determinate oxidative stress. Renal function was expressed in serum creatinine, creatinine clearance, and blood urea nitrogen (BUN). Serum creatinine and creatinine clearance were classified by CTCAE (v4).
RESULTS: No test showed significant variation after chemotherapy. Serum creatinine varied from 0.8±0.2 to 1.6±1.1 mg/dL ($p < 0.001$); creatinine clerance from 100.0±24.4 to 57.0±25.8 mL/min ($p < 0.001$); BUN from 26.2±7.8 to 61.7±28.4 ($p < 0.001$). Serum creatinine increase was present in 16.7% in G1, 16.7% in G2 and 16.7% in G3; creatinine clearance decrease was present in 33.3% in G1, 41.7% in G2, 8.4% in G3 and 4.2% in G4. Higher production of H_2O_2 (Amplex Red test) was correlated with greater variation of serum creatinine ($p=0.004$, $R=0.561$) and related to higher grades of serum creatinine ($p=0.004$) and creatinine clearance ($p < 0.001$). Linear regression analyses showed a univariate positive relationship between H_2O_2 production and serum creatinine ($p=0.013$), creatinine clearance ($p=0.046$) and BUN variation ($p=0.032$); and a multivariate positive relationship between H_2O_2 production and BUN variation ($p=0.040$).
CONCLUSION: H_2O_2 production is directly related to all evaluated renal parameters.

64. The evaluation of cellular oxidative stress and toxicities due to antineoplastic treatment with sorafenib in patients with hepatocellular carcinoma. *Graziele B. Ferrari, Master Student*[1], Júlia C.F. Quintanilha, Master's Student[2], Marília B. Visacri, M.Sc.[3], Taynna Tatiane Pereira, Undergraduated[1], Laís Sampaio Amaral, Master Student[1], João Paulo de Oliveira Guarnieri, Undergraduated[4], Camila de Oliveira Vaz, Undergraduated[1], Larissa Brito Bastos, Undergraduated[1,2,3,4], Caio Henrique Gibim, Master Student[1,2,3,4], Priscila G. Mazzola, Ph.D.[1,2,3,4], Patricia Moriel, Ph.D.[1,2,3,4]; [1]State University of Campinas – UNICAMP [2]University of Campinas (UNICAMP) [3]University of Campinas, Campinas, Brazil [4]University of Campinas – UNICAMP
INTRODUCTION: Sorafenib is an oral multiquinase inhibitor used in the treatment of patients with advanced hepatocellular carcinoma. This drug has benefits for patient survival, however, it has important adverse reactions. Hand-foot syndrome is a cutaneous reaction that can present complications leading to dose reduction and discontinuation of treatment. In literature, its mechanism is still not well understood. Studies have shown that sorafenib is able to produce a rapid reactive oxygen species (ROS) of mitochondrial origin, but there is still a lack of information about its correlation with the toxicities of this drug.
RESEARCH QUESTION OR HYPOTHESIS: There is an increase in the cellular oxidative stress of patients with hepatocellular carcinoma undergoing chemotherapy with sorafenib and this is related with the presence of hand foot syndrome.
STUDY DESIGN: This is a prospective observational study approved by the Ethics Committee (CAAE: 49975915.4.0000.5404).
METHODS: Blood samples were collected one day before and approximately one month after the beginning of treatment to perform MitoSox Red test to determinate cellular oxidative stress. Patients were evaluated for the presence of hand-foot syndrome after one month of sorafenib use.
RESULTS: Fourteen patients were included and half of them presented hand-foot syndrome. In general, patients showed an increase in the MitoSox Red test results, variating from 175,5 ± 302,9 A.F.U to 627,4 ± 1159,6 A.F.U after one month of sorafenib. MitoSox Red test variated from 237,6 ± 429,5 A.F.U to 606,5 ± 1013,5 A.F.U for the group of patients who had the syndrome and from 113,44 ± 73,42 A.F.U to 648,41 ± 1372,98 A.F.U for the group who did not have this adverse reaction.
CONCLUSION: These results showed that there is an increase in cellular oxidative stress after the administration of sorafenibe, but probably it does not have a relationship with the presence of hand-foot syndrome.

65E. Trastuzumab loading, reloading, and monitoring evaluation in a regional community hospital. *Jennifer Kwok, Pharm.D.*, Tracy Haley, R.Ph., Claire Boomershine, Pharm.D., BCOP; Department of Pharmacy, Owensboro Health Regional Hospital, Owensboro, KY

Pain Management/Analgesia

66E. Pharmacist strategies for the self-management of pain. *Daniel Trinh, B.S.*[1], Ramon Chavez, N/A[2], Daniel Vergel de Dios, N/A[3], Marion Slack, Ph.D.[4], Jeannie Lee, Pharm.D., BCPS[5]; [1]College of Pharmacy, University of Arizona, Tucson, AZ [2]College of Pharmacy, University of Arizona [3]University of Arizona [4]Department of Pharmacy Practice and Science, The University of

Arizona College of Pharmacy, Tucson, AZ [5]Department of Pharmacy Practice and Science, College of Pharmacy, University of Arizona, Tucson, AZ

Pediatrics

67. Correlation of creatinine-based equations with 24-hours creatinine clearance test (CCT) in pediatric oncology and hematopoietic stem cell transplant (HSCT) patients. *Wan Xuan Selina Lim, B.Sc. (PharmHons)*[1], Xue Na Goh, B.Sc. (PharmHons)[2], Mei Yi Loke, B.Pharm[2]; [1]Department of Pharmacy, KK Women's and Children's Hospital, Singapore [2]Department of Pharmacy, KK Women's and Children's Hospital, Singapore

INTRODUCTION: With the switch to the Isotope Dilution Mass Spectrometry (IDMS)-traceable serum creatinine (SCr) assay in March 2012, there were concerns about whether the original Schwartz equation can still reliably estimate creatinine clearance (CrCl) as compared to the bedside Schwartz equation.

RESEARCH QUESTION OR HYPOTHESIS: To evaluate the correlation between the Schwartz equations and the 24-hour creatinine clearance test (CCT) to determine the most appropriate equation to predict the renal function of pediatric oncology and hematopoietic stem cell transplant (HSCT) patients.

STUDY DESIGN: A retrospective single-centre observational study conducted in KK Women's and Children's Hospital (KKH).

METHODS: 83 pediatric oncology and HSCT patients aged 1–16 years old from March 2012 to June 2014 were included and their 24-hour CCT, SCr and other patient attributes were extracted from the electronic database. The patient's CrCl was then calculated based on the original and bedside Schwartz equations, and compared to their 24-hour CCT. Correlation analysis included the use of the intraclass correlation coefficient (ICC), linear regression and the Bland-Altman plot.

RESULTS: While both creatinine-based equations yielded similar correlations with the 24-hour CCT, the bedside Schwartz equation appeared to have a better agreement based on the Bland-Altman 95% limits of agreement. A stratified analysis of the results also showed that the bedside Schwartz equation can correlate better in females, children ≤2 years old and >12 years old.

CONCLUSION: While no recommendation can be made to favor one equation over the other, the bedside Schwartz equation gave CrCl estimates closer to the measured CrCl.

68. Experience with dexmedetomidine for sedation of children and adolescents undergoing imaging. *Victoria Tutag Lehr, Pharm.D.*[1], Ajay Pradhan, B.S. Candidate[2], Ahmad Farooqi, M.S.[3]; [1]Department of Pharmacy Practice, Wayne State University, Detroit, MI [2]Department of Biological Sciences, Wayne State University, Detroit, MI [3]Children's Research Center of Michigan, School of Medicine Wayne State University, Detroit, MI

INTRODUCTION: Dexmedetomidine, a selective alpha-2 agonist with minimal effect on respiration, is increasingly used for sedation of children during imaging. Advantages of dexmedetomidine over fentanyl and benzodiazepines include intermediate onset, minimal respiratory depression and mild, transient hemodynamic effects. The efficacy and safety of dexmedetomidine in a heterogeneous pediatric population requires further characterization.

RESEARCH QUESTION OR HYPOTHESIS: Dexmedetomidine is safe and effective for sedation of children and adolescents undergoing imaging.

STUDY DESIGN: Retrospective review of medical records from January 2011 to December 2013 at an academic pediatric hospital. IRB approval obtained.

METHODS: Inpatients or outpatients,1 to ≤ 18 years of age requiring imaging who received ≥ 1 dose of IV dexmedetomidine for sedation were included. The primary outcome was efficacy evaluated by percentage of patients successfully completing the imaging. Safety was evaluated by type and frequency of adverse effects. Demographics, clinical characteristics, and outcomes were collected. Pearson's Chi-squared Test/Fisher-Irwin test analyzed distribution of categorical variables. Student's t test and Wilcoxon rank sum test compared groups for continuous variables. p-values < 0.05 were considered significant.

RESULTS: The sample (n=759 cases) was 58% male, median age 9 years (IQR 6–12 years); weight 31 kg (IQR 22–47 kg). 539/759 (71%) required total IV dexmedetomidine doses ≤ 200 mcg. Midazolam was administered to 33% for anxiety. A total of 751/759 (99%) completed the imaging. Recovery duration was ≤30 minutes for 744/759 (98%) of cases. Adverse effects (AEs) occurred in 39/759 (5%): hypertension (11); bradycardia (10); hypotension (8); tachycardia (4); nausea/vomiting (4); paradoxical reaction (2). Treatment was required for 26/39 (66%) AEs. There were no differences in gender, age, weight, co-administration of other sedatives in patients with AE compared to those without AE ($p > 0.05$).

CONCLUSION: These findings suggest that dexmedetomidine is an effective and safe agent for sedation of children and adolescents undergoing imaging.

69E. Frequency of severe infusion reactions associated with rapid infusion of infliximab without pre-medications. *Stephanie Hutsell, M.S., Pharm.D.*[1], May Wu, Pharm.D.[2], K.T. Park, M.D., M.S.[3]; [1]Department of Pharmacy, Lucile Packard Children's Hospital, Stanford, Palo Alto, CA [2]Department of Pharmacy, Lucile Packard Children's Hospital, Palo Alto, CA [3]Pediatric Gastroenterology, Lucile Packard Children's Hospital, Palo Alto, CA

70. Safety and effectiveness of diuretic use in preterm infants. *Priya Shah, Pharm.D. Candidate*[1], Christine Robinson, Pharm.D.[2]; [1]Ernest Mario School of Pharmacy, Rutgers, The State University of New Jersey, Piscataway, NJ [2]Pharmacy Department, Morristown Medical Center, Morristown, NJ

INTRODUCTION: Since pulmonary edema may result in lung injury, diuretic therapy has been used in preterm infants with chronic lung disease to improve lung function. Based on limited literature and lack of evidence for important clinical outcomes and associated adverse effects, diuretic use is generally not recommended in this patient population.

RESEARCH QUESTION OR HYPOTHESIS: Evaluate the safety and effectiveness of diuretic use for chronic lung disease in preterm infants at Morristown Medical Center

STUDY DESIGN: Retrospective chart review of 25 preterm infants admitted to the neonatal intensive care unit at Morristown Medical Center who were prescribed at least one dose of diuretics for confirmed or developing chronic lung disease between June 13, 2012 and August 13, 2015.

METHODS: Data collected included diuretic agent, dosage, adverse effects, and patient demographics. The data was analyzed using descriptive statistics. The primary objective was to assess potential complications of diuretic administration. Secondary objectives were assessment of short-term and long-term improvement.

RESULTS: Twenty-five preterm infants with a median gestational age of 25 4/7 weeks and median birthweight of 725 grams were included. Spironolactone-thiazide combination therapy was the most frequently prescribed diuretic regimen (68 percent). The median duration of diuretic use was 36 days. Electrolyte abnormalities occurred in 84 percent of patients and included hyponatremia, hypokalemia, and hypochloremia. Management included electrolyte supplementation, discontinuation of diuretic therapy, decrease in diuretic dose, and supplementation with dose decrease or discontinuation. Upon completion of diuretic therapy, 52 percent continued to require respiratory support. The median length of hospitalization was 114 days and four patients died.

CONCLUSION: A majority of patients developed laboratory abnormalities and required management. Short term improvement in the level of required respiratory support was seen in less than half of patients and clinically important improvement in long term

outcomes was not observed. Risks and benefits of diuretic use in this patient population should be carefully weighed.

Pharmacoeconomics/Outcomes

71E. Treatment with omalizumab reduces exacerbations, healthcare resource utilization and missed school days in children with uncontrolled allergic asthma. Stanley Szefler, M.D.[1], *Evgeniya Antonova, Ph.D., M.S.*[2], Benjamin Trzaskoma, M.S.[2], Benjamin Ortiz, M.D.[3], Brandee Paknis, Pharm.D.[3], Ahmar Iqbal, M.D.[2], Stanley Goldstein, M.D.[4]; [1]The Breathing Institute/Pulmonary Medicine, Children's Hospital Colorado, Aurora, CO [2]Genentech, Inc. [3]Novartis Pharmaceuticals Corporation, East Hanover, NJ [4]Allergy and Asthma Care of Long Island, Rockville Centre, NY

Pharmacoepidemiology

72. A Clinical audit for appropriateness of NSAIDs prescribing for patients with diabetes mellitus by primary care physicians in Saudi Arabia. *Faizan Mazhar, Pharm.D, M.phil., BCPS*[1], Shahzad Akram, Pharm.D., BCPS[2], Nafis Haider, B.Pharm., M.Pharm.[1]; [1]King Fahad Military Medical Complex, Dhahran, Saudi Arabia [2]Pharmaceutical Care, King Abdulaziz Medical City, Riyadh, Saudi Arabia

INTRODUCTION: Non-steroidal anti-inflammatory drugs (NSAIDs) are one of the most commonly used medications, perhaps because they are effective in treating various ailments. NSAIDs are not without safety concerns, most notably their cardiovascular (CV) and gastrointestinal (GI) adverse events. Patients with diabetes are at higher risk of CV and symptomatic, uncomplicated or complicated GI events.

RESEARCH QUESTION OR HYPOTHESIS: To study the prescribing patterns of NSAIDs in diabetic patients seen at primary care, and evaluate their appropriateness based on GI/CV risk profile of the patients.

STUDY DESIGN: Cross-sectional, descriptive study.

METHODS: We retrospectively identified a cohort of patients with diabetes mellitus which were examined at a primary care department for medical reasons from 1 to 31 March 2016. The presence of GI risk factors, CV histories, and current drug treatments were recorded. Data were evaluated for appropriateness of NSAIDs prescribing by using current accepted guidelines and recommendations.

RESULTS: A total 443 patients were reviewed. NSAIDs were prescribed in 171 (38.5%) patients. Ibuprofen (23.5%) was the most frequently prescribed drug, followed by celecoxib (20%), and naproxen (14.1%). Of 171 patients, 76 (44.4%)had a previous history of CV events, while in patients without CV history, 52 were at moderate to very high 10-year risk of heart disease. Prescriptions of naproxen were markedly less (19.1%)in patients with CV history. Given the GI risk,22.9% patients at high-risk were prescribed traditional-NSAIDs without a gastroprotective agent. Overall,22.9% patients at high-GI risk and 65.8% patients at high-CV risk were prescribed NSAIDs that were not in accordance with current guidelines or recommendations made by regulatory agencies.

CONCLUSION: Inappropriate prescribing of NSAIDs was found in more than half of the studied diabetes patients that were at-risk for significant GI and CV adverse events. The risk of individual NSAIDs against the likely analgesic benefits should be weighed against the potential adverse events while prescribing such medications in a high-risk population, such as diabetes.

73. The influence of rivaroxaban versus warfarin therapy for stroke prevention in hospital resource utilization in nonvalvular atrial fibrillation patients. *Barkha Jain, Pharm.D. Candidate*[1], Luigi Brunetti, Pharm.D., MPH[2]; [1]Department of Pharmacy Practice and Administration, Ernest Mario School of Pharmacy, Rutgers, The State University of New Jersey, Piscataway, NJ [2]Department of Pharmacy, Robert Wood Johnson University Hospital Somerset, Somerville, NJ

INTRODUCTION: Nonvalvular atrial fibrillation (NVAF) is associated with longer inpatient stay, multiple readmissions, and increased hospital treatment costs. Two commonly used anticoagulants, warfarin and rivaroxaban, effectively reduce the risk of stroke in patients with NVAF. In spite of its effectiveness, warfarin therapy is cumbersome in clinical practice owing to its narrow therapeutic window, frequent monitoring, and bridge therapy requirements. Because rivaroxaban does not necessitate routine coagulation monitoring and bridge therapy, it can potentially decrease healthcare resource consumption and costs.

RESEARCH QUESTION OR HYPOTHESIS: This study aimed to compare the impact of rivaroxaban and warfarin therapies on measures of hospital resource utilization among hospitalized patients diagnosed with established or new-onset NVAF.

STUDY DESIGN: This study was a retrospective cohort study.

METHODS: The primary endpoints were inpatient length of stay (LOS) and patient charges. The secondary endpoint was hospital readmission rates. Hospitalized patients, > 18 years of age, anticoagulated with rivaroxaban or warfarin between January 2012 and May 2015 were admitted. Descriptive and inferential statistics were used to analyze the data.

RESULTS: A total of 620 patients were included in the analysis, with 281 patients in the rivaroxaban cohort and 339 in the warfarin cohort. The median age of the cohorts was 77 years and 46% of patients were female. The average LOS for rivaroxaban patients was 4.47 days, compared to 5.74 days for the warfarin cohort. The average difference in hospital LOS of 1.27 days was significant ($P<0.001$). Rivaroxaban was also associated with a significant reduction in patient charges ($P=0.004$). The unadjusted readmission rates did not differ significantly in both groups (11.7% versus 15.6%, warfarin and rivaroxaban, respectively; $P=0.16$).

CONCLUSION: While readmission status was not significantly different between groups, further analyses, which account for comorbidities, are necessary. Rivaroxaban therapy was associated with a significant reduction in hospital LOS and patient charges compared with warfarin therapy in this sample of NVAF patients.

Pharmacogenomics/Pharmacogenetics

74. Frequency of the *SLCO1B1* (rs4149056) polymoR.Ph.ism in Caucasians compared to Mexican Americans. Robert Kidd, Pharm.D., Ph.D., *Tatiana Wright, Pharm.D. Candidate*; Bernard J. Dunn School of Pharmacy, Shenandoah University, Winchester, VA

INTRODUCTION: The *SLCO1B1* (rs4149056) polymoR.Ph.ism has been associated with statin toxicity and has variant allele frequency of approximately 15% in Caucasians. The allele frequency in Mexican Americans has only been examined in very small study populations and further analyses may clarify the importance of population specific pharmacogenomic testing.

RESEARCH QUESTION OR HYPOTHESIS: The purpose of this study was to compare the frequency of the *SLCO1B1* (rs4149056) polymoR.Ph.ism between Mexicans and Caucasians.

STUDY DESIGN: Cross-sectional analysis of DNA samples from subjects self-identified as Mexican or Caucasian.

METHODS: This study was approved by the Shenandoah University Institutional Review Board. The DNA samples were from previous studies with consent for this pharmacogenetic analysis. A QuantStudio 6 Flex real-time PCR and TaqMan Genotyping Assays were used to genotype the samples. The genotypes and allele frequencies were compared utilizing Pearson's chi-squared test and a p-value of less than 0.05 was considered to be statistically significant.

RESULTS: In the Caucasian group (n=183), 129 (70.5%) of the subjects were the TT genotype, 53 (29.0%) were the TC genotype, and 1 (0.5%) was found to have the variant or CC genotype. In the Mexican American group (n=187), 159 (85.0%) subjects had the TT genotype, 27 (14.4%) had the TC genotype, and 1 (0.5%) had the CC genotype. These genotypes were significantly different between the two groups (p=0.003). Furthermore, the variant allele

frequency of 7.7% in the Mexican American subjects was significantly lower than the 15.1% frequency in the Caucasian controls (p=0.002).
CONCLUSION: The *SLCO1B1* (rs4149056) variant allele frequency was found to be significantly lower in the Mexican American subjects. However, other important SLCO1B1 genetic variations may predominate in Mexicans. Given the extensive use of statin therapy, future research should explore for other *SLCO1B1* variations that may occur with higher frequencies in Mexican Americans.

75. Frequency of BRCA associated protein 1 (BAP1) gene mutation in Egyptian patients with advanced sporadic Malignant Pleural Mesothelioma and its Correlation with clinical outcome. *Raghda Shehab Eldin, B.Sc. Pharm, M,Sc. Candidate*[1], Nagwa Sabri, Ph.D.[2], Ahmed El Bastawisy, Ph.D.[3], Abeer Bahnasy, Ph.D.[4]; [1]Hospital Pharmacy Administration, Central Administration of Pharmaceutical Affairs, Nasr City, Egypt [2]Head of Clinical Pharmacy Dept., Faculty of Pharmacy, Ain Shams University, Egypt [3]Medical Oncology, National Cancer Institute, Cairo [4]Surgical Pathology, NCI, Cairo University, National Cancer Institute, Cairo
INTRODUCTION: Malignant Pleural Mesothelioma (MPM) is a lethal cancer with limited therapeutic options. Patients with MPM have a poor prognosis, with estimated median survival varying from 4 to 12 months. BAP1 (BRCA associated protein 1) has the highest prevalence of protein-altering mutations identified in MPM.
RESEARCH QUESTION OR HYPOTHESIS: What is the frequency of BAP1 mutation in Egyptian patients with advanced sporadic MPM? And is there association between BAP1 mutation and clinical response, progression free survival (PFS) after first and second line chemotherapy and overall survival (OS)? And will that open a new era for discovering a novel lethal target in the setting of BAP1 loss?
STUDY DESIGN: This is a Prospective, cohort study.
METHODS: This study included 122 patients who are diagnosed with advanced MPM and received conventional therapy at National Cancer Institute. Following assessment of BAP1 mutations, Patients were categorized into two groups, mutated and non-mutated. Then the relation between BAP1 mutation and PFS, OS using Log Rank test and clinical response using chi-square test was assessed using Polymerase Chain Reaction (PCR) technique.
RESULTS: 38.5% of the MPM cases showed mutation in BAP 1 gene. There were no significant associations between BAP1 mutation and PFS (P = 0.31), clinical response (P =0.34) after first line treatment and OS (P = 0.67) .There were significant associations between BAP1 mutation and PFS (P = 0.046) and clinical response (P = 0.017) after second line treatment where BAP1 mutation associate with shorter PFS and poor clinical response.
CONCLUSION: BAP1 gene mutation isn't a progression factor in advanced sporadic MPM after first line treatment but it could contribute in disease progression after second line treatment.

76. Utilization of a CYP2C19 genotype-guided antiplatelet treatment algorithm over time in patients undergoing percutaneous coronary intervention. *Alexandra Cervantes, Pharm.D. Candidate*[1], Vindhya B. Sriramoju, M.D.[2], Nicholas Varunok, M.D. Candidate[2], Kasey Hamrick, Pharm.D.[1], George A. Stouffer, M.D.[2], Craig Lee, Pharm.D., Ph.D., FCCP[1]; [1]Division of Pharmacotherapy and Experimental Therapeutics, UNC Eshelman School of Pharmacy, Chapel Hill, NC [2]Division of Cardiology, UNC School of Medicine, Chapel Hill, NC
INTRODUCTION: Individuals prescribed clopidogrel that carry a *CYP2C19* loss-of-function (LOF) allele exhibit higher risk for adverse cardiovascular outcomes following percutaneous coronary intervention (PCI). Our institution implemented an algorithm that uses clinical factors and *CYP2C19* genotype to guide P2Y12 inhibitor selection in high-risk PCI patients.
RESEARCH QUESTION OR HYPOTHESIS: We aimed to evaluate algorithm use over 18 months following implementation in a real-world clinical setting.
STUDY DESIGN: This single-center, retrospective cohort study included 903 patients receiving coronary stent placement between July 2012–December 2013.
METHODS: Data was abstracted from the electronic health record. *CYP2C19* genotype testing, P2Y12 inhibitor selection (clopidogrel versus prasugrel/ticagrelor), and changes in anti-platelet therapy were compared across 6-month intervals (July-Dec 2012, Jan-Jun 2013, July-Dec 2013) by chi-square.
RESULTS: Overall, a *CYP2C19* genotype was obtained in 636 (70.4%) patients 191/636 (30%) carried a LOF allele, and prasugrel/ticagrelor was prescribed in 136/191 (71.2%) LOF carriers. *CYP2C19* genotyping testing frequency at index PCI significantly declined over time from 80.6% (Jul-Dec 2012) to 54.9% (Jan-Jun 2013) and 56.4% (Jul-Dec 2013) (P<0.001). There was also a significant decrease in use of prasugrel/ticagrelor in LOF carriers (83.1% to 76.4% to 53.8%, respectively, P<0.001). This was accompanied by less frequent switching from clopidogrel to prasugrel/ticagrelor in LOF carriers over time (P=0.025). No significant difference in prasugrel/ticagrelor selection was observed over time in those without a LOF allele (21.3% to 19.9% to 27.4%, respectively, P=0.289).
CONCLUSION: *CYP2C19* genotype testing in patients undergoing PCI and conversion to prasugrel/ticagrelor in LOF carriers was high over 18 months following implementation of a genotype-guided treatment algorithm. However, use of the algorithm in practice appeared to decrease over time, as indicated by a decrease in *CYP2C19* genotype testing and prasugrel/ticagrelor use in LOF carriers. This suggests that P2Y12 inhibitor selection is complex in real-world clinical practice and influenced by multiple factors, and recurring clinician education on algorithm use may be necessary.

Pharmacokinetics/Pharmacodynamics/Drug

77. Tenofovir plasma concentrations in obese and normal weight HIV-infected patients. *Rachel Foster, Pharm.D., MBA*[1], Caroline Derrick, Pharm.D., BCPS[2], Marlon Rampaul, M.B.B.S.[2], Mackenzie Cottrell, Pharm.D., BCPS, AAHIVP[3], Angelena Cuteri, Pharm.D.[1], P. Brandon Bookstaver, Pharm.D., FCCP, BCPS, AAHIVP[1], Celeste Caulder, Pharm.D.[1], Sharon Weissman, M.D.[2], Isioma Aninyei, M.D.[2], Julie Ann Justo, Pharm.D., M.S., BCPS, AQ ID[1]; [1]Department of Clinical Pharmacy & Outcomes Sciences, University of South Carolina College of Pharmacy, Columbia, SC [2]Infectious Diseases Division, University of South Carolina School of Medicine, Columbia, SC [3]Division of Pharmacotherapy and Experimental Therapeutics, UNC Eshelman School of Pharmacy, Chapel Hill, NC
INTRODUCTION: Maintaining therapeutic drug concentrations of antiretroviral therapy (ART) in HIV patients often requires 95% or greater adherence to medications, but individual factors such as race, genetics, and body size may affect antiretroviral drug exposure. The impact of obesity on the pharmacokinetics of tenofovir (TFV) remains unclear.
RESEARCH QUESTION OR HYPOTHESIS: The aim of this study was to evaluate the effect of body size on TFV plasma concentrations in HIV-infected patients receiving a tenofovir disoproxil fumarate (TDF)-containing regimen.
STUDY DESIGN: This was a prospective pharmacokinetic study performed in virologically-suppressed, HIV-infected patients in an outpatient clinic.
METHODS: Obese patients were matched to normal weight patients by age (± 10 years), renal function (SCr ± 0.3 mg/dL), and concomitant protease inhibitor use. All patients received a TDF-containing regimen and were virologically suppressed (HIV RNA <20 copies/mL). Plasma TFV concentrations were collected upon enrollment (random) and again within 7 to 14 days (trough and 2-hour peak, respectively). Baseline characteristics were compared using descriptive statistics. Pharmacokinetic parameters, e.g. area-under-the-curve (AUC), were calculated using noncompartmental analysis (Phoenix WinNonlin 6.4). Parameter estimates between groups were compared using Student's *t* test or Mann-Whitney U test, as appropriate (alpha level=0.05).

RESULTS: Sixteen obese and eight normal weight patients completed study procedures (BMI 30.7–63.9 vs. 18.3–25.1 kg/m^2). The obese group had a higher proportion of African Americans and females (88% vs. 63%; 81% vs. 25%, respectively). Obese patients demonstrated numerically lower median TFV plasma concentrations vs. normal weight patients (see table). The TFV steady state 24-hour AUC in plasma was significantly lower in obese patients (p=0.027).
CONCLUSION: Obese patients had significantly lower overall TFV plasma exposures compared with normal weight patients. Such lower exposures may be clinically relevant, particularly in the setting of ART non-adherence or resistance. Further studies are needed to determine the clinical impact of obesity on antiretroviral efficacy for both TDF- and tenofovir alafenamide (TAF)-containing formulations.

78. Therapeutic drug monitoring of infliximab induction therapy in inflammatory bowel disease. *Jose German Sanchez-Hernandez, Pharmacy*[1], Sofia Fraile, Pharmacy[1], Noemí Rebollo, Pharmacy[1], Esther Laso, Pharmacy[1], Alejandra F. Pordomingo, Medicine[2], M.V. Calvo, Pharmacy[1]; [1]Pharmacy Service, University Hospital of Salamanca, Salamanca, Spain [2]Gastroenterology Service, University Hospital of Salamanca, Salamanca, Spain
INTRODUCTION: Individual clinical response to anti-TNF, can be influenced by their pharmacokinetics and immunogenicity, so therapeutic monitoring of drug levels (TDM) can guide the biologic treatments. Most accepted treatment algorithms based on TDM have been developed for the management of loss of clinical response in maintenance phase.
RESEARCH QUESTION OR HYPOTHESIS: Utility of early TDM optimization during or immediately after the induction phase of infliximab (IFX) therapy in patients with inflammatory bowel disease (IBD).
STUDY DESIGN: Prospective study of patients with IBD starting treatment with IFX during a year. Informed voluntary consent was obtained from all patients.
METHODS: Patients received intravenous IFX 5 mg/Kg at weeks 0, 2, 6 and 14. Serum trough levels of IFX (STLIs) and anti-drug antibodies (ADA) were measured at week 6 or 14 by enzyme-linked immunoabsorbent assay (Promonitor®). Therapeutic range of IFX was considered >15 mcg/mL at week 6 and 4–8 mcg/mL at week 14. Clinical response was obtained by reviewing the evolution of fecal calprotectin (FC) and hospitalization or admission to the emergency department (H/AED) due to relapse during the following weeks after TDM.
RESULTS: 27 patients (33.3% females) were included, with a median age of 46 years (range [19–79]). 8 patients were diagnosed with ulcerative colitis and 19 with crohn disease. Therapeutic STLIs were found in 44.5% of patients, and supratherapeutic and infratherapeutic STLIs in 14.8% and 40.7%, respectively. Only 1 patient showed ADA. 5 patients with infratherapeutic STLIs had inadequate clinical response (increasing FC and/or H/AED). Only 1 patient with therapeutic STLIs had AED due to crohn flare up.
CONCLUSION: There is great inter-individual variability in STLIs during the induction phase and a high percentage of patients with infratherapeutic levels was found. Proactive TDM of IFX during or immediately after the induction phase could improve clinical outcomes in patients with IBD.

79. Influence of creatinine clearance estimate method on vancomycin dosing for obese adult patients. *Larry Bauer, Pharm.D.*; UW Department of Pharmacy, Box 357630, University of Washington, Seattle, WA
INTRODUCTION: Two methods for estimation of creatinine clearance (eCrCl) in obese adult patients predominate for computation of initial doses of vancomycin.
RESEARCH QUESTION OR HYPOTHESIS: Compare initial doses computed using two different eCrCl methods (Salazar-Corcoran: S-C; modified Cockcroft-Gault using adjusted body weight (ABW = IBW+0.4[TBW-IBW]): modC-G); initial doses with final, adjusted doses to attain target Css; initial Css from computed doses with final Css.
STUDY DESIGN: Observational, 157 patients (76M/81F); criterion: obese (>30% over IBW) adult patients, susceptible infections, steady-state antibiotic plus stable Scr concentrations.
METHODS: Initial doses computed using standard pharmacokinetic equations (*Applied Clinical Pharmacokinetics, 3/e*) with either S-C or modC-G used to compute eCrCl. Final, adjusted doses computed to attain individualized goal between 10–20 mg/L. Initial versus final, adjusted doses or estimated versus final, adjusted Css compared for precision and bias using the Sheiner and Beal method (*J Pharmacokinet Biopharm*. 1981 Aug;9(4):503–12).
RESULTS: Patient age: 22–81 years, percent over IBW: 35–121%, Scr: 0.5–4.2 mg/dL. Initial doses computed using modC-G were significantly smaller (−16%, p<0.05, ANOVA) than those computed using S-C (+2%, NS) compared to the final, adjusted doses. Estimated Css using modC-G were significantly less (−18%, p<0.05) than those estimated using S-C (+4%, NS) compared to final, adjusted Css. Doses and Css predicted using modC-G were less precise and biased compared to those computed using S-C. Initial doses were adjusted to attain target Css for 77% of patients when modC-G was used versus 41% of patients when S-C was used.
CONCLUSION: Using S-C for eCrCl to dose vancomycin for obese adult patients is more precise and less biased than using modC-G. This is most likely due to modC-G computing eCrCl values that are ~10–20% less than S-C for most patients. While the difference in initial doses is small between the two eCrCl equations, a smaller number of patients require subsequent dosage adjustments when using S-C.

80. Can use of the standard and revised Winter-Tozer formula accurately predict free phenytoin concentrations in non-critically ill hospitalized patients?. *Marketa Marvanova, Pharm.D., Ph.D., BCGP, BCPP*[1], Ayesha Khan, Pharm.D., BCPS[2]; [1]NDSU School of Pharmacy, Fargo, ND [2]Chicago State University College of Pharmacy, Chicago, IL
INTRODUCTION: Phenytoin (PHT) is a highly protein-bound antiepileptic drug with non-linear pharmacokinetics. Only free PHT concentrations are pharmacologically active thus more clinically-relevant for therapy monitoring. Hypoalbuminemia and uremia are associated with reduced PHT binding to serum albumin and thus increased free PHT concentrations. Free PHT laboratory measurement is expensive, has result lag time, and is not universally available at facilities.
RESEARCH QUESTION OR HYPOTHESIS: Can the standard and revised Winter-Tozer (WT) formula accurately predict free PHT concentrations in non-critically ill hospitalized patients with hypoalbuminemia (serum albumin <3g/dL) or end stage renal disease (ESRD) (CrCl<15mL/min).
STUDY DESIGN: Retrospective chart review of non-critically ill patients hospitalized between January 2010 and April 2013 in single-center, 560-bed urban community hospital.
METHODS: Participants were ≥18 years old, had ≥1 free PHT, serum albumin and creatinine concentrations obtained within the same admission, no concomitant administration of warfarin, valproic acid and its derivatives, or aspirin ≥2g/day, and were not admitted to intensive or coronary care unit. Normalized total PHT concentrations were calculated using the standard WT formula (ESRD) and revised WT formula (hypoalbuminemia). Free PHT concentrations were estimated as 10 percent of normalized total PHT concentrations. Microsoft Excel 12.0 and STATA 10.1. were used for statistical analyses (descriptive statistics, Pearson correlation coefficient (r), two-tailed test).
RESULTS: Thirty-nine patients met inclusion criteria (age 73±15 years, 54% female, 77% African American, 18% Caucasian). Strong, positive correlation between actual/measured and predicted free PHT concentrations was observed in patients with hypoalbuminemia using the revised WT (n=27, r=0.96, p<0.001). Strong, positive correlation was also observed between measured and predicted free PHT in patients with ESRD using the standard WT formula (n=12, r=0.95, p<0.001)
CONCLUSION: Data demonstrated feasibility of use of WT formulas to accurately predict free PHT concentrations in non-critically ill patients, primarily elderly, African American populations.

Psychiatry

81. Diagnosis and treatment of ADHD in the United States: update by gender and race. Kathleen A. Fairman, M.A., *Alyssa M. Peckham, Pharm.D., BCPP*, David A. Sclar, B.Pharm., Ph.D.; Department of Pharmacy Practice, Midwestern University, College of Pharmacy-Glendale, Glendale, AZ

INTRODUCTION: U.S. rates of diagnosis/treatment of ADHD were last documented prior to expansions in diagnostic criteria and pharmacotherapies.

RESEARCH QUESTION OR HYPOTHESIS: Update previously observed demographic trends in ADHD diagnosis/treatment: (1)increase in adults; (2)faster rate of increase in female than male youths; and (3)higher rates for whites than nonwhites.

STUDY DESIGN: Retrospective, repeated cross-sectional analysis.

METHODS: National Ambulatory Medical Care Survey (NAMCS) data were obtained for three time periods: 2008–2009, 2010–2011, 2012–2013. Visits including ADHD diagnosis (International Classification of Diseases, Ninth Revision codes 314.0x–314.9x) and stimulant or nonstimulant pharmacotherapy (diagnosis+drug) were measured per 1000 population and per 1000 office visits, overall, separately for adults (aged >20 years) and youth (aged <19 years), and by race and insurance type. Logistic regression models of diagnosis and diagnosis+drug controlled for these factors, psychiatric comorbidities, and time period. Interactions of time with demographic factors, and of race and sex with comorbid disorders and insurance type, were tested.

RESULTS: From 2008–2009 to 2012–2013, diagnoses of ADHD per 1000 population increased by 36% in adults and by 18% in youth; diagnosis+drug increased by 29% in female and 10% in male youths. Diagnosis was 77% less likely among black than white adults but 24% more likely among black than white youths. In multivariate analyses, mood and anxiety disorders predicted ADHD diagnosis/treatment in both age groups. Conduct disorder in youths multiplied odds of diagnosis+drug by 3.31 (95% confidence interval [CI]=2.20–4.98), especially among blacks (interaction odds ratio [OR]=3.78, 95% CI=1.39–10.32). Interaction of mood/anxiety disorder×female sex multiplied odds of ADHD diagnosis/treatment by 1.7–2.5. Additional interactions for diagnosis in adults included male sex×Medicaid enrollment (OR=2.09, 95% CI=1.42–3.08) and black race×anxiety/depression (OR=1.98, 95% CI=1.11–3.55).

CONCLUSION: Upward trends in ADHD diagnosis and treatment have continued but vary markedly by demographic group. As these disparities are unlikely neurobiological in nature, additional studies of undertreatment/overtreatment are needed.

82. Treatment of mental health conditions and health-related quality of life in US Hispanic adults: results from the 2015 behavioral risk factor surveillance system. *Beatriz Manzor Mitrzyk, Pharm.D.*, Karen Farris, Ph.D.; Department of Clinical, Social, and Administrative Sciences, College of Pharmacy, University of Michigan, Ann Arbor, MI

INTRODUCTION: Hispanics represent 17% of the US population. They are less likely to receive treatment for mental illness compared with White Americans. The health-related quality of life (HRQOL) of Hispanics in this context is unknown. Understanding these trends will help us target future mental health interventions with Hispanics.

RESEARCH QUESTION OR HYPOTHESIS: To determine associations between Hispanic and Non-Hispanic Americans using self-reported depression, anxiety, mental health condition treatment, and general health data.

STUDY DESIGN: An analysis was conducted of 10,766 persons answering the 2015 Behavioral Risk Factor Surveillance System (BRFSS) core questionnaire and Anxiety and Depression module. The BRFSS is a population-based phone (landline and cell) questionnaire conducted monthly by state health departments. Respondents were in Mississippi, North Dakota, Tennessee, West Virginia, and Oklahoma. We examined demographics, healthcare insurance status, depression, anxiety, mental health condition treatment, and general health.

METHODS: Race/ethnicity was defined as White Non-Hispanic, Black Non-Hispanic, Hispanic, and Other.

RESULTS: Overall, race/ethnicity distribution was White 64%, Black 12%, Hispanic 17%, and Other 8%. Among Hispanics, 14% had depression and 20% had anxiety. Among Whites, 20% had depression or anxiety. Hispanics appear to have lower odds (OR=0.56; 95% CI 0.15,2.01) of anxiety treatment and higher odds (1.2; 0.58,2.53) of depression treatment than Whites (neither statistically significant). Hispanics were 2.5 times (1.14,5.59) more likely to report high general health than Whites. Overall, respondents receiving treatment for mental health conditions were 73% (0.37; 0.29,0.46) less likely to report high general health.

CONCLUSION: Disparities in mental health treatment between Hispanics and Whites were not supported. General health was significantly higher in Hispanics than Whites. Future research should examine how healthcare.

Pulmonary

83E. The National Burden of Asthma in children in the U.S.: results from a Nationally Representative Study. Patrick Sullivan, Ph.D.[1], Vahram Ghushchyan, Ph.D.[2], Prakash Navaratnam, Ph.D., M.P.H.[3], Howard Friedman, Ph.D., M.M.S.[3], Abhishek Kavati, Ph.D., M.B.A., M.S.[4], Pin Xiang, Pharm.D.[5], *Benjamin Ortiz, M.D.*[4], Bobby Lanier, M.D.[6]; [1]Regis University School of Pharmacy, Denver, CO [2]American University of Armenia, Armenia [3]DataMed Solutions LLC, New York, NY [4]Novartis Pharmaceuticals Corporation, East Hanover, NJ [5]University of Texas at Austin, Austin, TX [6]University of North Texas, Fort Worth, TX

84E. Long-term outcomes from a pediatric subgroup of TENOR I: 10 years follow up. Benjamin Ortiz, M.D.[1], Bradley Chipps, M.D.[2], Robert Zeiger, M.D., Ph.D.[3], *Tmirah Haselkorn, Ph.D.*[4], Aimee Foreman, M.A.[5], Farid Kianifard, Ph.D.[6], Brandee Paknis, Pharm.D.[1], Stanley Szefler, M.D.[7]; [1]Novartis Pharmaceuticals Corporation, East Hanover, NJ [2]Capital Allergy and Respiratory Disease Center, Sacramento, CA [3]Kaiser Permanente Southern California, San Diego, CA [4]EpiMetrix, Inc., Los Altos, CA [5]ICON Plc, San Francisco, CA [6]Novartis Pharmaceuticals Corporation, East Hanover, NJ, East Hanover, NJ [7]Pediatric Asthma Research Program, Breathing Institute, Children's Hospital Colorado, and University of Colorado School of Medicine

Substance Abuse/Toxicology

85. Evaluation of patients with self-reported substance abuse presenting to the emergency department from mass gathering events. *Gary Peksa, Pharm.D.*[1], Joshua DeMott, Pharm.D.[2], Charles Hebert, M.D.[3], Matthew Novak, Pharm.D.[4]; [1]Departments of Pharmacy and Emergency Medicine, Rush University Medical Center, Chicago, IL [2]Department of Pharmacy, Rush University Medical Center, Chicago, IL [3]Departments of Internal Medicine and Psychiatry, Rush University Medical Center, Chicago, IL [4]Illinois Poison Center, Chicago, IL

INTRODUCTION: Mass gathering events (MGEs) are concentrations of people which have the potential to strain the response resources of a community, including music festivals and sporting events. Little information exists regarding the profiles of attendees and substance abuse at MGEs prior to emergency department (ED) presentation.

RESEARCH QUESTION OR HYPOTHESIS: What are the characteristics and substance abuse of patients presenting to the ED at an academic medical center from MGEs?

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

METHODS: The electronic medical record (EMR) was used to abstract clinical data of patients seen in the ED of Rush University Medical Center between October 2013 and December 2015.

A special event marker in the EMR identified patients presenting from MGEs. Descriptive analyses were performed to process all data.
RESULTS: A total of 209 patients were reviewed with 158 patients self-reporting substance abuse and included for analysis. Patients with self-reported substance abuse had a median age of 20 years, 54.4% were male, 65.2% reported no past medical history, and 91.8% presented to the ED via ambulance. Patients self-reported alcohol use in 146 cases and illicit drug use in 50 cases. Of the 50 self-reported cases of illicit drug use, 48% used marijuana, 36% used M.D.MA, and 22% used LSD. The most frequently prescribed medications in the ED were intravenous fluids (57%), ondansetron (36.1%), non-opioid analgesics (7.6%), and anxiolytics (7%). Nine of 158 patients were admitted to the hospital, and 1 patient required intubation.
CONCLUSION: Patients presenting to the ED from MGEs with self-reported substance abuse are generally young, without significant past medical history, and arrive via ambulance transport. A majority of patients received supportive care treatment with subsequent discharge from the ED.

Transplant/Immunology

87. Impact of six-month surveillance biopsies and monitoring in pediatric renal transplant recipients. *John Lyons, Pharm.D.*[1], Daniel Ranch, M.D.[2], Reed Hall, Pharm.D., BCPS[1], Pamela R. Maxwell, Pharm.D., BCPS[3], Kelley Hitchman, M.S., Ph.D.[4], Yoko Hirase, B.S.[5], Barrett Crowther, Pharm.D., BCPS[1]; [1]University Health System, San Antonio, TX [2]Department of Pediatrics, The University of Texas Health Science Center at San Antonio, San Antonio, TX [3]University Transplant Center, The University of Texas Health Science Center at San Antonio, San Antonio, TX [4]Department of Pathology, The University of Texas Health Science Center at San Antonio, San Antonio, TX [5]University of Texas at Austin College of Pharmacy, Austin, TX
INTRODUCTION: To date, few studies have assessed the utility of surveillance biopsies in pediatric renal transplantation.
RESEARCH QUESTION OR HYPOTHESIS: Surveillance biopsies at 6 months post-transplant will result in improved allograft function and higher incidence of rejection.
STUDY DESIGN: Single-center, retrospective chart review of pediatric renal transplant recipients transplanted at University Hospital from 01/01/2011–10/31/2015.
METHODS: Patients ≤18 years of age who received a renal transplant between the study dates were included and divided into two groups: patients who underwent surveillance biopsies (SB) and patients who did not (control). Mean percent change in estimated glomerular filtration rate (eGFR), incidence of rejection, and infection-related hospitalizations were compared between the groups at 12 months post-transplant.
RESULTS: The SB (n=16) and control (n=18) arms had comparable baseline characteristics. There was no significant difference between arms for outcomes of interest reported in the table below:

Outcome	SB (n=15)*	Control (n=18)	P
Δ eGFR from peak to 12 months, %(mean±SD)	−22.9±15.7	−13.2±16.6	0.094
Decrease in eGFR ≥ 10 mL/min/1.73 m^2, n (%)	12 (75.0)	8 (47.1)	0.157
Acute rejection, n (%)	3 (18.8)	1 (5.6)	0.323
Infection requiring hospitalization, n (%)	2 (12.5)	2 (11.1)	1.00

*One patient without 12 month follow-up at transplanting center.Of 16 surveillance biopsies performed, 6 patients had borderline rejection, 9 had tacrolimus-associated toxicity, and 1 had normal histology. No patients experienced any biopsy-related complications, but a majority of patients required a hospital stay ≥ 24 hours for the biopsy.
CONCLUSION: The use of surveillance biopsies in pediatric renal transplant recipients was not associated with superior renal function at 12 months post-transplant compared to controls. Despite the low-risk of biopsy complications and infections, a majority of patients who received surveillance biopsies had a hospital length of stay ≥ 24 hours. This analysis questions the short-term benefit of surveillance biopsies in pediatric kidney transplant recipients, but warrants long-term follow-up to determine the impact of actionable findings on surveillance biopsy.

Clinical Pharmacy Forum
Ambulatory Care

88. Impact of a new ambulatory care pharmacist position within a family medicine clinic. *Lauren Odum, Pharm.D.*, Sean Ragain, M.D., Sarah Ludlow, M.D., Fikisha Warden, M.D., Diane Block, M.S.N., Kristina Bryowsky, Pharm.D.; SSM Health St. Clare, Fenton, MO
SERVICE OR PROGRAM: SSM Health St. Louis created its first ambulatory care, non-faculty pharmacist position. This role helps to meet the demands and widen the scope of the PGY1 pharmacy residency program, support community endeavors within the health system, and assist family medicine providers and patients achieve disease state goals. Community events include organizing and participating in health fairs or educational programming. The disease state management activities predominantly involve caring for diabetes, hypertension, and polypharmacy patients although the scope of the protocol is broad.
JUSTIFICATION/DOCUMENTATION: Measures of success include achieving ASHP accreditation for the PGY1 residency program and having pharmacy more visible in community outreach activities, including creating a smoking cessation course and participating in a flu clinic. The disease state management measures of success include integrating into the family medicine group as evidenced by a collaborative protocol agreement with referrals (n=148 over 9 months). Focused metrics include blood pressure and A1C. Of 23 hypertension patients who were referred, 91% (n=21) were able to attain their JNC8 blood pressure goal. The average blood pressure reduction was 30/14 mmHg (n=23). Of the 40 diabetes referrals, 16 had a repeat A1C with 69% (n=11) able to reach their ADA A1C goal. The average A1C reduction was 2.1% (n=16). Polypharmacy referrals (n=22) resulted in an average reduction or simplification of 2.5 medications per patient.
ADAPTABILITY: As quality of care becomes more emphasized in payment models, family medicine clinics can continue to be an area of growth for clinical pharmacists to engage in team-based care and participate in population health initiatives.
SIGNIFICANCE: Expansion of ambulatory care clinical pharmacist positions outside of academia can have added value in training pharmacy residents and students, supporting the mission of a health system rooted in caring for its community, and improving outcomes of chronic disease states.

89. Development of a pharmacist-run home visits program to decrease medication-related errors. *Christine Chim, Pharm.D., BCACP*; College of Pharmacy & Health Sciences, St. John's University, Queens, NY
SERVICE OR PROGRAM: A home visits service was developed at a primary care office to demonstrate the impact of a pharmacist and pharmacy students engaging with patients identified as frequent emergency room (ER) users. Specific aims of this project are to identify medication-related problems (MRP), to enhance pharmacy student-learning, and to assess patients' and students' perceptions of this service. Identified through an internally-generated report, patients will be randomized into an office-visit group or the home visit group to be seen by a pharmacist and pharmacy student. In either group, the pharmacist and pharmacy student will provide education related to modifiable risk factors, identify and solve MRPs, and reduce healthcare barriers.
JUSTIFICATION/DOCUMENTATION: Substantial evidence associates medication mismanagement with adverse events and preventable hospitalizations. Higher rates of ER utilization are common among those exhibiting health-related barriers or MRPs, all of

which pharmacists can address in the comfort of a patient's home. Medication-related problems will be identified and documented in an ambulatory care pharmacy-focused database for statistical coding and analysis. Patient perspectives will be assessed via qualitative surveys before and after the service. Moreover, pharmacy students do not typically learn in patients' homes: pre- and post-surveys will be conducted to assess their perspectives.
ADAPTABILITY: The study would avail more opportunities for pharmacists. The data can set the stage for determining whether pharmacist-run home visits can help decrease frequent ER utilization and/or improve diseases.
SIGNIFICANCE: Though the literature demonstrates pharmacists' value in various settings, insufficient data exists in the home setting; the service can reinforce their value as healthcare providers. Moreover, a patient's home would serve as a unique educational setting: it would open students' eyes and minds to the surrounding community's living conditions, or even to what it lacks, and thereby increase their mindfulness and sensitivity for individuals' needs, especially towards those with limited healthcare access.

90. Efficacy of Pharmacy Ambulatory Behavioral Health Services Implementation. *Kimberly Ng, Pharm.D., BCPS*[1], Mark Asaad, Pharm.D.[2]; [1]College of Pharmacy and Health Sciences, St. John's University, Queens, NY [2]Department of Pharmacy, NYC Health + Hospitals/Elmhurst, Elmhurst, NY
SERVICE OR PROGRAM: In November 2015, NYC Health + Hospitals/Elmhurst sought to improve patient care in the Ambulatory Behavioral Health Services (ABHS) clinic, a service which provides outpatient treatment and ongoing management of behavioral health disorders. The goal was to improve patient access to medications, compliance, patient experience and minimize drug costs. To accomplish this, Pharmacy Services worked to establish an ABHS satellite pharmacy. A full time pharmacist is responsible for reviewing and dispensing medications, providing recommendations for alternative agents, and providing education and support for physicians placing orders and electronically prescribing antipsychotic medications. By prioritizing Outpatient Pharmacy processing of prescriptions which originate from the ABHS clinic and counseling patients on their oral medications, the pharmacist also promotes patient adherence.
JUSTIFICATION/DOCUMENTATION: Prior to the establishment of the ABHS pharmacy, many patients failed to take their prescribed medications and failed to refill maintenance medications contributing to patient admissions, avoidable readmissions and an increased expenditure for psychiatric medications. With counseling and prescription prioritization, time to process and pick-up prescriptions has been reduced to approximately one hour. Same-day prescription pick-up has achieved a success rate of 67% while same week pick-up has achieved a 96% success rate.
ADAPTABILITY: In a patient population known to have compliance challenges, the satellite pharmacy is highly adaptable to all ambulatory clinic settings in which a licensed pharmacist is able to provide similar services. Given the success, further expansion of satellite pharmacy dispensing and counseling services for comorbidities is being considered.
SIGNIFICANCE: The establishment of a satellite pharmacy sustained the expansion of valuable pharmacy services. There has been an increase in medication compliance as reflected by the data for prescription pick-up. To promote student educational experiences, the Pharmacy Department developed and received approval from St. John's University College of Pharmacy to offer an advanced pharmacy practice experiential rotation which will commence during Spring 2017.

91E. Making an IMPACcT (Improving Patient Access, Cost, and Care through Training) as an Interprofessional Team. *Danielle Ezzo, Pharm.D., BCPS*[1], Christine Chim, Pharm.D., BCACP[2], Celia Lu, Pharm.D., BCACP[1], Nissa Mazzola, Pharm.D., CDE[1], Alice Fornari, M.D.[3], Daniel Coletti, Ph.D.[4], Joseph Conigliaro, M.D.[5]; [1]Department of Clinical Health Professions, St. John's University College of Pharmacy and Health Sciences, Queens, NY [2]College of Pharmacy & Health Sciences, St. John's University, Queens, NY [3]Office of Academic Affairs, Northwell Health, Great Neck, NY [4]General Internal Medicine, Northwell Health, Great Neck, NY [5]Medicine – General Internal Medicine, Northwell Health, Great Neck, NY

92. Implementing a transitions of care pharmacy program to reduce 30-day readmission rates. *Mary Lomberk, Pharm.D.*[1], Lacey Charbonneau, Pharm.D.[1], Jennifer Kearns, Pharm.D.[2], Timothy Bach, Pharm.D.[3], Daryl Miller, Pharm.D.[4], Josephine Cheng, Pharm.D.[3], Timothy L'Hommedieu, Pharm.D., M.S.[3]; [1]BayCare, Clearwater, FL [2]BayCare, St. Petersburg, FL [3]BayCare, Tampa, FL [4]BayCare, Winter Haven, FL
SERVICE OR PROGRAM: The Transitions of Care (TOC) pharmacy program began in 2015 as a pharmacist-led pilot project providing patients discharged from St. Joseph's Hospital (SJH) in Tampa, Florida with coordinated interventions as a part of post-discharge care planning. TOC pharmacists have three interactions with enrolled patients: an introduction to the program before discharge, a follow-up call 3–7 days post-discharge, and a follow-up call at 21 days post-discharge. The current TOC service focuses on Medicare patients, 65 and older, discharged with a core measure disease state.
JUSTIFICATION/DOCUMENTATION: It is estimated that 20% of Medicare beneficiaries are readmitted within 30 days of hospital discharge. Furthermore, 1 in 5 readmissions is due to a medication-related adverse event. The TOC program was designed with insight from previous clinical research as well as guidance from the American Pharmacist Association and National Transitions of Care Coalition standards of practice.
ADAPTABILITY: Pharmacists practicing in hospital settings can adopt our model. The electronic health record can be used to identify eligible patients for enrollment into the program. For the follow-up calls, access to medication list, discharge summary, and medication assistance resources are needed to complete comprehensive medication reviews and coordinate care. The success of the TOC pharmacy program at SJH prompted expansion to include patients from eleven BayCare Health System hospitals across the greater Tampa Bay area.
SIGNIFICANCE: Various pharmacy organizations endorse the value of leveraging a pharmacist's skill set in TOC models. Initially, the BayCare TOC program demonstrated a significant absolute reduction in all-cause 30-day readmissions of 6.9% and a relative reduction of 43.4% when compared to pre-implementation. The continued effort to implement clinically-trained pharmacists into the TOC process will not only optimize the continuity of care for the patient, but also promote the advancement of pharmacy practice within the interdisciplinary care team.

93E. Impact of clinical pharmacy involvement on the management of hypertension and diabetes: a closer look at clinical outcomes and medication-related problems. *Jenna Fancher, Pharm.D. Candidate*[1], Kimberly Carter, Pharm.D., BCACP[2], Nicholas Leon, Pharm.D., BCPS, BCACP[3]; [1]Jefferson College of Pharmacy, Jefferson College of Pharmacy, PA [2]Penn Center for Primary Care, Presbyterian Medical Center, PA [3]Penn Center for Primary Care, Penn Presbyterian Medical Center, Philadelphia, PA

94. Hepatitis B screening and vaccination of patients treated for hepatitis C in a multi-disciplinary clinic. *Lisa Woolard, Pharm.D., BCACP*[1], Babafunlola Davis, Pharm.D., BCPS, BCACP[2]; [1]Kaiser Permanente Georgia, Sandy Springs, GA [2]Kaiser Permanente Georgia, Atlanta, GA
SERVICE OR PROGRAM: Our practice site is a pharmacist managed clinic with physician oversight. The pharmacist is responsible for initiation, education, lab monitoring, refills and side effect management of patients referred for hepatitis C treatment. Additionally, the pharmacist reviews patients for hepatitis B immunity status. Susceptible patients are screened and vaccinated as necessary.

JUSTIFICATION/DOCUMENTATION: Between November 1, 2014 and December 31, 2016, 376 patients were treated for hepatitis C in our clinic. Two hundred eighty patients were screened prior to referral, and 13 patients initiated vaccination without prior screening. Of these 293 patients, 156 were immune (by exposure or vaccination completion) pre-referral. Seventy-nine of the 83 patients who were not previously screened or vaccinated were screened by the pharmacist, and 23 patients were determined to be immune. Vaccination series is in progress or has been completed for 39 of the 60 susceptible patients. The pharmacist also completed vaccination series for 42 patients with incomplete series prior to referral.
ADAPTABILITY: Pharmacists involved in hepatitis C treatment can perform hepatitis B screening and make vaccination recommendations for susceptible patients.
SIGNIFICANCE: In September 2016, the American Association for the Study of Liver Disease (AASLD) and the Infectious Disease Society of America (IDSA) updated the guidelines to recommend hepatitis B screening and vaccination of susceptible patients initiating direct acting anti-viral (DAA) therapy for hepatitis C. The guidelines were updated based on evidence of hepatitis B reactivation in patients who receive DAA therapy for hepatitis C. Of note, our practice was performing hepatitis B screening and vaccination before the updated guidelines were published. However, with this new development, hepatitis B screening is now a prerequisite for referral to our clinic. Hepatitis B screening and vaccination prior to DAA therapy may help to reduce susceptibility and protect patients against coinfection or reactivation.

Cardiovascular

95. Collaborative interdisciplinary MedED program for the optimization of care post- discharge in the cardiology patient population. *Manouchkathe Cassagnol, Pharm.D.*[1], Lorinda Bauer, R.N., M.B.A.[2], Deborah Ahern, A.N.P., B.C.[2], Ofek Hai, D.O.[2], Roman Zeltser, M.D.[3], Amgad Makaryus, M.D.[3]; [1]College of Pharmacy and Health Sciences, St. John's University, Queens, NY [2]Department of Cardiology, Nassau University Medical Center, East Meadow, NY [3]Hofstra-Northwell School of Medicine, Hofstra University, Hempstead, NY
SERVICE OR PROGRAM: Nassau University Medical Center (NUMC), Department of Cardiology has implemented the MedEd program: transition of care medication management service for general cardiology patients (including heart failure). Service conducted in collaboration with the NUMC Transition of Care (ToC) Service addresses the need for intensive, focused medication education for this patient population. Nurses, health coaches, and social services facilitate the ToC service. A clinical pharmacist and student pharmacists on the cardiology inpatient rotation conduct bedside discharge medication therapy education and a post-discharge telephone follow-up to perform medication reconciliation and reinforcement of medication education (MedRec/MedEd). MedRec/MedEd are performed 24–72 hours prior to the patient's post-hospital, cardiology/heart failure clinic appointment.
JUSTIFICATION/DOCUMENTATION: Effort to address the education needs of this patient population and reduce readmission rates for patients is the justification for implementing our program. Patient encounters were documented in the electronic medical record using a standardized note template. Cardiologist and/or nurse practitioner are notified of patients' current medication regimen prior to appointment. Documented measures include: 30-day readmission rates, adherence, medication discrepancies and misadventures, and adverse events.
ADAPTABILITY: Cardiology practices that include outpatient clinic services could implement such a program. At least 1 dedicated Clinical Specialist or a Clinical Specialist with support of students and/or residents are needed to conduct this service. Services are offered Monday through Friday during business hours. Implementation barriers include coverage during vacations, student-pharmacists training and comfort level in providing service and workload
SIGNIFICANCE: ToC programs that feature medication therapy education conducted by pharmacists have shown to be effective at reducing readmission rates, improving medication adherence and decreasing no-show rates to office visits. Current literature is limited in describing the effect these services have on general cardiology patients. This program is unique in that it features interdisciplinary efforts for the augmentation of appropriate, timely, and evidence-based management of the cardiology patient population.

Clinical Administration

96. Using clinical scorecards to drive performance improvement across a diverse group of hospitals. *Steven Johnson, Pharm.D.*, Joseph Dula, Pharm.D., BCPS, Gretchen Lindsey, Pharm.D., Katherine Marchionda, Pharm.D., Suzy Wilson, Pharm.D.; Pharmacy Systems, Inc., Dublin, OH
SERVICE OR PROGRAM: The corporate Clinical Services Team developed 4 clinical pharmacy scorecards to apply consistently throughout approximately 100 hospitals in 2016. These criteria were intended to have broad applicability to a variety of hospital sizes/types and patient populations served. Criteria was measured quarterly and scored by Regional Directors of Operations/Clinical Services and used to drive local performance improvements.Scorecards were created to measure the presence of key policy/procedure components, literature-based best practices and macro-level clinical outcomes relevant to hospital inpatient clinical practice. A time-bound measurement/improvement cycle of 12 months was selected, with quarterly scoring of program components and metrics by regional operations and clinical directors. The criteria selected in 2016 involved pharmacokinetic monitoring, IV to PO conversion, renal dose adjustment and adverse drug reaction reporting/capture programs.
JUSTIFICATION/DOCUMENTATION: The macro-level outcome metrics chosen were purposefully broad to increase applicability across multiple hospitals and specialties. Metrics were purposefully blunt to minimize the need for detailed chart review or intensive resource use to calculate the scorecard outcome value.
ADAPTABILITY: Facilities with a less than desirable outcome score were strongly encouraged to perform detailed medication use evaluations, competency assessment/training, and performance improvement cycles to improve practice and directly improve patient care as well as the clinical scorecard lag measure.
SIGNIFICANCE: In one clinical service region, 13 of 17 (76%) of participating hospitals improved clinical service components measured by the scorecard. Most facilities (15/17, 88%) volunteered to provide monthly vs. quarterly outcome metrics to aid in rapid performance improvement cycling and/or presentation of timely, consistent comparative data across the region. Several hospitals documented statistically significant improvements in outcomes via monthly run chart outcome monitoring. The improvements seen regionally were consistent with system-wide performance improvements toward best practice, both in total # of participating hospitals and the metrics themselves.

97. Development of clinical pharmacy services at a private tertiary hospital and its impact on the quality of health care provided. *Nancy Mohamed, Sr., B.Sc. Pharmacy, BCPS*[1], Nahla Kandil, BPSc, M.Sc., BCPS, BCCCP[2], Mustafa Kamal, B.Sc. Pharmacy[3], Sara El Mahdy, B.Sc. Pharmacy[3], Tarek Elmzzahi, B.Sc. Pharmacy[3], Elmohanad Farouk, Jr., B.Sc. Clinical Pharmacy[4], Aya Abou Issa, Jr., B.Sc. Clinical Pharmacy[5]; [1]Mabaret Al-Asafra Hospital, Alexandria, Egypt [2]MOH hospital, alexandria, Egypt [3]Mabaret Al-Asafra Hospital, Alexandria [4]Mabaret Al-Asafra Hospital, Alexandria, Egypt, Egypt [5]Mabaret Al-Asafra Hospital, Alexandria, Egypt, Alexandria, Egypt
SERVICE OR PROGRAM: Back in 2014, we initiated a clinical pharmacy unit in our healthcare setting. It was primarily introduced to consultants, intensivists and nurses of the critical care unit where pharmacists applied evidence-based therapeutic guidelines and made recommendations to achieve desired therapeutic

goals, optimal antibiotic regimens and ultimate administration techniques.Constant evaluation of therapy for appropriateness, monitoring for efficacy and toxicity and reporting adverse events were tasks done on a daily basis.This is done through rounding with the patient care teams and providing education to various members of the team.

JUSTIFICATION/DOCUMENTATION: Clinical pharmacists (CPs) were successfully active in the decision-making process on prospective basis with therapeutics plans.During last year, pharmacists made around 1500 interventions, 85.4% of which targeted enhanced therapeutic effect and reducing their adverse events, while 14.6% targeted cost savings.Dosing modifications and administration techniques were the most frequent interventions, followed by tailoring therapeutic plans according to the latest guidelines.Recording interventions were done daily on a database for analysis.

ADAPTABILITY: The service was established with one CP as an initial trial covering one unit, following which six CPs were recruited. Service was expanded to cover all hospital units due to wide medical staff acceptance and increasing needs to their services.Pharmacists have also been successful in protocol development, implementation and management within the multidisciplinary team.CPs who provide frontline care have gone through rigorous education and training to ensure the safest and most efficacious use of medications possible.

SIGNIFICANCE: CPs attended rounds and proactively made interventions with an acceptance rate reaching 98.4%. They were also enrolled in all hospital committees and even lead an antimicrobial stewardship program.

Additionally, they made consultations regarding perioperative thrombotic use in addition to responding to resuscitation events.Furthermore, CPs accomplished and presented findings of two studies in an international conference.

Community Pharmacy Practice

98. Increasing patient care services through a new community pharmacy practice model. *Megan Myers, Pharm.D.*[1], Michael Andreski, R.P.h., M.B.A., Ph.D.[2], Anthony Pudlo, Pharm.D., M.B.A.[3], Kate Gainer, Pharm.D.[1]; [1]Iowa Pharmacy Association, Urbandale, IA [2]Department of Pharmaceutical, Biomedical, & Admin. Sciences, Drake University College of Pharmacy and Health Sciences, Des Moines, IA [3]Professional Affairs, Iowa Pharmacy Association, Urbandale, IA

SERVICE OR PROGRAM: An 18-month pilot program utilized Certified Pharmacy Technicians to perform refill prescription product verification, commonly referred to as tech-check-tech (TCT) in 17 community pharmacies in Iowa. The intent was to shift pharmacists' time from product verification to patient care activities. Pharmacists tracked time spent in patient care before and after the implementation of TCT as well as the types and reimbursement status of activities performed. Pharmacists were encouraged to work collaboratively with other healthcare providers and to develop or expand services offered.

JUSTIFICATION/DOCUMENTATION: Previous research has reported lack of time due to high levels of dispensing activities as a barrier to providing patient care in community pharmacies.Results from the pilot demonstrate that TCT was effective for shifting approximately 19% of pharmacist time from dispensing to patient care. Number of services provided almost doubled and the types of services provided also increased. At the start of the program, 40.5% (179/442) of the possible tracked services (26 types of services across 17 sites) were being provided by the participating pharmacies. Over the course of the study period 71.3% (315/442) of the possible services had been had been provided. Several sites also developed formal collaborative practice agreements with local providers and/or made process improvements in the delivery, follow-up, and documentation of services provided.

ADAPTABILITY: Sites were chosen to approximately represent the types of community based pharmacy practices found in Iowa. The pilot sites included: 3 independent pharmacies, 11 small or regional chains, and 3 national chains.

SIGNIFICANCE: This pilot program supports that TCT may be an effective strategy to increase clinical services provided in a variety of community pharmacy settings in Iowa. The workflow change made the pharmacist more available to provide patient care services, which may prepare the pharmacies for potential value-based reimbursement opportunities in the future.

Education/Training

99. Integration of clinical pharmacists into an academic dental clinic. *Michael Krajewski, Jr., Pharm.D., M.L.S.*[1], Kalpesh Desai, Pharm.D., B.S.[1], Albert Cantos, D.D.S.[2]; [1]School of Pharmacy and Pharmaceutical Science, State University of New York at Buffalo, Buffalo, NY [2]State University of New York at Buffalo, Buffalo, NY

SERVICE OR PROGRAM: In spring 2016, the University at Buffalo School of Pharmacy and Pharmaceutical Sciences (UB SPPS) began a novel clinical service placing two pharmacy practice faculty in the University at Buffalo School of Dental Medicine (UB SDM) clinic. The clinic serves a cross section of the general population with a heavy weighting toward patients receiving government benefits for their care. The pharmacists' role is to provide medication reconciliation, dental student education, drug information services, and consult the UB SDM quality assurance (QA) committee. The pharmacist provides medication education in clinic to complement and enhance didactic instruction received by dentists-in-training during patient medication reviews. These reviews identify interactions, indications, or adverse events not readily apparent without pharmacist training. This inter-professional education (IPE) trains dental students how to interact with pharmacists and introduces them to the pharmacist's role in healthcare.

JUSTIFICATION/DOCUMENTATION: This pharmacy service intends to improve medication education of dental students and faculty, medication safety, and foster inter-professional relationships through IPE. The service enables patients on complex medication regimes to be treated more promptly by obviating the need for external consultation, which can delay treatment. Nature and number of interactions are documented, but no outcomes are tracked. The pharmacists' QA consultant role fulfills a state funding mandate.

ADAPTABILITY: This model could be adopted by similar academic clinics serving the public. Not all dental practices may have a state funding mandate requiring a pharmacist. Further research will assess the economic benefit of this service to justify expansion and utility in other dental settings.

SIGNIFICANCE: Reports regarding a clinical pharmacist practicing in a dental practice are few. The dental setting is an area of opportunity to foster inter-professional collaboration and provide clinical pharmacy services in a novel area thus expanding the practice of pharmacy and optimizing patient care.

100. A win-win situation: integration of active learning strategies into an advanced hospital rotation to define the student workforce. *Andrea Logan, Pharm.D., BCPS*[1], Bobby Poplin, Pharm.D.[2], Dorian Brown, Pharm.D., BCPS[3], Angie Veverka, Pharm.D., BCPS[4], William Guffey, Pharm.D., BCACP, BCPS[3]; [1]Carolinas HealthCare System Quality Division, Charlotte, NC [2]Carolinas Medical Center – NorthEast, Concord, NC [3]Carolinas Medical Center [4]RxPrep, Inc., Manhattan Beach, CA

SERVICE OR PROGRAM: A restructured advanced hospital rotation (AHR) integrating students as "pharmacist extenders" into daily workflow at Carolinas Medical Center was implemented. The initial orientation period prepared P4 students to independently perform responsibilities with oversight from their daily assigned pharmacist for the remainder of the rotation. Student duties included warfarin dosing, discharge counseling, and pharmacokinetic consults.

JUSTIFICATION/DOCUMENTATION: In light of decreasing reimbursements and escalating expenses, there is a critical need for pharmacists to increase their role in direct patient care. A paradigm shift in experiential pharmacy education is also

warranted to better prepare students for expanded responsibilities within the profession. Since AHR students traditionally play a passive, more observant role, the rotation model was revised as an opportunity to reengineer student training and learning to optimize resources while providing higher quality experiential education.
ADAPTABILITY: During the pilot phase, students performed clinical functions impacting select floor patients. Based on feedback, student responsibilities expanded to all floor and ICU patients. With the creation of student and pharmacist protocols for various clinical tasks, this AHR model can be easily adapted to other acute care settings.
SIGNIFICANCE: Most pharmacists involved in the pilot phase completed the evaluation (N=12). A majority agreed or strongly agreed that *having a student as a pharmacist extender helped them perform their daily tasks more efficiently*. The program was continued following the pilot and post-rotation surveys were collected from students over a 6-month period with a 58% response rate (N=7). All students agreed that the orientation provided adequate preparation to complete clinical functions. Students indicated in open-ended comments that daily immersion with pharmacist responsibilities and the increased autonomy offered by the rotation improved understanding of clinical judgment. The integration of active learning strategies into this AHR model successfully enhanced student learning and helped pharmacists perform tasks more efficiently allowing for potential expansion of clinical services.

Geriatrics

101. Utilizing academic detailing and direct to consumer education to decrease the use of sedative-hypnotics in geriatric patients. *Anishka Walker, Pharm.D.*[1], Bridget Roop, Pharm.D.[2], Addison Ragan, Pharm.D.[3], Calleen Lavinghousez, Pharm.D.[4], Heidi Cantrell, Pharm.D.[5], Kevin Brittain, Pharm.D.[6], Garrett Aikens, Pharm.D.[7]; [1]Charlie Norwood VAMC – Pharmacy Department, Veterans Health Administration, Augusta, GA [2]Birmingham VAMC – Pharmacy Department, Veterans Health Administration [3]Pharmacy, Central Alabama Veterans Health Care System, Montgomery, AL [4]Charleston VAMC – Pharmacy Department, Veterans Health Administration [5]Atlanta VAMC – Pharmacy Department, Veterans Health Administration [6]WJB Dorn VAMC, Veterans Health Administration [7]Pharmacy, Central Alabama Veterans Affairs Health Care System, Montgomery, AL
SERVICE OR PROGRAM: The VISN 7 Academic Detailing (AD) Program is a personalized educational outreach service for providers that focuses on the enhancement of Veteran outcomes by empowering clinicians and promoting the use of evidence-based treatments.To improve safe medication prescribing, the VISN 7 AD team focused on reducing sedative-hypnotic drug use in geriatric patients. The AD Clinical Pharmacy Specialist (CPS) met one on one with providers and mailed direct to consumer brochures (DTC) to patients over 75 years of age who were prescribed a sedative-hypnotic. The brochures included information about the safety concerns of sedative-hypnotic use in the geriatric population while utilizing cognitive dissonance.
JUSTIFICATION/DOCUMENTATION: There are many documented risks to using sedative-hypnotics for treatment of insomnia and anxiety in geriatric patients. These include motor vehicle accidents, psychomotor and cognitive impairment, and dangerous interactions with other CNS depressants such as alcohol and opioids. The main objective of each visit was to increase provider awareness and encourage behavior change around safe medication prescribing.
ADAPTABILITY: This service successfully employed a health educational intervention modeled after the EMPOWER (Eliminating Medications through Patient Ownership of End Results) trial. Patients were targeted as catalysts for engaging providers in collaborative discontinuation of sedative-hypnotic medications.
SIGNIFICANCE: At the end of the fiscal year, there was a net decrease of 385 elderly patients receiving sedative-hypnotic medications. The impact to our elderly veterans that discontinued their sedative-hypnotic medication is a reduction in adverse effects. Providing the patient with information about medication safety prior to their appointment is an effective and efficient way to augment academic detailing provider education and increase the success of educational campaign outcomes. Advertising the DTC campaign with providers showed there was an effort to provide patient education from a "neutral" source and thus made providers more receptive to our academic detailing provider visits.

Hematology/Anticoagulation

102. Improving patient safety through a pharmacist-managed venous thromboembolism prevention service. *Julie McGinley, Pharm.D., M.H.S.*[1], Julia Schimmelpfennig, Pharm.D., M.S., BCPS, CDE[2]; [1]Department of Pharmacy Practice, Southern Illinois University Edwardsville School of Pharmacy, Edwardsville, IL [2]Department of Pharmacy, HSHS St. Elizabeth's Hospital, Belleville, IL
SERVICE OR PROGRAM: In 2015, a pharmacist-managed venous thromboembolism (VTE) prevention service was initiated to replace a physician-managed VTE protocol. The pharmacist-managed venous thromboembolism prevention service (PVTPS) was approved by the Medical Executive Committee. PVTPS allowed for pharmacists to stratify admitted patients' risk for possible VTE while in the hospital, select and order evidence-based pharmacologic and/or mechanical prophylaxis based on risk stratification, and place a contraindication to pharmacologic prophylaxis if indicated.
JUSTIFICATION/DOCUMENTATION: Up to 60% of all VTEs are hospital acquired, and VTE is the leading cause of preventable hospital death. Following the 2008 US Surgeon General's Call to Action to Prevent DVT and PE, efforts have turned to VTE prevention while patients are admitted in hospitals. Additionally, anticoagulants have become a top safety priority as they are one of the top five medication classes associated with patient safety incidents. PVTPS pharmacists were 98% compliant with selecting appropriate risk stratification, which guided selection of evidence-based pharmacotherapy. With PVTPS, the identification of high risk patients almost doubled, the number of low risk patients decreased, and the number of pharmacologic contraindications increased.
ADAPTABILITY: A standardized protocol and treatment algorithm were approved prior to initiation which eased implementation burden. The PVTPS also collaborated with processes already in place to avoid duplication of efforts. Due to the standardized protocol and algorithm, the PVTPS is generalizable and adaptable to many facilities.
SIGNIFICANCE: Clinical pharmacists trained in PVTPS function at the height of their license in collaboration with physicians in the hospital. The PVTPS significantly improved patient safety by improvements in identification of patients at high risk for a VTE, ordering of evidence-based pharmacotherapy, identification of patients at risk for bleeding, and documenting contraindications to prophylactic therapy.

Infectious Diseases

103. Establishing a New Pharmacist-Managed Penicillin Allergy Testing Team. *Gay Alcenius, Pharm.D.*[1], Travis Swihart, Pharm.D., BCPS[2], Kerrie Deighton, Pharm.D.[2], Vivek Kak, M.D., FACP[3], Stephanie Huffman, M.S.N., R.N., CIC[4], Ellen VanStee, BS.Pharm., M.B.A.[1], Steven Johnson, Pharm.D.[5], Richa Handa, M.D.[6]; [1]Allegiance Health, Jackson, MI [2]Department of Pharmacy, Henry Ford Allegiance Health, Jackson, MI [3]Infectious Disease, Henry Ford Allegiance Health, Jackson, MI [4]Infection Control, Henry Ford Allegiance Health, Jackson, MI [5]Pharmacy Systems, Inc., Dublin, OH [6]Department of Infectious Disease, Henry Ford Allegiance Health, Jackson, MI
SERVICE OR PROGRAM: A new pharmacist-managed program to evaluate and test patients with stated penicillin allergies was created as part of a multi-disciplinary antimicrobial stewardship program.

JUSTIFICATION/DOCUMENTATION: Penicillin allergy is a commonly reported drug allergy (up to 10% of the general population); however approximately 90% of patients do not exhibit hypersensitivity when tested. Failure to utilize a penicillin in a patient not truly allergic to it may result in sub-optimal antimicrobial selection.A new pharmacist-administered testing program to evaluate stated penicillin-allergies using benzylpenicilloyl polylycine was created to address this need and promote the optimal use of antibiotics. The service is available Monday through Friday (8AM – 4PM) and begins with a prescriber order. Once the order is placed, the antimicrobial stewardship pharmacist is alerted, follows step-by-step procedures to evaluate appropriate candidates for testing, administers the test when appropriate and collaborates with the Infectious Disease Physician, Infection Control and other caregivers as necessary to optimize antimicrobial selection. The program includes an initial and annual competency program for the pharmacy staff.A total of 3 patients have been tested in the new program to date, with 2 patients not exhibiting true allergy to penicillin, and 1 indeterminate test.
ADAPTABILITY: This pharmacist managed program is adaptable and would be implementable at most hospitals with a decentralized pharmacy staff.
SIGNIFICANCE: The low observed prevalence of true penicillin allergy among patients with a stated penicillin allergy has allowed streamlining of antibiotic therapy for the patients treated to date.

104. Performance Improvement in a Pharmacist-Managed Vancomycin Dosing Service. *Benjamin Bushong, Pharm.D.*[1], Marc Neinhuis, Pharm.D.[1], Vern Botts, B.S. Pharm[1], Darrell Stuart, M.D.[1], Steven Johnson, Pharm.D.[2]; [1]McLaren Bay Region, Bay City, MI [2]Pharmacy Systems, Inc., Dublin, OH
SERVICE OR PROGRAM: An extensive pharmacist competency program was developed and implemented to improve outcomes in a long-standing pharmacist-managed vancomycin dosing service.
JUSTIFICATION/DOCUMENTATION: Vancomycin is utilized judiciously, but not infrequently as part of a long-standing antimicrobial stewardship program. In a system-wide clinical scorecard program, the hospital rate of vancomycin trough levels less than 10 mcg/mL was found to average 25.15% at baseline. A frontline clinical pharmacist volunteered to review outlier cases to determine causes and noted substantial variation in practice (and outcomes) between pharmacists. A pharmacist competency and education program was developed to increase consistency in practice and improve quality of patient care. This included a comprehensive vancomycin competency with one to one follow up to all pharmacists within the facility. Further standardization was achieved with implementation of a protocol for the initiation of vancomycin therapy, including routine loading doses and monitoring recommendation. Protocol based dosing was tracked prospectively for three months following initiation with individual case review of all patients. Monthly performance on the vancomycin trough % below 10 mcg/mL metric was presented to staff to track performance improvement, with a goal of less than 20% set by site leadership.
ADAPTABILITY: Vancomycin dosing competency, protocol, and monitoring of program outcomes are important quality control functions for pharmacist-managed clinical programs. The materials developed could be readily adapted to most acute care hospitals that utilize pharmacists to dose vancomycin.
SIGNIFICANCE: The % vancomycin trough levels less than 10 mcg/mL dropped to an average of 9.9% in the 6-month period following implementation of this program.

105. Rapidly improving outcomes in a pharmacist-managed vancomycin dosing/monitoring program. *Chelsea Branch, Pharm.D.*[1], Rebecca Furtah, Pharm.D.[1], Steven Johnson, Pharm.D.[2]; [1]McLaren Port Huron, Port Huron, MI [2]Pharmacy Systems, Inc., Dublin, OH
SERVICE OR PROGRAM: Team-based performance improvement cycling was employed to rapidly improve outcomes in a pharmacist-managed vancomycin dosing service.
JUSTIFICATION/DOCUMENTATION: Our hospital's performance on a clinical scorecard metric (% vancomycin trough < 10 mcg/mL) was among the lowest in a 11-hospital health system. A team of front-line and clinical pharmacists utilized performance improvement techniques to implement change and engage staff. Changes included modifying the dosing protocol and calculation methodology, development of staff to ensure consistency of approach, communication of goals and frequent feedback of performance metrics.With the critical value for vancomycin trough levels set at > 20 mcg/mL, the team noticed that "critical" value calls to the nurse and physician created confusion and occasionally resulted in fewer doses being given on-time. In addition, the critical value seemed inconsistent with the more aggressive dosing often employed by pharmacists. Clinical pharmacy leadership collaborated with the clinical laboratory to implement a change in critical value setting to 30 mcg/mL locally. This change was supported by the corporate antimicrobial stewardship committee and eventually implemented system-wide.Monthly performance on the vancomycin trough % below 10 mcg/mL metric was presented to staff to track performance improvement, with a goal of less than 15% set by site leadership.
ADAPTABILITY: The use of performance improvement to drive change in therapeutic trough levels and handling of critical results makes this technique adaptable to a wide variety of hospitals. The inclusion of laboratory leadership in the process to reduce unnecessary critical value calls may be an opportunity for other hospitals as only 2/11 (18%) of hospitals in the 11-hospital health-system had existing vancomycin trough critical values of 30 mcg/mL or higher.
SIGNIFICANCE: The % vancomycin trough levels less than 10 mcg/mL dropped from an average of 33.91% to an average of 18.1% in the 6-month period following implementation of this team-based program.

106E. Multicenter Study to evaluate the impact of Antibiotic Time Out in Four Community Hospitals. Radhika Polisetty, Pharm.D.[1], *Jaime Borkowski, Pharm.D.*[2], Elizabeth Jochum, Pharm.D.[3], Jennifer de la Cruz, M.D.[4], Steven Lewis, M.D.[5], Luis Manrique, M.D.[6], David Cooke, M.D.[7]; [1]Department of Pharmacy Practice, MIdwestern University Chicago College of Pharmacy, Downers Grove, IL [2]Pharmacy Department, Northwestern Medicine Delnor Hospital, Geneva, IL [3]Pharmacy Department, Northwestern Medicine Kishwaukee Hospital, Dekalb, IL [4]Department of Infectious Disease, Northwestern Memorial HealthCare, Winfield, IL [5]Department of Internal Medicine, Northwestern Medicine Delnor Hospital, Geneva, IL [6]CDPG Infectious Disease, Northwestern Memorial HealthCare, Winfield, IL [7]NMHC CEO Office, Northwestern Memorial HealthCare, Winfield, IL

Medication Safety

107. Hospital-wide conversion from bag-based to syringe-based delivery of adult epidural infusions. *Renee Xamplas, Pharm.D., BCPS*[1], Angela Plewa Rusiecki, Pharm.D., BCPS[1], Pamala Pontikes, Pharm.D.[2]; [1]Department of Pharmacy, John H. Stroger, Jr. Hospital of Cook County, Chicago, IL [2]Department of Pharmacy, Cook County Health and Hospitals System, Chicago, IL
SERVICE OR PROGRAM: A multidisciplinary team was formed to address the switching from a basic epidural infusion pump (GemStar™) system using 250mL bags to a smart pump (Alaris™), syringe-based system, in a hospital already using the Alaris™ syringe-based system for intravenous (IV) patient controlled analgesia (PCA). A smart pump drug library data set was created and existing orderables for adult epidural infusions were modified. In order to be distinguished from IV PCA pumps, pumps were uniquely labeled with yellow stickers and designated for epidural use only. Physician, nursing, and pharmacy staff were educated, and informative flyers were distributed.

JUSTIFICATION/DOCUMENTATION: The pumps used for epidural infusion did not have smart pump capabilities and were sunsetting. Furthermore, they did not allow the option for patient controlled epidural analgesia (PCEA). While desired for enhanced safety, converting to the Alaris™ smart pump system did pose some concerns. One concern was related to the smaller volume, requiring more frequent replacement and possible interruption in medication therapy. Another involved the possibility that a medication intended for epidural administration would be given intravenously, and vice versa. These concerns were addressed via optimizing the pharmacy preparation and delivery of the epidural medications, clearly distinguishing the PCEA pumps, and providing education. The conversion to a smart-pump syringe-based epidural administration system with the option for PCEA may be associated with less drug wasted, more safety features, and increased patient satisfaction.
ADAPTABILITY: With the use of computer generated orderables, multidisciplinary education and smart pump drug libraries, the transition to a syringe-based epidural delivery system with optional PCEA use can be seamlessly implemented.
SIGNIFICANCE: A hospital-wide transition to syringe-based adult epidural administration was safely and successfully implemented using a multidisciplinary team approach in an urban teaching hospital, leading to safer medication administration, potentially increased patient satisfaction and possible better patient outcomes.

Oncology

108. Development and clinical implementation of a software application for the optimal management of lung cancer. *Konstantina Chatziliadi, M.Sc.*, Sophia Markantonis-Kyroudis, Ph.D., Skouroliakou Maria, Ph.D., Ioannis Tsamis, M.Sc., Panos Papandreou, Pharm.D.; Laboratory of Biopharmaceutics & Pharmacokinetics, Department of Pharmacy, School of Health Sciences,, National and Kapodistrian University of Athens, Greece
SERVICE OR PROGRAM: A clinical pharmacist driven software application was developed for the optimization of lung cancer management. The software database was based on globally used lung cancer protocols and updated with current concepts of treatment in medical oncology. Overall, 39 treatment protocols and 27 cytotoxic drugs were included, as well as information regarding the management of side effects of chemotherapy. A pilot study was carried out, to evaluate the accuracy and reliability of the software, on twenty patients from the oncology department of a private hospital, with different types and stages of lung cancer. Specifically, the dosage, infusion time and solvent volume for each antineoplastic drug administered were calculated using the software and found to be significantly higher than those determined by hospital clinicians ($p < 0.05$). The software thus estimated drug regimen parameters with greater accuracy in accordance with guidelines.
JUSTIFICATION/DOCUMENTATION: Lung cancer remains the leading cause of cancer death among both men and women. The preparation of antineoplastic medications required for its management and the constant updating of information relating to cancer treatment consumes significant pharmacy staff time and costs. The objective of this project was to create an application that would provide the user with the means to enter patient data, select and modify appropriate chemotherapy regimens, specify details for administration and preparation of injectable solutions, both accurately and in the shortest possible time, possibly minimizing potential human errors due to the fully automated process.
ADAPTABILITY: The software application is a useful tool for clinical pharmacists and other health professionals involved in lung cancer treatment.
SIGNIFICANCE: The automation of lung cancer chemotherapy is timesaving providing clinical pharmacists, oncologists and nurses with the means to promptly give accurate antineoplastic drug dosing recommendations and details for their preparation and administration, as well as to have access to a constantly updated database.

Pediatrics

109. Expansion of pharmacy services in a pediatric emergency department through student driven medication discharge counseling. *Pamela Neely, Pharm.D., AE-C*, Jena Valdes, Pharm.D., AE-C, BCPPS; Department of Pharmacy, Johns Hopkins All Children's Hospital, Saint Petersburg, FL
SERVICE OR PROGRAM: Beginning in June 2016, the Johns Hopkins All Children's Hospital Pharmacy and Emergency Departments collaborated to expand pharmacy services by providing discharge prescription counseling to patients and families. Counseling is provided by trained fourth year pharmacy students during their pediatric emergency medicine advanced hospital practice experience (APPE) rotation from 3pm to 9pm Monday through Friday. All low acuity patients triaged to the "Quick-kid" area with discharge prescriptions are included. Patients and families are counseled and offered on-site retail services, following prescription review.
JUSTIFICATION/DOCUMENTATION: Medication discharge counseling in the emergency department is a key intervention to prevent adverse outcomes related to inappropriate medication use. In addition, medications in-hand at discharge improves compliance, provides greater access to pediatric compatible formulations and generates additional revenue. During the first six months, 667 patients received counseling on 851 medications with 25% more in-hand at discharge. These medications consisted of 54% antimicrobial, 23% gastrointestinal, and 7% analgesic medications.
ADAPTABILITY: Each pharmacy student receives training by the emergency medicine pharmacy preceptor, which includes review of communication skills, discussion points for the most frequently prescribed medications, direct observation of counseling sessions, and completion of a competency checklist prior to conducting independent counseling. A resource binder and access to online patient medication handouts are available to pharmacy students.
SIGNIFICANCE: Pharmacy students can contribute to expanded pharmacy services in a pediatric emergency department with the appropriate training, references, and support from a pharmacy preceptor. A future goal is to measure the impact of the program by performing follow up phone calls to caregivers within 48 hours of discharge to assess compliance and adverse outcomes.

Psychiatry

110. Impact of a student pharmacist driven medication reconciliation and antidepressant treatment history project at a depression clinic: a pilot study. *Stella Tang, B.S., Pharm.D., Candidate*[1], Jolene Bostwick, Pharm.D., BCPS, BCPP[2], Leanna Jaward, Pharm.D. Candidate[1], Kristen Ward, Pharm.D.[1], Sagar Parikh, M.D.[3]; [1]University of Michigan College of Pharmacy, Ann Arbor, MI [2]Department of Clinical Pharmacy, University of Michigan College of Pharmacy, Ann Arbor, MI [3]Department of Psychiatry, Michigan Medicine, Ann Arbor, MI
SERVICE OR PROGRAM: A student pharmacist driven service at a depression clinic involved interviewing patients over the phone prior to their depression clinic visit to conduct medication reconciliation and collect antidepressant treatment history. Five third-year student pharmacists were trained to perform the pharmacy encounters by pharmacist preceptors and an attending psychiatrist. Students called patients the week before their scheduled appointment and collected information about their current medications (including drug, dose, frequency, and indication) and their past antidepressant and adjunctive therapies (including drug, dose, duration of therapy, side effects experienced, response to therapy, and reason for discontinuation). Following patient interactions, the students documented results in a clinic note template to be shared with a clinical team.
JUSTIFICATION/DOCUMENTATION: The service met a need for identifying medication discrepancies and inadequate past medication trials. A total of 21/35 patients (60.0%) had at least one discrepancy identified. The total number of medication changes

made in patient electronic medical records was 146. A total of 115 past antidepressant medication trials were documented in the surveyed population, and of those trials, 72 (62.6%) were considered adequate (greater than 2 months). A total of 16/35 patients (45.7%) qualified as having treatment-resistant depression.
ADAPTABILITY: The methods utilized outline a process whereby additional clinics can implement similar processes to gather relevant information prior to clinic visits across various general and specialty settings.
SIGNIFICANCE: The success of the service highlights the critical role that a pharmacy team plays in optimizing patient care. The team identified and corrected a large number of discrepancies in medication lists and identified a significant number of treatment-resistant patients' past medication trials. To the authors' knowledge, a medication reconciliation service integrating antidepressant treatment history has not been published.

Transplant/Immunology

111. Development and implementation of a standardized, guideline-based post-hematopoietic cell transplant vaccination template in the electronic medical record. *Lindsey Douglass, Pharm.D.*[1], Rachel Reiner, Pharm.D.[2]; [1]Pharmacy Department, Saint Luke's Hospital of Kansas City, Kansas City, MO [2]Pharmacy Department, Saint Luke's South Hospital, Overland Park, KS
SERVICE OR PROGRAM: Clinical pharmacists constructed a protocol that was integrated into our electronic medical record (EMR) program to be utilized for ordering and administration of post-hematopoietic cell transplant (HCT) vaccinations. This template protocol includes separate monthly encounters with mandatory vaccinations to be administered, titers as needed, and provider communications to assess if certain optional vaccinations are indicated. The protocol will be used within the Saint Luke's Health System outpatient oncology clinics as a supportive care plan within the Epic Beacon system.
JUSTIFICATION/DOCUMENTATION: Vaccination is integral to improving long term morbidity and decreasing mortality in post-HCT patients. Precise timing allows for maximal response while preventing infective complications. In reviewing the collaborative European and North American 2009 guidelines, Infectious Diseases Society of America 2013 guidelines, current Centers for Disease Control and Prevention recommendations, and product-specific literature, it is apparent that the vaccination schedule for post-HCT patients is extensive and complex. Initial research showed none of the institutions surveyed utilized a protocol built into the EMR system. Our center does not provide HCT but patients follow up with our providers for routine care post transplant. Recommended post-HCT vaccine schedules varied by the referring institution, and providers within our health system would often send incomplete vaccination orders prompting clinical pharmacist intervention.
ADAPTABILITY: Since our protocol is guideline based with modifications to account for consolidation of vaccinations and current product availability, it can be adapted to any institution that administers post-HCT vaccinations.
SIGNIFICANCE: This protocol will ensure that patients receive all of the appropriate vaccinations on the proper schedule and titers based on need. Vaccination history is readily retrievable, allowing for easier determination of appropriate vaccinations. There are specific prompts to identify vaccines for whom only a subset of post-HCT populations qualify.

Advances in International Clinical Pharmacy Practice, Education, or Training
Adult Medicine

112. Using the Bridging Income Generation with GrouP Integrated Care (BIGPIC) model as a method for addressing chronic disease management in a peri-urban, resource-limited setting. *Mario Hoyos, Pharm.D.*[1], Chelsea Pekny, Pharm.D.[2], Ellen Schellhase, Pharm.D.[2], Monica Miller, Pharm.D.[2], Samuel Kimani, B.Ed.[3], Sonak Pastakia, Pharm.D., M.P.H.[2]; [1]Purdue University College of Pharmacy [2]Department of Pharmacy Practice, Purdue University College of Pharmacy [3]Tumaini Children's Center
SERVICE OR PROGRAM: Purdue University faculty and student pharmacists worked with providers from Moi Teaching and Referral Hospital (MTRH) and the AMPATH Consortium to establish a BIGPIC program at the Tumaini Center to serve the Munyaka slum and neighboring communities outside of Eldoret, Kenya. The program follows the 6 pillars of the BIGPIC model. 1) find patients portably, 2) link to peer/microfinance groups, 3) integrate education, 4) treat portably, 5) enhance economic sustainability, and 6) generate demand for care through incentives. Student pharmacists and faculty procured the supplies and medications necessary for screening events and care groups and created a sustainable work plan for the establishment of a new BIGPIC care program. They also brought together leaders of the Munyaka community, Tumaini Center administration, and AMPATH and MTRH providers to ensure community and provider support of the program.
JUSTIFICATION/DOCUMENTATION: Munyaka and surrounding community chiefs and elders have been engaged and are in support of the establishment of these care programs. Screening events for hypertension and diabetes have been set for January 2017 and the microfinance team from AMPATH will create BIGPIC groups from the patients who screen positive. The providers who will care for patients in the groups at the Tumaini Center have been identified and group care has been put into their work assignments starting in February 2017.
ADAPTABILITY: This model may be replicable for other underserved populations in similar regions around the world.
SIGNIFICANCE: The implementation of this program shows that the BIGPIC model, which has been shown to work effectively in rural areas throughout Western Kenya, is also feasible in the areas surrounding major cities in third-world countries. Replication of this model could bring healthcare to underserved populations around the world who are suffering from chronic diseases.

Education/Training

113. Implementation and evaluation of a pharmacy mentorship program in the international Setting. *Yasmin Abou Zahr, Pharm.D.*[1], Rania El Lababidi, Pharm.D.[2]; [1]department of Pharmacy Services, Cleveland Clinic Abu Dhabi, Abu Dhaib, United Arab Emirates [2]Department of Pharmacy Services, Cleveland Clinic Abu Dhabi, Abu Dhabi, United Arab Emirates
SERVICE OR PROGRAM: We describe the outcomes of a structured pharmacy mentorship program (PMP) developed by the department of pharmacy services at Cleveland Clinic Abu Dhabi. The program was designed and implemented between May 2015 and May 2016. Mentors and mentees applied to the program and a structured matching process was performed. An initial induction session and monthly educational sessions were delivered to mentors and mentees. Focus groups and surveys were conducted at the beginning and end of the PMP. Survey results were analyzed to assess the program's effectiveness.
JUSTIFICATION/DOCUMENTATION: In total, there were 28 participants in the PMP. Eighteen Mentees were matched with 10 mentors. Completion rates for the surveys were 78% (22/28) and 75% (21/28) for the pre- and post-mentorship survey conducted, respectively. Ninety percent of participants reported that they had the opportunity to learn and grow through participation in the PMP. Eighty six percent of participants reported being highly satisfied with their job through participation in the PMP. In addition, 60% (9/15) achieved additional specialty certifications and 20% (3/15) achieved a promotion. Challenges to remaining in the program included time commitment and scheduling difficulties. The majority (60%) of participants stated that they were likely to re-enroll in the program.
ADAPTABILITY: Although the PMP was implemented in the international setting, it may be implemented in other settings including academic institutions and hospitals. The PMP design

and delivery would be customized to meet the specific organization's learning needs.
SIGNIFICANCE: Literature suggests that mentorship programs are positively correlated with professional growth and development, as well as increased job satisfaction. There is limited literature on formalized PMPs in the international hospital setting. This PMP demonstrated a positive impact on pharmacy staff's professional growth, staff engagement and overall job satisfaction.

Systematic Reviews/Meta-Analysis Ambulatory Care

199. Systematic Review of Pharmacist Involvement in Telemedicine Intervention. *Harvey He, Pharm.D. Candidate*; School of Pharmacy, University of Pittsburgh, Pittsburgh, PA
BACKGROUND: The aim of this review is to assess pharmacists' impact on clinical outcomes in telemedicine interventions in outpatient and ambulatory care settings. The intervention of interest is any method that utilizes technology to allow pharmacist to communicate with other providers. The outcomes of interest are what modes of communication were used, who the pharmacist was communicating with, and if the intervention studied produced any clinical outcomes such as medication adherence. Clinical outcomes were compared to outcomes before telemedicine intervention.
METHODS: This review is based on a search of Medline, Scopus, and Embase databases. Subject headings and keywords used include "telemedicine", "telehealth", "telepharmacy", "pharmacy", and "pharmacist." The resulting articles were then independently screened for relevance to pharmacist utilizing by two separate individuals. Articles were categorized by the care setting and filtered for reported outcomes and comparators; articles were excluded if they reported no outcomes. The remaining articles were reviewed for mode of communication, involved parties, and outcomes.
RESULTS: Of 322 articles with relevance to pharmacist utilizing telemedicine, 33 articles presented studies performed in the outpatient setting and produced clinical outcomes. The modes of communication used were telephonic messages (19/33) and video consultations (5/33). All 33 articles involved communications between pharmacist and patient, with 1 article also involving communication between a multidisciplinary team. Of the outcomes reported, 20 interventions were found to be not superiority to usual care, 12 interventions were found to superior, and 1 was found to be worse.
DISCUSSION: There is limited information available about telemedicine interventions. Telemedicine interventions are commonly used for pharmacist to patient direct communications. Most interventions were found to be not superior to usual care.
OTHER: There is no primary source of funding, potential conflicts of interest, or registration number for this study.

Cardiovascular

200. Non-adherence to antihypertensive drugs: A systematic review and meta-analysis. *Akshaya Srikanth Bhagavathula, Pharm.D.*[1], Tadesse Abegaz, M.Sc. Clinical Pharmacy[2]; [1]Department of Clinical Pharmacy, School of Pharmacy, University of Gondar, Gondar, Ethiopia [2]Department of Clinical Pharmacy, University of Gondar-School of Pharmacy, Ethiopia
BACKGROUND: Hypertension drives the global burden of cardiovascular disease and its prevalence is estimated to increase by 30% by the year 2025. Non-adherence to chronic medication regimens is common, approximately 43 to 65.5% of patients who fail to adhere to prescribed regimens are hypertensive patients.
METHODS: This systematic review applied a meta-analytic procedure to investigate the medication non-adherence in adult hypertensive patients. Original research studies, conducted on adult hypertensive patients, using the 8-item Morisky medication adherence scale (MMAS-8) to assess the medication adherence between January 2009 and March 2016 were included. Comprehensive search strategies of four databases and MeSH keywords were used to locate eligible literature. Study characteristics, participant demographics, and medication adherence outcomes were recorded. Effect sizes for outcomes were calculated as standardized mean differences using random effect model to estimate overall mean effects.
RESULTS: A total of 28 studies from 15 countries were identified, in total comprising of 13,688 hypertensive patients, were reviewed. Of 25 studies included in the meta-analysis involving 12,603 subjects, a significant number (45.2%) of the hypertensive patients and one-third (31.2%) of the hypertensive patients with co-morbidities were non-adherent to medications. However, a higher proportion (83.7%) of medication non-adherence was noticed in uncontrolled blood pressure (BP) patients. Although a higher percentage (54%) of non-adherence to antihypertensive medications was noticed in females ($p<0.001$), the risk of non-adherence was 1.3 times higher in males, with a relative risk of 0.883. Overall, nearly two-thirds (62.5%) of the medication non-adherence was noticed in Africans and Asian (43.5%).
DISCUSSION: The findings of our review pointed out the lack of medication adherence in hypertensive patients is a significant concern.
OTHER: Non-adherence to antihypertensive medications was noticed in 45% of the subjects studied and a higher proportion of uncontrolled BP (83.7%) were non-adherent to medication. Intervention models aiming to improve adherence should be emphasized.

201. Patient adherence to Novel Oral Anticoagulants (NOACs) for the treatment of atrial fibrillation, and occurrence of associated bleeding events: a systematic review and meta-analysis. *Akshaya Bhagavathula, B.Pharm., Pharm.D.*; Department of Clinical Pharmacy, University of Gondar-School of Pharmacy, Gondar, Ethiopia
BACKGROUND: Adherence to prescribed novel oral anticoagulants (NOACs) is important for the prevention of stroke in non-valvular atrial fibrillation (NVAF) patients. Real-world evidence from published observational studies of adherence to NOACs and associated clinical outcome events in AF patients, was reviewed systematically.
METHODS: Observational studies assessing patient adherence to NOACs conducted on AF patients between September 2010 and June 2016 were identified by systematic searching of PubMed, Scopus and Google Scholar, using MeSH keywords to locate eligible studies, in accordance with Cochrane guidelines. Papers from included studies were quality assessed in duplicate, and data extracted according to a range of pre-defined criteria and outcomes. Meta-analysis was performed using a Random effects model with DerSimonian-Laird weighting to obtain pooled effect sizes.
RESULTS: From 185 potentially relevant citations, six studies, comprising 1.6 million AF patients, met the eligibility criteria and were included in the review and meta-analysis. Among these, successful adherence to NOACs occurred in some 75.6%. Adherence levels were higher in patients treated with dabigatran (72.7%) compared with those treated with apixaban (59.9%) or rivoraxaban (59.3%). However, the level of adherence was still suboptimal than expected 80% rate. Bleeding events in non-adherent patients were found to be 7.
DISCUSSION: This systematic review identified 6 well designed observational cohort studies, involving a total of 1,640,157 patients, that had evaluated the adherence to NOACs for stroke prevention among patients with AF, over a 12–18 months period of follow-up and all are published between 2015–2016.
OTHER: Suboptimal adherence to NOACs among AF patients was highlighted as a significant risk factor that may affect clinical outcomes, with a higher percentage of non-adherent patients having bleeding events. There is an urgent need for research on the effects of specific interventions to improve patient adherence to NOACs and to assess the related outcome factors that may be associated with adherence.

Education/Training

202. A systematic review of successful components in faculty mentoring programs within the health sciences. *Kristin Zimmerman, Pharm.D.*, MaryPeace McRae, Pharm.D., Ph.D.; Department of Pharmacotherapy & Outcomes Science, VCU School of Pharmacy, Richmond, VA

BACKGROUND: Faculty mentoring is associated with enhanced career development, research productivity and retention. However, successful health-sciences mentoring programs vary widely in their design and evaluative metrics. This study systematically evaluated publications of health-sciences faculty mentoring programs to identify successful components of mentoring programs.

METHODS: A search (Education Resources Information Center and Education Research Complete databases from inception to June 2016) and reference review for faculty mentoring programs in U.S. higher education institutions was performed. Studies describing the development/implementation of multifaceted, on-campus mentoring programs with a live component for health-sciences faculty were included. Data were analyzed qualitatively. For programs demonstrating scholarly productivity or promotion/retention improvements, common components were identified and evaluated as predictors of success.

RESULTS: 294 initial records were identified; 90 full text articles were reviewed for eligibility and 11 remained in the final sample. Of studies reporting scholarly productivity increases (n=5), all programs included research content. Other commonalities included funding (80%), teaching (60%), and networking (60%) content, and holding at least monthly meetings (40%). Of studies reporting enhanced promotion/retention (n=7), 100% and 83% of programs had content areas related to research and teaching, respectively. Other commonalities included networking/collaboration (67%), funding (67%) and time management (50%) content, holding at least monthly meetings (100%) and having formal curricula (100%).

DISCUSSION: Factors consistently associated with successful programs included formal curricula, frequent meetings, and research, funding, networking/collaboration and teaching programming. By nature of their design, included studies carried a high risk of reporting, performance and detection bias. These results are also limited by the small sample size and are due, in part, to the large number of publications failing to report program outcomes. Components identified in this review are important for health-sciences faculty mentoring programs aiming to enhance scholarly productivity and improve faculty promotion/retention.

OTHER: This evaluation was unfunded.

Infectious Diseases

203. Treatment outcomes of visceral leishmaniasis in Ethiopia from 1994–2015: a systematic review and meta-analysis. *Eyob Gebreyohannes, Bachelor of Pharmacy, Masters Degree Student in Clinical Pharmacy*[1], Akshaya Bhagavathula, B.Pharm., Pharm.D.[2], Tadesse Abegaz, M.Sc. Clinical Pharmacy[3]; [1]Department of Clinical Pharmacy, University of Gondar, Gondar, Ethiopia [2]Department of Clinical Pharmacy, University of Gondar-School of Pharmacy, Gondar, Ethiopia [3]Department of Clinical Pharmacy, University of Gondar-School of Pharmacy, Ethiopia

BACKGROUND: In Sub-Saharan Africa, Ethiopia recorded the second highest number of visceral leishmaniasis (VL) cases (next to Sudan) with more than 4000 people registered for treatment every year. We aimed to perform a systematic review and meta-analysis on this topic to obtain stronger evidence on treatment outcomes of VL from the existing literatures in Ethiopia.

METHODS: The full texts of 15 studies conforming to the inclusion criteria were analyzed and quality assessment was. The Cochrane Q and the I^2 were used to evaluate heterogeneity of studies. Random effects model was used to combine studies showing heterogeneity of Cochrane Q $p<0.10$ and $I^2>50$. We performed subgroup analysis by comparing the treatment outcomes between HIV positive and negative patients across different studies.

RESULTS: There were 3275 participants; 2809 were male and 244 female patients (unable to determine sex for 222), of whom 1565 exposed to SSG and 726 exposed to other drugs. Overall, a treatment success rate of 79.3% (95% CI: 71.4%–97.1%), $p<0.001$) with a death rate of 327 [9.2% (5.40–13.0%), $p<0.001$] was reported. SSG showed higher treatment success 82% (71%–92%), $p<0.001$ than comparators 75% (0.67–0.84), $p<0.001$. Our subgroup analysis on 2964 participants revealed four times higher treatment success rates in HIV-negative than HIV positive patients [OR: 4.017 (1.139–14.168 ($p=0.031$).

DISCUSSION: Treatment success with SSG was equal to or better than other antileshmanial drugs in Ethiopia, but poor treatment outcomes were noticed in VL-HIV co-infected patients in Ethiopia. Our results suggest that greater priority should be placed on more effective treatment of VL in HIV-infected patients in Ethiopia and globally.

OTHER: Future research is warranted to improve outcomes of patients with HIV-VL coinfection.

204. Clinical failure with ceftriaxone versus ceftaroline or ceftobiprole for Staphylococcal community-acquired pneumonia: a systematic review and meta-analysis. *Khalid Eljaaly, Pharm.D., BCPS*[1], Ahmed Basilim, Pharm.D.[1], Haytham Noorwali, Pharm.D.[2]; [1]HOPE Research Center, University of Arizona, Tucson, AZ [2]College of Pharmacy, University of Arizona, AZ

BACKGROUND: Ceftriaxone is a commonly used empiric antibiotic for community-acquired pneumonia (CAP). It not clear if it is an adequate agent for methicillin-susceptible Staphylococcus aureus (MSSA); therefore, the need to change ceftriaxone or add another agent with potentially better activity against MSSA is controversial. The objective of this study was to compare clinical efficacy of ceftriaxone versus either ceftaroline or ceftobiprole for MSSA CAP.

METHODS: We conducted a systematic review and meta-analysis of randomized clinical trials (RCTs) comparing clinical failure of CAP in adults who received ceftriaxone versus those who received either ceftaroline or ceftobiprole. Patients who received ceftriaxone plus an anti-methicillin-resistant Staphylococcus aureus agent were excluded. The PubMed, EMBASE and Cochrane Library databases were searched for relevant RCTs. In addition, we searched ClinicalTrails.gov, EU Clinical Trials register, and WHO International Clinical Trials Registry Platform for unpublished studies. The search was performed until January 20, 2017 without date or language restrictions. We estimated risk differences (RDs) with 95% confidence intervals (CIs) using random-effects model and assessed for heterogeneity (I^2).

RESULTS: A total of four RCTs met the inclusion criteria. Three RCTs used ceftaroline, while one used ceftobiprole. For ceftriaxone, two RCTs used 2 grams, while one two used 1 gram. In comparison with either ceftaroline or ceftobiprole, clinical failure with ceftriaxone was statistically higher (RD=−0.208, 95% CI −0.339 to −0.017, P = 0.033, I^2 = 0%).

DISCUSSION: This meta-analysis of RCTs showed that ceftriaxone use was associated with higher clinical failure compared to ceftaroline/ceftobiprole for adults with MSSA CAP. This provides support that ceftriaxone should not be used for MSSA CAP.

OTHER: None.

Pulmonary

205. Reslizumab as add-on maintenance treatment for severe asthma with eosinophilic phenotype: a systematic review of randomized controlled trials. *Keaton Grant, Pharm.D. Candidate*[1], Aisha Shokoya, Pharm.D. Candidate[2], Donald Williams, Pharm.D., Candidate[3], Mara Poulakos, Pharm.D.[4]; [1]Lloyd L. Gregory School of Pharmacy, Palm Beach Atlantic University, Royal Palm Beach [2]Lloyd L. Gregory School of Pharmacy, Palm Beach Atlantic University, West Palm Beach, FL [3]Lloyd L. Gregory School of Pharmacy, Palm Beach Atlantic University [4]Palm Beach Atlantic University, LLoyd L. Gregory School of Pharmacy, West Palm Beach, FL

BACKGROUND: The FDA estimates that 1 in 20 patients with severe asthma are uncontrolled despite maximum therapy due to elevated eosinophils. Reslizumab was recently FDA approved as add-on maintenance treatment of patients with severe eosinophilic asthma. We reviewed randomized, controlled trials to evaluate the efficacy and safety of reslizumab in this patient population.
METHODS: A literature search was conducted utilizing PubMed and OVID MEDLINE, with the following search terms "reslizumab," "asthma" and "eosinophil". No age characteristics, publication date or status restrictions were imposed. Four randomized, double-blind, placebo-controlled trials were assessed, studying administration of reslizumab to patients with inadequately controlled eosinophilic asthma on medium-dose inhaled corticosteroid (ICS). Risk of bias was assessed using the Cochrane Risk of Bias Tool.
RESULTS: Trials involved a total of 1,870 participants and evaluated the safety and efficacy of reslizumab in patients ranging from ages 12 to 75 with inadequately controlled eosinophilic asthma while on medium-dose ICS. Bjermer et al and Corren et al evaluated change from baseline of forced expiratory volume in 1 second (FEV_1) over 16 weeks. In two duplicate trials, Castro et al evaluated frequency of clinical asthma exacerbations (CAE) per patient during 52 weeks. There was a statistically significant increase in the mean FEV_1 change as well as a decrease in frequency of CAE's in the reslizumab group.
DISCUSSION: FEV_1 and CAE frequency are appropriate efficacy measures. However, studies were limited to individuals with uncontrolled asthma on medium-dose ICS, excluding those with ICS contraindications. Two trials were 16 weeks duration, limiting the long-term safety assessment of the medication. Due to methodological and clinical heterogeneity we focused on describing the studies. Overall, results support the use of reslizumab in asthmatic patients with elevated eosinophils who are uncontrolled on medium dose ICS.
OTHER: Authors have no source of funding or conflict of interests.

Rheumatology

206. Tapering regimens following medium to high dose extended duration corticosteroid monotherapy in adults with rheumatic disease: a systematic review. *Ashley M. Campbell, Pharm.D., BCPS*, Brian L. Erstad, Pharm.D., FASHP, FCCM, FCCP, BCPS; Department of Pharmacy Practice and Science, The University of Arizona College of Pharmacy, Tucson, AZ
BACKGROUND: Corticosteroids have long been used to treat rheumatic conditions due to their anti-inflammatory actions, but adverse effects associated with extended duration regimens leave clinicians questioning optimal tapering strategies. This systematic review aimed to assess clinical outcomes (efficacy and adverse effects) of differing tapering regimens following medium to high-dose extended duration corticosteroid therapy in adults with rheumatic disorders.
METHODS: A systematic search of MEDLINE, EMBASE, www.ClinicalTrials.gov, CENTRAL and Cochrane Systematic Reviews databases, National Guideline Clearinghouse, American College of Rheumatology, and reference lists up to January 15, 2017, was conducted independently by two authors. Bias was assessed using the Cochrane Collaboration tool, and disagreements were resolved through discussion. Randomized controlled trials (RCTs) comparing at least two tapering regimens in adults with rheumatic conditions of medium to high-dose (>7.5mg but <100mg oral prednisone equivalent daily) extended duration (at least 10 days) corticosteroids were included if they reported at least one efficacy (e.g.: maintenance of disease remission) and one adverse effect parameter.
RESULTS: While no RCTs with clinically relevant endpoints matched the search criteria, one prospective study suggested that extending dosing intervals to alternate day regimens does not control disease as well as single or split daily doses. The two major rheumatic conditions that continue to use medium to high-dose extended duration corticosteroid regimens as first-line monotherapy are polymyalgia rheumatica and giant cell arteritis. While systematic reviews and guidelines do provide recommendations for tapering regimens, these are based on small case series in conjunction with expert opinion.
DISCUSSION: Ideal corticosteroid tapering regimens for patients with rheumatic conditions remain unknown, as recommendations in clinical guidelines are based largely on expert opinion. This systematic review supports the need for additional research to shift corticosteroid tapering recommendations to a more evidence-based practice.
OTHER: No funding was obtained and neither of the authors have relevant conflicts of interest. This study is unregistered.

Substance Abuse/Toxicology

207. A systematic review of the relationship between substance abuse and psychotropic medication adherence: opportunities to improve outcomes for patients with a dual-diagnosis. *Tyler Dunn, B.S., M.S. Candidate*, Khalid Kamal, M.Pharm., Ph.D., Vincent Giannetti, Ph.D., Jordan R. Covvey, Pharm.D., Ph.D., BCPS; Division of Pharmaceutical, Administrative and Social Sciences, Duquesne University Mylan School of Pharmacy, Pittsburgh, PA
BACKGROUND: Poor medication adherence is associated with negative health outcomes, especially in patients with mental illness and substance use disorder. Currently, in patients with dual diagnosis, there is an incomplete understanding of how medication adherence for mental illness relates to substance use relapse. The purpose of the study was to conduct a systematic literature review to evaluate the relationship between psychotropic medication adherence and substance use disorder relapse in dually-diagnosed patients.
METHODS: A systematic literature review was conducted and reported per the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. The search was conducted in PubMed, SCOPUS, and PsychINFO electronic databases up to January 2016. Inclusion criteria were primary research articles assessing the relationship between substance abuse, psychotropic medication and adherence; reviews, grey literature, and non-English articles were excluded.
RESULTS: Fifty articles were included in the qualitative synthesis of the review. A majority of the studies (30; 60%) were conducted in the United States. 39 (78%) identified illicit drug use as a predictor of low medication adherence while 5 (10%) found no significant relationship. Two studies found current substance use to be a predictor of non-adherence but not past use. 7 studies (14%) specifically observed the dual diagnosis population. In these studies, adherence was linked to fewer stressful life events, supported housing, lower psychiatric symptom severity, social support for abstinence, satisfaction with medication, less medication side effects, higher self-efficacy and higher functioning abilities. No studies measured substance abuse disorder relapse rates as an outcome related to medication adherence.
DISCUSSION: This literature review suggests a paucity of evidence regarding the relationship between psychotropic medication adherence and substance use disorder relapse. Further research in this area is needed to understand how interventions can target patients more effectively and improve health outcomes.
OTHER: N/a.

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